AFRICAN ECONOMIC RESEARCH CONSORTIUM (AERC)

Evolution, Status and Impact of ICT on Economic Development and Transformation in Africa: An Overview

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Contribution to the AERC Project on The Impact of ICTs on Economic Development and Transformation

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EVOLUTION, STATUS, AND THE IMPACT OF ICT ON ECONOMIC DEVELOPMENT AND TRANSFORMATION IN AFRICA: AN OVERVIEW

1.0   INTRODUCTION

The process of technological innovation in the late 20th century has been dominated by new technologies such as biotechnology, new materials and microelectronics together with innovations in software development. The combination of advanced microelectronics and innovations in software development has led to systemic technologies which have come to form a pervasive cluster of information and communication technologies (Mansell, 1994)[1]. Information and communications technology (ICT) refers to technologies that pertain to the new science of collecting, storing, processing and transmitting information whereby information, computing, and telecommunications are converging. These technologies represent a myriad of stand-alone media, including telephone and mobile telephony, radio, television, video, tele-text, voice information systems and fax, as well as computer-mediated networks that link a personal computer to the Internet.

In 1998 OECD member countries agreed to define the ICT sector as a combination of manufacturing and services industries that capture, transmit and display data and information electronically.   The ICT breaks the traditional dichotomy between manufacturing and services making it possible for activities producing and distributing ICT products to pervade all sectors of the economy (OECD 2002). The definition, thus, paves way for understanding the multi-dimensionality of the ICT and its applicability across various sectors.

ICT can be thought of as an integrated system that incorporates the technology and infrastructure required to store, manipulate, deliver and transmit information, the legal and economic institutions required to regulate ICT access and usage, and the social and inter-personal structures which allow information to be shared, facilitate access to the ICT infrastructure, and through which innovation takes place.   Three broad sub-systems make up the ICT system, each of which comprise further sub-systems: technology and infrastructure (comprising communication and data processing); institutions (comprising legal and economic institutions) and social

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[1]   Mansell, R. (Ed.).The Management of Information and Communication Technologies: Emerging Patterns of Control. Science Policy Research Unit. Published by The Association for Information Management, London, 1994.

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structures and processes (these influence ICT usage and the inter-personal links that facilitate the transfer of information).

The world is experiencing a new industrial and technological revolution which is bringing about a significant, fast and extensive transformation of society and economic activity resulting in a rapid transformation of the processes of production as well as the transmission of goods and services produced. The ICT systems are pervading virtually all forms of human endeavor: work, education, leisure, communication, production, distribution and marketing as well as the content of information networks.   Information and Communication Technology (ICT) plays a major role in all aspects of national life: in politics, in economic life, as well as in social and cultural development. It transforming lives of people, the way they do business, access information and services, communicate with each other, provides entertainment and has benefits relating to human rights by supporting freedom of expression and right to information. Information and communications technology (ICT) is a pervasive input to almost all human activities and breaks barriers to human development by providing content to knowledge, breaking barriers to participation and breaking barriers to economic opportunity (e.g. by requiring less initial capital investment and by being more labour intensive (though skill intensive too)).

ICTs have diffused into all branches of the economy and their impact has come to be very pervasive impacting virtually all aspects of productive activity in the economy. The nature and extent of ICT adoption has been explored quite extensively in recent research though in Africa such work is still limited. In the case of Africa the nature and extent of adoption has been addressed in a few research programmes (e.g. Research ICT Africa) supported by IDRC and the African Technology Policy Studies Network. This information is useful in understanding the pervasiveness of ICTs and the extent and patterns of access. What has not been explored adequately to date is the impact of ICTs on economic development.   This project is aimed to contribute to filling this gap.

This paper presents an overview of the ICT evolution, status, and its future in Africa in relation to its impact on development and economic transformation of Africa. The objective of this study is to investigate the impact and implications of ICTs on economic development and transformation in Africa.

More specifically this study will address two main questions
  (i)   Identify the status of ICT access and adoption in production and growth generating activities that could lead to economic transformation in Africa
  (ii)   Explore options and possibilities of using ICT to enhance economic development and transformation in Africa.

2.0   ICT EVOLUTION

The world has undergone an evolution in terms of structural change and technological transformation. However, Africa is still lagging behind in this modern world whose development is largely determined and led by technological advances. Increasingly, ICT plays an important role in determining levels of development and the quality and accessibility of services in our modern societies. It is in this context that governments and world leaders made a strong commitment towards building a people-centred, inclusive and development-oriented Information Society for all, where everyone can access, utilize and share information and knowledge (WSIS, 2003 and 2005)[2].

2.1   Information Technology Era

Information technology (IT) is a term that encompasses all forms of technology used to create, store, exchange, and use information in its various forms (business data, voice conversations, still images, motion pictures, multimedia presentations, and other related forms) including the both telephony and computer technology that have been the driver of what has often been called "the information revolution."

Electronic calculating machine: In 1946, the first entirely electronic calculating machine ENIAC was made up of 30 separate units, weighing 30 tons, occupying 1,800 square feet with 17,468 vacuum tubes. The machine had a capacity for doing nearly 400 multiplications per second.

Mainframes: Thereafter, the decades from the 1950s to 1970s are deemed as the ones for organizational mainframe and mini-computers. In this mainframe era, an IBM computer that could perform 10 million instructions per second and was costing a hefty $10 million in 1975.

Evolution of the Microprocessor: In 1969, Intel produced the first microprocessor i4004. This is the time when the computer's entire Central Processing Unit (CPU) was placed on a single silicon chip. The rapid development of microprocessor in 1980s, the microprocessor revolution, brought a major acceleration of downsizing: replacement of traditional mainframe and minicomputers with micro-based alternatives. This trend also drives users to low-cost solutions based on PCs, LANs, network servers, and multiple microprocessor-based systems.

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[2]   World Summit on the Information Society (WSIS), held in Geneva in 2003 and Tunis in 2005.

The Internet era: The Internet, is a worldwide system of computer networks, communicating and facilitating rapid information flows. Today, the Internet is a public, cooperative, and self-sustaining facility accessible to hundreds of millions of people worldwide. More recently, Internet telephony hardware and software allows real-time voice conversations.

2.2   Evolution of ICT Applications

Data Processing: They are characterized as being transaction-based, cyclically processed, usually batch-oriented, and usually operating in a current time frame.

Information Management: Management Information Systems (MIS) facilitate and control the day-today business in organization with Decision Support Systems (DSS) providing support to decision makers in making fast, effectiveness and strategic decisions.

Knowledge Management: Knowledge management refers to the state of affairs whereby organizations comprehensively gather, organize, share, and analyze knowledge in terms of resources, documents, and human skills. The challenge is to select or build software that fits the context of the overall plan and promote information sharing.

2.3   Evolution of Government Information Systems

Mainly characterized by the development of internal government information systems for   Data Processing Systems, Management Information Systems, and Decision Support Systems. *Evolution of Goals Pursued*: Transaction-based, cyclically processed, usually batch-oriented, and usually operating in a current time frame. In general, the goals of computerization are to make government business more effective, more efficient, and more productive without touching upon the organizational structure of government.

2.4   Evolution of Gaps and Inequalities in Access

The "digital divide" refers to the separation between those who can access digital technology, thus benefiting from the digital age, and those who cannot. Thus great divide between rich and poor countries and between rich and poor sections of societies within countries has developed which is reinforcing the long observed inequalities in economic wealth and social conditions. According to the Orbicom-CIDA Project, 2002 some statistics as related to the digital divide show that about 201 million people in the world are online out of which 95% of the world's Internet

users are in Europe and North America. Sub-Sahara has about 10 percent of the world's population (626 million), but only 0.2 percent of the world's 1.0 billion telephone lines. The encouraging development is that ICT in Africa is growing faster than the world average (as shown in Table 1 below) albeit from a very low initial level.

Table 1: African Mobile and Cellular Statistics for 2004 (GSM)

	World	Africa
GSM as % of total	70%	95.61
12 month % growth	52.49	101.85
3 month % growth	10.74	21.22
% Pre -paid	18.57	26.67
12 month % growth (f'cast)	33.65%	60.13%

Source: CellularOnline, http://www.cellular.co.za

Within countries, the digital divide is best illustrated by differences in access between cities and villages especially in Africa.

The digital divide also exists between the educated and the uneducated. Education is also likely to affect the level of web use skill since people with higher levels of education are likely to have had more exposure to computer technology in general and gain access to the Internet in particular.

2.5   ICT Development Paths

As consideration is made of the paths that can be adopted in developing the ICT industry in Africa, it is instructive to position Africa and other developing countries with similar economic backgrounds in the ladder of the historical phases that the developed world had gone through in its ICT development. Particularly in Western countries, the ICT development took place in several relatively easily identifiable phases as identified by Nissanke in his framework paper for this volume. These are:

a) Early adopters and primitive tools (1951-1962)

b) Regulated environment and frustrated users (1963-1974)

c) End user computing and decentralisation (1975-1984)

d) IT as a competitive strength (1985-1995)

e) e-Commerce and ubiquitous (anywhere-anytime) computing (1996 - to the present)

Nissanke argues that this historical perspective provides Africa (and other developing countries concerned) with a basis for developing a strategy for the development of its ICT. Though the early phases can be skipped to an extent, Africa needs to adopt (d) as its immediate goal in relation to all her economic activities, industry, agriculture, social services and government administration, and (e) as some of the key areas where early demonstration of local competence may project an image of Africa as a region with high ICT capability.

The early stages of ICT development can benefit from the experience of the now developed countries in terms of the core institutional structures that they had to put in place in order to facilitate and regulate the development of ICT.

3.0   STATUS OF ICT AND ITS DIFFUSION IN THE AFRICAN ECONOMY

The African ICT sector is undergoing tremendous advances, which have changed peoples' lives and the way they participate in the development activities using various information and communication devices such as mobile cellular phones, radios, faxes, televisions and computers.

Where incomes are low, infrastructure is undeveloped and density of the population is low challenges to accessing ICT are great though not insurmountable. Alternatives individual access is being developed in terms of community shared facilities such as telecentres, cyber-cafes and community information centers. Strategies for drawing people to use these facilities are essential for developing African countries.

3.1   Status of Broadcasting in Africa

Hundreds of new local and community radio stations are now operating and satellite TV is now also widely available. Communication is essential to rural development with the importance now attached to grassroots participation and sustainable development. Rural radio is the most inexpensive, popular and socio-culturally appropriate means of communication and is also the most accessible by most of the population in Africa. Radio is still by far the most dominant mass medium in Africa with ownership of radio sets being much higher than for any other electronic device.

Satellite-based broadcasting has seen major activity on the continent in the last few years. For example, many countries in Africa are now connected to the South African company M-Net, which deploys the digital direct-to-home subscriber satellite service called DSTV. This type of service provides access to several video channels and audio programmes to the whole of Africa and on affordable cost by many middle class people in the continent.

The Africa Internet – A Status Report, July 2002 has revealed that over 60 percent of the population of the sub-continent is reached by existing radio transmitter networks while national television coverage is largely confined to major town. Some countries still do not have their own national television broadcaster. An increasing number of commercial stations are being established following liberalization of the sector in many countries. However the news and information output of these commercial stations is often either a re-broadcast of the national (state-controlled) broadcaster's news, or that of an international broadcaster or news agency. Local news and current affairs, especially that focusing on events outside of the capital, is rarely broadcast and community broadcasting has generally been slow to take off in the

region, although, Ghana, Mali, Niger, South Africa, Tanzania and Uganda have seen notable numbers of new community radio licensees. In 1997 radio ownership in Africa was estimated by UNESCO at close to 170 million with a 4% per annum growth rate. This puts current estimates for 2002 at about over 200 million radio sets, compared with only 62 million TVs [1].

The community radio also provides a unique space for women, where they can express themselves in the language which their particular community can understand. Due to the convergence of technologies some community radios are broadcasting on the Internet and helping women to reach even broader audiences.

3.2   Status of the Internet

The spread of the Internet in Africa in the early 1990s was one of the phenomena that has triggered concerns about connectivity, access and cost-based pricing. It rapidly became clear that connectivity is just one part of the information technology development equation.

The Internet has grown relatively rapidly in most urban areas in Africa. However, the differences between the development levels of Africa and the rest of the world are much wider in this area (The Africa Internet – A Status Report, July 2002). It is estimated that only 1 in 160 people in Africa use the Internet compared to a world average of about one user for every 15 people. As of mid 2002 the number of dialup Internet subscribers was close to 1.7 million, 20% up from the year 2001, mainly attributed by the growth in a few of the larger countries such as Egypt, South Africa, Morocco and Nigeria with North Africa and South Africa accounting for 70% of this growth.

The use of ICTs has grown relatively rapidly in most urban areas in Africa with the Internet spreading to every major city. More mobile cell phones are now deployed on the continent than the number of fixed lines laid in the last century. The number of mobile phone subscribers in Africa increased from 15 million in 2000 to over 80 million in 2004, an increase of 433 per cent (UNCTAD, 2006). Among African countries, South Africa, Nigeria, Egypt and Morocco continue to be the leaders in terms of the region's number of subscribers. In 2007 there are some 778 million people in SSA, of whom 152 million are mobile phone users and 20 million are Internet users (MIT, 2007; Internet World Statistics, 2007).

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Computers are still by far the most important gateway to the Internet even though the Internet is increasingly being accessed through a variety of devices. Computers are indispensable for the development of the information economy and in particular for the application of ICT in e-business processes. Computer penetration rates are lowest for Africa (1.4 per cent), compared with 66.8 per cent for North America (UNCTAD, 2006). Ownership of PCs is as high as 74% in the OECD countries compared with 5.6% among the lowest-income, an evident impact of the nexus of income-digital inequality.

Although broadband access to the Internet has become a regular feature in developed countries' enterprises and subscriber growth rates in Africa are very high, the number of broadband subscribers in most African countries is extremely small, and penetration rates are less than 1 per cent even in countries that are more advanced in ICT, such as South Africa, Mauritius, Egypt and Tunisia (UNCTAD, 2006). There were estimated to be over 12 million Internet users in 2003 in Africa. Most African capitals now have more than one Internet Service Provider (ISP), as the Africa Internet – A Status Report narrates that by mid 2002 there were about 560 public ISPs across the region (excluding SA. Twenty countries had 5 or more ISPs, while seven countries had 10 or more active ISPs: Egypt, Kenya, Morocco, Nigeria, South Africa, Tanzania and Togo, and 16 countries still had only one ISP. Although Ethiopia and Mauritius are the only countries where a monopoly ISP is still national policy there are other countries in which this practice still continues, predominantly in Francophone and Sahel sub-regions, where markets are small. With the exception of some ISPs in Southern Africa, most of the international Internet circuits in Africa connect to the USA and Canada, with some to Belgium, Germany, the Netherlands, United Kingdom, Italy, and France[2].

3.3   Websites

In a brief analysis of African Government websites, more than three-quarters of all countries in Africa have a web presence. There is a notable increase in official general government web sites providing various information that was not available before. However, the extent to which government use of the Internet for existing administrative purposes is still quite limited. Many administrations are beginning to streamline their operations and improve internal efficiencies by adopting ICTs. For example the government of Lesotho recently declared that all announcements for cabinet and committee meetings would be made only by email. Administrations such as those in South Africa, Algeria and Tunisia now provide immediate global access to tenders via the web. Health and education departments in many countries are beginning to electronically transmit operational MIS statistics such as disease occurrences and pupil registrations. In South Africa, the results of blood tests are being transmitted to remote clinics that are off the telecom grid via mobile telephone

text messages. As greater numbers of public officials are now gaining low-cost access to the web, the vast information resources available via Internet are becoming increasingly important tools in ensuring informed decision-making.

However, most sites have an external focus as demonstrated by the type of information provided (tourism, business/investment opportunities, and general introduction to the geography and culture of the country). Most sites are in English rather than in African languages. Many of the political party sites, on the other hand, appear to have more of an internal focus. These sites tend to include more detailed information about the current political situation, the party platform, the people involved, and often an interactive component such as a discussion forum/chat room or email addresses to which feedback can be sent. Outside of these political party sites, government websites generally do not have interactive formats, with a few notable exceptions. Most sites are vehicles of disseminating information rather than two-way information flow. Only about a fifth of all sites have any significant two-way information flow or interactivity features.

3.4   Status of Infrastructure

The realization of these potentials of ICT in Africa in most cases is hampered with inadequate reliable infrastructure (physical and regulatory), lack of access to technology in rural or remote areas and to the poor and the underprivileged (generally women and minorities); prevailing illiteracy, both computer-based and otherwise; and lack of content in local languages further aggravate the difficulties. Although ICT in Africa has made a real contribution to the economic development, important challenges remain.

Africa is taking up the challenge of developing a modern telecommunications sector capable of supporting broad-based national economic and social development. As a result of telecommunication sector reform, in many parts of the continent is making improvements in the telecommunications network. This improvement is eventually paying off in many African countries. Digital exchanges and microwave technology have connected thousands of new subscribers.

3.4.1   Telecommunications Infrastructure

According to The Africa Internet – A Status Report, July 2002, changes in the telecommunication sector in Africa have perhaps been even more marked than in broadcasting. A substantial increase in the rate of expansion and modernization of fixed networks is occurring along with the explosion of mobile networks.

Infrastructure is the physical hardware used to interconnect computers and users. It includes the transmission media, including telephone lines, cable television lines, and satellites and antennas, and also the other devices that control transmission paths. Infrastructure also includes the software used to send, receive, and manage the signals that are transmitted[3].

The developments in the telecommunication sec tor have shown that leapfrogging is possible in Africa. The prevalence of wireless over fixed line communication devices in many countries in Africa is a clear example of leapfrogging. The mobile technology brings communications to whole communities that previously had little or no access to fixed line telephones. Mobile telephone services have proved to be easier to access and more flexible to deploy than fixed line communications. Furthermore, mobile coverage delivers a basic infrastructure of communication to communities that road, rail and other communications infrastructure cannot reach as easily.

One of the major limitations to ICT development in Africa is poor communications infrastructure in most African countries mostly due to the lack of terrestrial backbone infrastructure with the consequent dependency on satellite communications. A number of ICT initiatives have taken place in the last two decades that were intended to bridge the digital divide within Africa and between Africa and the rest of the world. These include: the Africa Information Society Initiative, the Africa Connection, and the e-Africa Commission.

The successful development of the infrastructure calls for close collation with the operators of telecommunications networks, electricity supply authorities, gas and oil pipeline and railway operators, that have built or are building optical fibre systems in order to maximise the ICT opportunities in the region.

The Eastern Africa Submarine Cable System (EASSy) project, which was initiated in 2003 aims to connect countries along the eastern coast of Africa via a high bandwidth fibre optic cable system to the rest of the world. It is considered a milestone in the development of information infrastructure in the region.

The New Partnership for Africa's Development (NEPAD), which is a vision and strategic framework for Africa's renewal to address the current challenges facing the African continent such as the escalating poverty levels, underdevelopment and the continued marginalization of Africa, aims to accelerate these developments hence,

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[3]   eThink Tank Information Document June 2000

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bridging the digital divide within Africa and between Africa and the rest of the world. This is noted in many African countries, which are now taking the necessary steps such as increasing the teledensity, establishment of cyber cafes and development of Internet Service Providers.

Table 3: List of agreed Projects required fulfilling the objective of establishing a Basic Rationalized Regional Broadband ICT Network in Eastern and Southern Africa

PROJECT	LINKS	PROJECT OWNERS / PROMOTERS / BUILDERS	ROUTING	READY FOR SERVICE DATE
1.	Ethiopia-Sudan	Comtel	Addis Ababa-Khartoum	2007
2.	Ethiopia-Kenya	Comtel	Addis Ababa-Nairobi	2007
3.	Sudan-Uganda	e-Africa * Commission	Juba-Kampala	TBD
4.	Djibouti-Eritrea	Comtel	Djibouti-Asmara	2007
5.	Nairobi-Mombasa	EASSy / Kenya Pipeline Company	Nairobi-Mombasa	2006
6.	Kenya-Uganda	Comtel / EASSy / KPC	Nairobi-Tororo-Kampala	2006
7.	Tanzania-Zambia	Com-7	Dar es Salaam-Mbeya - Kasama-Mpika-Kapiri Mposhi-Kabwe-Lusaka-Livingstone	2007
8.	Tanzania-Malawi	Comtel / SRII	Mbeya -Mzuzu -Lilongwe -Blantyre	2006
9.	Tanzania-Burundi	Com-7	Dar es Salaam-Dodoma -Tabora -Kigoma-Bujumbura	2007
10.	Namibia-Zambia-Botswana	SRII	Katima Mulilo -Livingstone -Kasane	2005

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PROJECT	LINKS	PROJECT OWNERS / PROMOTERS / BUILDERS	ROUTING	READY FOR SERVICE DATE
11.	Zambia-Zimbabwe	SRII	Lusaka-Kariba-Harare	2005
12.	Zimbabwe-Mozambique	Comtel	Harare-Mutare-Chimoio	2007
13.	Malawi-Mozambique	SRII	Blantyre-Tete-Chimoio	2006
14.	DRC-Angola	Comtel	Lumumbashi-Benguela-Luanda-Kinshasa	2007
15.	Uganda-Rwanda	Comtel	Kampala-Kigali	2007
16.	DRC-Zambia	Com-7	Lubumbashi-Ndola-Kapiri Mposhi	2007
17.	Burundi-Rwanda	Comtel	Bujumbura-Kigali	2007
18.	Swaziland-Mozambique	SRII	Namasha-Maputo	2007
19.	Burundi-DRC	Comtel	Bujumbura-Lubumbashi	2007

Source: Compiled by Author from "Report of the Workshop on the Integration and Rationalization of ICT Broadband Infrastructure for Eastern and Southern Africa (Held in Johannesburg 28-30 July, 2004)"

3.4.2 Human Resource Infrastructure

Africa's competitiveness is heavily dependent on the skills of its people. The effective use of ICT and its spread is limited by the level of requisite human skills. The future of ICT in the continent depends upon its ability to develop their skills to cope with the changing ICT environment.

3.5   Status of Regulatory Authorities

The foundations of the present day progress in ICT policy and regulation were built in the 1990s, although information policy issues date back to the 1970s when computers were introduced to Africa. By the end of 1960, mainframe computers had been introduced to most African countries in the form of the mainframe computers concentrated in headquarters of ministries, central statistics offices and major public

utility agencies. In several countries computers were categorized as luxuries and were only imported under strict controls.

Telecommunications policy in many African countries like elsewhere has evolved over the last decade or so with ongoing sector reforms in the form of privatization, liberalization of key market segments and consequent competition. The liberalization of the sector has resulted in an increasing number of players in the sector such as investors in telecommunications, Internet Service Providers (ISPs); and cellular phone provider operators. This has also meant that demands for regulation have increased. Thus the number of ICT regulatory authorities in the African countries has increased dramatically in recent years to referee the market place.

The regulatory functions are:

- Promotion of universal service to basic telecommunication services;

- Fostering of competitive markets to ensure efficient, reliable quality and affordable services;

- Delivery of other regulatory functions such as licensing for new services and transparent practices;

- Prevention of the abuse of market power by dominant firms in the market place;

- Protection of consumer rights including privacy rights; and

- Promotion of increased telecommunication connectivity through efficient use of spectrum and interconnection.

Regulatory authorities are now operational in many African countries. This has been seen as key to the effective development and management of the ICT sector which has numerous players.

Regulatory institutions in many countries remain weak and unable to deal with complex issues such as competition, cost-effective tariffs and investment. Regulators in the region are not equipped to deal with emerging policy and regulatory issues such as spam and consumer concerns regarding privacy, which were not issues of concern many years ago. Except for a few they lack the requisite leadership, often precisely to serve as functionaries of the Ministry. This is exacerbated by limited traditions of rule of law, information asymmetry between the operators and themselves, scarce skilled human resource and ineffective competition laws.

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3.6   ICT Policies and Initiatives for ICT Development in Africa

ICT policy in Africa in particular highlights some of the telecommunication policy issues in Africa and their potentials to impact on development[4]. The issues range from sector market structure, access network, licensing, universal policy, competition policy, and essential telecommunications services (e.g. basic telephone service and internet access) in the context of the universal access policy, to license obligations that all carriers should comply with.

The early 1980s saw a significant development in scaled down main frame computers then known as 'mini computers' triggering new interests in the formulation of national informatics policies with attention to the acquisition of computer technology, human resources development, the storage and use of databases by public and private sector institutions, the use of computers in the academic systems, the protection of intellectual property rights and the participation in international information exchange. The introduction of minicomputers sparked off several initiatives around the world that were based on the cooperative information systems models where countries/institutions were required to contribute to central databanks in order to access to joint information resources.

The Pan African Development Information System (PADIS) was created in 1980 around the cooperative information service model. PADIS and the United Nations Education and Scientific Organization (UNESCO) were at the forefront of promoting national information policies as early as 1980s. This was followed by Africa's interest in launching its own regional satellite network (RASCOM), in order to facilitate communications and access to information, albeit with no success to date.

As Gillward and Adam have indicated in their framework paper in this volume, the ICT policy and regulatory process in Africa took two major routes over the last two decades. The first route was taken by the countries that continued to purse the international reform of the communication sector that began in the early 1990s. The opening up of the telecommunications sector, primarily through privatization and new private investments especially in the mobile telephony, has enhanced the role of foreign direct investment in the sector in an expanding access to communications services. However, there was relatively less emphasis on policy goals of delivering

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[4]   CHAKULA ISSUE NO. 10, May 2004: Telecommunication policy trends in Africa – highlights of key issues

affordable access to the population and other reform elements such as competition and effective regulation. There was little paid to institutional capabilities, resources, markets and governance and policy coordination issues at national levels. The second route was adopted by countries that followed the advice of development agencies in creating comprehensive national ICT policies, strategies and plans to deliver broader socio-economic outcomes through the appropriation of ICTs.

There has been a significant divergence between sector reform agendas and efforts to develop national e-strategies in Africa. Sector reform efforts failed to recognize the implication of integrated ICT policies, while national ICT strategies fell short of capitalizing on national reform efforts towards competitive environment for affordable access. These failures could have serious implications on Africa's integration into the global information economy. The political economy of the ICT sector reform was shaped both by external factors, policy choices, domestic power relationships and vested interests of different groups. It is in this context that the paper by Gillward and Adam reviews national ICT policies, telecommunications sector reform initiatives, emerging policy issues, associated research questions and methodological challenges in analyzing the political economy of ICT sector in Africa.

On the telecommunications sector reform Gillward and Adam have observed that early experiences in breaking up telecommunications monopolies in Latin America, Europe and United States and structural adjustment programmes of the World Bank and the International Monetary Fund (IMF) were influential in driving reforms in the telecommunication sector in Africa as early as 1990. The reform involved the revision of policy and regulatory frameworks, separation of postal telecommunications services, enacting of sector laws, creating autonomous regulatory agencies, privatization of the state-owned telecommunications operator and liberalisation of the mobile and Internet sectors.

Tremendous progress was made in liberalization of the cellular market throughout Africa except for handful countries and the Internet market is fully liberalized in the region except for Ethiopia.

Although the competition in cellular and the Internet market has driven access and wide spread availability of communication networks, the experience of telecom sector reform shows that, privatization did not lead to fixed line network growth; neither competitiveness nor universal access was achieved. The regulatory institutions did not build up quickly enough to speed up the gains and introduce competition that could have resulted in cost reduction and further improvement in network rollouts.

Sub-Saharan African countries have gone through two major ICT policy shifts over the last ten years that influenced progress in access to ICT and Telecommunications Systems Operators (TCSO) participation and networking.

The first policy regime was the drive for privatization of the Telecommunications sector. This was spurred, among others by sector reform around the world, the desire to improve telecommunications services, rapid changes and convergence in technology, the tightening public sector budget, the basic telecommunications agreement for accession to the World Trade Organization and the Structural Adjustment Programmes driven by International Financial Institutions. As a result, a fair degree of liberalization has been achieved in some domestic telecommunication markets particularly in mobile services in Africa and private investment in Internet service has become a commonplace.

The second policy regime is the shift from telecommunication policies to broader ICT policies. Consequently a number of countries initiated national ICT policies and strategies. The status of ICT policies indicates that by 1999, there were ten countries that developed their e-strategies. By 2002, this number reached sixteen countries; twenty-five by 2004 and thirty-two countries by 2006. Since 1994, 41 African countries have opened their mobile markets up to competition, with more than one mobile operator. Consequently, 40 countries have now established independent regulators, setting the foundations for further expansion in telecoms services.

In spite of a large number of countries that have formulated integrated policies and the rhetoric of commitment at national and international levels, the vast majority of African countries were not able to optimize the potential of ICTs due to weaker markets, financial constraints, limited human resources and ineffective institutions. ICT policies and plans that were developed by ICT experts in the 1990s with little or no involvement of development experts and other stakeholders were hardly implemented. The shortfalls at the implementation level were associated with challenges of governance and leadership, challenges of creating predictable and stable investment frameworks, shortfalls in political stability and inadequate incentive structures for private investment.

Consistent with the wave of political liberalization and democratization processes in Africa, the 1990s saw involvement of stakeholders from civil society and the private sector in ICT policy debates and expansion of knowledge about the role of information and communication technologies in development. The emphasis on multi-stakeholder partnerships was useful in shifting ICT policy making away from the exclusive domain of government policy-makers to include non-governmental and transnational actors including pointing to its role in achieving the MDGs.

During the last 25 years, a number of initiatives have taken place in Africa with the aim of advancing the focus on ICT for Development in Africa. Table 3 summarizes

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some major initiatives indicating that Africa is committed to harmonize ICT development in the region for its economic development.

- *Southern African Development Community (SADC) Initiatives*

The status of ICT development and policies in the continent is still at varying degrees across SADC member states. For example, South Africa has made great advances while other countries still have more to do. The infrastructure gaps between countries and regions can be partly explained by the inheritance of Africa's colonial past and that will take some time to narrow.

- *World Summit on the Information Society (WSIS)*

The building of today's information society cannot be over emphasized. During the World Summit on the Information Society (WSIS), held in Geneva in 2003 and Tunis in 2005, governments and world leaders made a strong commitment towards building a people -centered, inclusive and development-oriented Information Society for all, where everyone can access, utilize and share information and knowledge.

- *Donor Initiatives to Support ICT Infrastructure in Africa*

With the growing importance of Internet connectivity and the potentials of ICTs in furthering economic and social developments, defining national ICT policies and strategies are now high on the agenda. A number of donor and executing agencies have joined their efforts to support African countries in formulating ICT policies in accordance to the prevailing development priorities of each country.

Table 3: Major initiatives concerning ICT for economic development in the SADC region
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Year	Initiative	Purpose

Year	Initiative	Purpose
2003	Eastern Africa Submarine Cable System (EASSy)	The project, funded by the World Bank and the Development Bank of Southern Africa , was initiated on January 2003. It is an initiative to connect countries along the eastern coast of Africa via a high bandwidth fibre optic cable system to the rest of the world. It is considered a milestone in the development of information infrastructure in the region. EASSy is planned to run from Mtun zini in South Africa to Port Sudan in Sudan , with landing points in six countries, and connected to at least five landlocked countries – who will no longer have to rely on expensive satellite systems to carry voice and data services.
2003	Adoption of the COMESA ICT Policy and Model Bill	Member States are in the process of integrating them into their regulatory framework. ICT policy guidelines and strategies adopted until now are: interconnection, licensing, universal access competition and pricing and consumer protection. The overall ICT strategy aims to co-operate and co -ordinate the activities of the member states to develop and maintain their ICT networks, with particular focus on the development of ICT services in Rural areas.
2003	Launching of the Association of Regulators of Information and Communications in Eastern and Southern Africa (ARICEA)	Supported by COMESA, this is a consultative and collaborative forum to exchange ideas and experiences among members on issues related to ICT regulation.
2002	The e-Africa Commission	Created by the New Partnership for Economic Development (NEPAD) Steering Committee and it is the responsible for the formulation and implementation of the NEPAD ICT programmes.
2001	Declaration on Information and Communication Technology	It seeks the construction of a favorable environment for ICT growth in the region feeding into national policies and laws.
1998	Creation of the Southern Africa	Its main objective is to harmonize interconnectivity in the SADC region. It operates under two key

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Year	Initiative	Purpose
	Telecommunications Administrations (SATA)	committees namely: Policy and Strategy; and Technology and Infrastructure.
1998	COMESA ICT Policy and Regulatory Harmonization Programme	Inspired on the experience of SADC, the Common Market for Eastern and Southern Africa (COMESA) developed an ICT institutional framework and launched a number of ICT initiatives with the intention to harmonize policies among its member states.
1997	Creation of the Telecommunications Regulators' Association for Southern Africa (TRASA)	TRASA includes the fourteen member states of SADC. It was created to harmonize the ICT regulation across the region by developing guidelines on key issues such as universal access and service, licensing policy for telecommunications service, tariffs, interconnection, fair competition and wholesale prices for the ICT sector.
1997	Formation of the African Technical Advisory Committee (ATAC)	Responsible for advising the Economic Commission for Africa (ECA) and its partners on the implementation of programmes and projects emphasized by AISI, as well as playing an advocacy role, identifying best ICT practices, and assisting ECA mobilize resources for its work programme.
1996	Africa Information Society Initiative (AISI)	An action plan to build up Africa's ICT infrastructure. It has served as a basis for numerous ICT initiatives in the continent assisting over 28 African countries to initiate, formulate and implement their national ICT strategies for socio-economic development.
1981	Creation of the Southern Africa Transport and Communications Commission (SATCC)	Responsibility for the co-ordination of Telecommunications issues within SADC. Focuses on the rehabilitation and development of the regional transport and communications infrastructure in the region, acting as a broker for investment as well as coordinating programmes of action.

Source: Compiled by author from Innovation Systems for ICT: The Case of Southern African Countries (by Erika Kraemer-Mbula and Mammo Muchie), and Internet

Policies for access and effective use as well as those related to applications, content and the development of a domestic IT industry should go hand in hand with connectivity. The launching of the African Information Society Initiative (AISI)[5] in

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5   http://www.uneca.org/aisi

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1996 with a core mission of assisting African countries with their ICT policy making provided an opportunity to improve awareness and connectivity, promote sectoral applications and content development and advance enabling policy and regulatory environment. However, on the ground, African countries took many different routes to developing their national ICT policies and strategies.

3.7   ICT Use in Selected Sectors

3.7.1   Health

Some of the most promising and clearly demonstrated applications for ICT in development are in the improvement of health care delivery. In many developing countries and communities it is used to facilitate remote consultation, diagnosis and treatment. In Gambia, for example, nurses in remote villages use digital cameras to download images of symptoms onto a PC and transfer them to nearby towns for examination by doctors. The same model is being applied to facilitate collaboration among physicians themselves. When an expert opinion is required, doctors in rural towns send the images captured by the nurses to specialists in the United Kingdom for advice. The principle of ICT-facilitated collaboration extends to medical research also. This is illustrated in West Africa, where malaria researchers use a network of satellites and ground stations to submit data for clinical trials conducted at tropical disease research facilities in London and Geneva.

Another promising application of ICT for Africa is the HealthNet system of local telecommunications sites used to provide low cost access to healthcare information in developing countries on the Internet. Users mainly physicians and medical workers can connect to the network through local telephone nodes to access services such as physician collaborations, medical databases, consultation and referral scheduling, epidemic alerts, medical libraries, email and shared research reporting databases.

On the issue of community sensitization and education, the radio, TV and Internet are used in African countries to promote HIV/AIDS education and prevention. The radio for example, is used to sensitize people on the use of condoms for unsafe sex at community level. TV programmes are also used to tackle issues through discussions and question and answer programmes, which can be viewed by many

people at the same time, hence promoting awareness and educating the general public on various health issues.

3.7.2 Education

Across a range of educational applications, ICT is being harnessed to improve the efficiency, accessibility and quality of the learning process. Distance learning is reducing barriers of affordability and geography especially in tertiary education. In the case of primary and secondary education, ICT has been found to significantly enhance the learning process by enabling increased access to knowledge and adoption of more collaborative and interactive learning techniques[6].

Through distance learning, use of educational software, and IT-related professional training programs, ICTs can help provide access to culturally appropriate educational, and job training, thus producing a higher-skilled workforce. [7]Many universities offer non-credit, remedial and specialized certification programs via satellite-based educational networks. For example, the University of Namibia offers a distance learning bachelor degree program in nursing in which women constitute between 90-95 percent of the students[8].

ICT enables distance learning and effective adult education. Multimedia technologies such as radio, projectors, public address systems, CD ROMs and television are making their way to educational institutions.

In the area of research, rapid advances in ICT have made it possible to handle digital data and information in large volumes at ever-increasing speeds and have resulted in sharp reductions in the cost of storing, filtering, processing, compressing, and retrieving data for interpretation and retransmission. ICT has increased researchers' ability to access information by supplying them with increasingly powerful tools at decreasing cost, thus enabling new ways of working[9]. Improved communication due to ICT is also contributing to creation and strengthening of professional networks.

3.7.3 Agriculture

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[6]   Source: (http://www.opt-init.org/framework/pages/2.2.2.html)

[7]   http://www.uneca.org/adf99/governance.htm#10#10

[8]   http://www.uneca.org/adf99/governance.htm#11#11

[9]   The Global Research Village: How Information and Communication Technologies Affect the Science system

The emerging new technologies can transform the way production is organized in Africa's agricultural and rural development. ICT offers means of exchanging and mass distributing advances in farming techniques, pest control and agri-exports [10]. Telecentres can facilitate distance learning and enable farmers in the rural areas to use ICT for accessing knowledge, sharing information and acquiring farming skills to enhance their crop production, thus creating a culture of information and experience-sharing within the African communities.

In order to address the challenges of land degradation, remote sensing data is being used to produce maps to show areas with potential soil erosion hazards, thus facilitating decision makers to take the necessary interventions to ameliorate the situation.

3.7.4 Environmental Management

The provision of public Information and easy access is one of the most direct routes to broad participation in environmental management and better environmental decisions. The use of ICT in environmental management in Africa has started to shed some light in many parts of the African continent. For example, in Ghana, an Environmental Information Network (EIN) Project has been developed that uses ICT to link the databases of two national environmental agencies. The database is publicly available for free use and local and international researchers, government agencies and other environmental organizations can use its information to support decision-making, intervention strategies, and awareness campaigns about environmental protection, and they can contribute to the knowledge pool.

In East Africa, the three East African Partner States (Kenya, Tanzania and Uganda) have joined hands in managing the Lake Victoria Basin environment. ICT is being used in various ways including the use of GIS to map soil erosion hazards in affected areas, preparing overlay maps to establish the relationships between water quality and fish biodiversity to mention a few. This has improved the management of the Lake Basin environment and at the same time opened eyes of the East Africans on the application of ICT in environmental management.

3.7.5 Tourism

Globalization and new information and communication technology (ICT) are radically transforming the tourist industry. The growing use of the Internet is enabling Africa to tap the potential of the tourism industry in terms of tourism promotion, marketing and

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[10] Perspectives on ICT and Sustainable Development in Africa (*By Rajas Gokhale*)

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sales.. The United Nations Conference on Trade and Development (UNCTAD) launched an e-tourism initiative in June 2004, which aims at enhancing developing countries' capacity to present the information on their tourism offer, and match it with the worldwide demand. It includes locally produced information about the tourism offer of the country, and value-added on-line services such as hotel reservation. Countries with high tourism receipts such as Egypt, Kenya and South Africa can benefit from the model in promoting and developing tourism and taping the potential of ICT for better management, organization, promotion and cost reduction[5]. For example, with e-tourism, an official guide of the country's hotels can be provided with information on hotel rooms with facilities for online reservation.

ICT is providing an opportunity for Africa to have effective means for marketing and selling their own tourism services online, especially through the Internet with the capacity to respond fast to the needs of today's travelers for quick access to information, customized software products and secure, online payment facilities for travelers.

3.7.6 Trade

The Web-based systems are becoming fast-moving sector in the world increasingly being used in commerce. Traders are using ICTs such as telephone, email and websites at the workplace to maintain business relations with partners outside their respective countries have acknowledged that ICTs. The outlets for their goods and services have increased. The information such as markets, market regulations, prices and potential suppliers and buyers may be posted on the web for easy accessibility. There is an increase in the use of other technologies such as electronic shopping facilities, Visa Cards, Credit Cards, etc. to enable them to gain competitiveness and unprecedented opportunities that is offered by the digital revolution for economic development.

3.7.7 Governance

Governance can be defined as the process through which institutions, businesses and citizen groups articulate their interests, exercise their rights and obligations and mediate their differences. ICT can help to sustain this process by support tasks that involve complex decision making, communication and decision implementation;

automate tedious tasks done by humans; and can support new tasks and processes that did not exist before[11].

One important role of ICT is the enhancement of e-governance for rural development in Africa. It can help to:

- *Reduce poverty* by creating a more skilled workforce and increasing the penetration of aid and subsidies to the undeserved

- *Provide basic needs* by improving the quality of healthcare, providing educational opportunities, planning for basic service delivery, and helping to improve agricultural productivity and commerce.

- *Improve public administration* by facilitating informed decision making, managing the burden of foreign debt, revitalizing local economies, improving policing and public safety, improving public administration and efficiency, facilitating regional, national, and sub-national coordination and communication, improving the quality of public services, and facilitating better post-conflict reconstruction and administration

- *Enhance democratization and citizen empowerment* by establishing an "open" online government, enhancing interactions between government and citizens, stimulating civic institutions and public debate, and promoting equity and empowering minorities. In South Africa, thousands of ordinary South Africans participated together with their elected representatives in writing the country's new constitution. The Constitutional Assembly's website gave access to a database containing official documentation, draft constitutional text, submissions from political parties and the public, committee reports and minutes, and other public documents[12]. In Tanzania, Masai pastoralists living in the Ngorongoro have used the Internet to voice their opposition to Government conservation management policy that threatened their land and their livelihood[13].

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[11]   African Development Forum 1999: Theme 2 - Information and Communication Technologies for Improved Governance in Africa

[12]   http://www.uneca.org/adf99/governance.htm#35#35

[13]   http://www.uneca.org/adf99/governance.htm#36#36

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4.0 ICT IMPACT ON ECONOMIC DEVELOPMENT

ICT can contribute to income generation and poverty reduction, and can facilitate economic transformation in Africa. The use of ICT to enhance economic development and transformation in Africa will entail addressing the impact of ICT on changing the structure of the African economy (composition of agriculture, industry and services), expanding economic and social development opportunities, facilitating diversification, exploring options for building competitive advantages, facilitating efficient functioning and responsiveness of institutions (including markets) with a view to creating vibrant markets and institutions[14].

In an information age, information asymmetries are one of the major causes for high transaction costs, uncertainty and therefore market failure. A reduction of information asymmetry will also create new opportunities and therefore enhance the efficiency of resource allocation (Akerlof 1970).

Technological leapfrogging offers an opportunity for developing countries to catch up with modern ICT resources. They provide more cost effective and user friendly options. For instance, Internet technologies support the global flow of information and the establishment of distance-free personal and organizational relations. Wireless technology and satellites can help circumvent the cost of infrastructure for remote or rural areas, or for areas without a critical mass of users. In this context, wireless local loop has the potential of providing an effective solution for low-cost access in rural areas. The Bushnet project in Africa uses High Frequency (HF) radio to distribute Internet and email services to remote subscribers. NGOnet is an initiative to create Internet access for NGOs in Africa to enhance communication and provide access to information. The African news media are now relatively well represented on the web with different newspapers and news magazines now available on the Internet.

The impact of ICTs on development and economic transformation can be mediated through several channels. Thes e include:

- its impact on the ways and the speed of acquiring information and knowledge (impact on education and learning) across societies and sectors;

- its impact on production and the way the production process is organized whereby the technology impacts on the organization of the work place much in the same way that electricity brought about different modes of production.

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[14] 2001 Annual Forum: Determinants and Impact of ICT use for African SMEs: Implications for Rural South Africa

The productivity impact and the consequent impact on wealth creation by transforming traditional production systems as well as creating new production regimes.

- Its impact on networking whereby linking people, places and events all over the globe occurs revolutionalizing the way various actors interact and relate to other actors in the country, region or globally. This impact includes the way business and research is carried out.

The literature on developed countries indicates substantial and increasing rise of returns to IT investment. The framework paper by Oyelaran-Oyeyinka has enumerated the stylized facts as follows:

- At the level of the firm, there is "strong evidence of excess returns" to IT systems, equipment and labour investments (Lichtenberg, 1995).

- There is a strong relationship between IT and improvements in economic performance of the USA and that the impact of IT on aggregate economic performance has increased over time (Stiroh, 2001).

- However, externalities are equally important, that is the complementary effects of investments made in R&D, computers and human capital in other areas of the industry and sectors reinforce, and could in fact be indispensable to, the observed positive impact on productivity in a particular sector. In other words, ICTs should be seen in the category of what some economists conceptualize as a "general purpose technology" (GPT). A GPT exerts widespread and productivity-raising effects in all parts of the economy and sector.

- There is a time dimension to IT investment because of the learning effect of technological investment within which firms master techniques and by which "network effects" begin to be felt. Policy makers should therefore plan for lags in investment. For instance, adoption of advanced manufacturing practices may require significant changes in work organization that may sometime be disruptive while making positive impact on productivity (Siegel et. al., 1997).

The emergence of ICTs and other new technologies has led to the coming together of several technological techniques to provide wider applications in industry and society. This process has been termed "convergence technologies" (CT) which has been defined as "the synergistic combination of nanotechnology, biotechnology, information technology and cognitive sciences" (Roco and Bainbridge, 2003). The

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benefits attending convergence include new organizational production structures and gains in communication as elaborated further in the framework paper by Oyelaran-Oyeyinka.

ICTs are impacting on the way businesses are organized. Business organizations and other institutions are applying networking technologies, including the Internet on a general basis. Presently there is relatively widespread use of ICTs by firms in developing, as well as developed, countries in all business activities. The term "e-business" has been used to encompass the application of ICTs in all business processes from office automation, production processes, co-ordination with other plants, customer relation management, supply chain management, and to the management of distribution networks (Lal, 2004).

The impact of ICTs on development and economic transformation may be done at the aggregate level or at a disaggregated level. Analysis at the aggregate level would try to establish, at the macro level, the impact of ICT on economic growth or on economic transformation. The rationale behind the aggregate approach is that the dynamism of ICT is expected to come from several sources including the decline in the prices of information processing, convergence in communication and computing technologies and the rapid growth in network computing. The communication networks and interactive multimedia applications are providing the foundation for transformation of existing social and economic relations into an information society (Pohjola, 2001)[15]. The studies which have adopted the aggregate approach have largely been done on the developed economies. They have found that the OECD countries that improved performance in the 1990s were generally able to draw more people into employment, increase investment and improve factor productivity (Pilat, Lee and van Ark, 2002)[16]. ICTs contributed to this growth by increasing investment through capital deepening encouraged by the steep decline in ICT prices and by facilitating factor productivity growth. However, data requirements for this kind of aggregate impact analysis is more difficult to obtain and results are not likely to be meaningful. It is in this context that relevant evidence relating to the impact of ICTs on economic growth and productivity have not yet been produced for developing countries (OECD-DAC, 2004a)[17].

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[15]   Pohjola, Matti (Ed.). Information Technology, Productivity and Economic Growth. International Evidence and Implications for Economic Development. WIDER Studies in Development Economics, Oxford University Press, 2001.

[16]   Pilat, Dirk., Frank Lee and Bart van Ark: Production and Use of ICT: A Sectoral Perspective on Productivity Growth in the OECD Area. OECD Economic Studies No. 35, 2002.

[17]   OECD-DAC: ICTs and Economic Growth in Developing Countries. DAC Network on Poverty Reduction. DCD/DAC/POVNET (2004)6/REV1, December 2004.

The impact analysis will therefore be done at a more aggregated level. Two types of disaggregation are adopted. First, disaggregation in terms of types of ICT. The main categories are ICT producing activities and ICT using activities. The second type is by category of users (individuals, households, businesses and government).

In the African countries it is likely that ICT producing activities are not significant and that it is the ICT using activities that will be dominant. However, it is important to address both with a view to establishing their significance and draw policy implications on each of the two categories.

In the context of Africa, ICT hardware may be disaggregated into telecommunications equipment and computer hardware manufacture and assembly. The latter should cover manufacture and assembly of computers (branded or unbranded/clones) and include clusters that are emerging in activities associated with repair of computers. The latter has been addressed by Prof. Bamiro in chapter… of this book. In telecommunications hardware should cover the manufacture and assembly and repair of telecommunications related equipment such as cell phones and others. ICT producing software and service activities have been addressed by Prof. Bamiro in his framework paper on this subject.

ICT using sectors will be selected from the most likely users. The framework papers have addressed users in agriculture and in industry for illustrative purposes. However, it is hoped that case studies will explore other potential users such as the financial sector, the trade sector and other services sectors to be selected after preliminary investigation has been carried out at country level.

Applications of ICT may also be categorized by type of user. These users range from personal use or household use, to use in business and use in government.

Mobile phones have economic importance for many users in developing countries, as they are enablers of business, in particular for micro-entrepreneurs. Artisans advertise themselves by giving a mobile phone number, taxi drivers are contacted by phone, and retailers do pre-shopping over the phone for supplies. A large majority of small businesses use mobiles, many of them had no form of telephone access before the acquisition of a mobile phone. The use of phones has resulted in increased turnover and greater efficiency in business. Grameen Bank has pioneered ICT work among the poor starting with the mobile telephone program called Grameen Phone to become the largest mobile operator in Bangladesh, having 70 per cent of market share. It has lately expanded to other ICT sectors, becoming the largest Internet Service provider with Internet kiosks in villages in Bangladesh and franchising IT education all over Bangladesh to build human resource base for the growth of IT businesses. Simple e-healthcare services are also provided.

It is important to define the needs at various levels and explore what ICT can do to meet those needs. At the national level for instance, it is important to define the national development objective and strategy as a basis for posing the question of use of ICT for realizing the national objectives. In the context of Africa, concern over growth and poverty reduction would have to be addressed along with concerns over the transformation of the African economy towards a more dynamic economy which can better cope with the global competitive environment.

One effect of the diffusion of ICT is the disruption of established economic relations as new possibilities are in the reach. Changes in how the economy works will also have effects on employment. Creation of new jobs and a loss of jobs that become redundant, new contents and quality of work, relocation of firms and maybe most important the skills required are all affected by the spread of ICT (ILO 2001).

In most African countries small and medium enterprises (SME) account for a significant share of production and employment and are therefore directly connected to broad based growth and poverty reduction in the continent.

4.1   Basic Social Services

Provision of basic social services like health and education is being facilitated by ICT development in Africa.

Health systems such as the HealthNet has brought significant impact in most countries in Afric a. Many physicians in developing countries rely on HealthNet as their sole source of information on the treatment of AIDS and tropical diseases, essential drugs, pediatrics and public health promotion. For example: Surgeons from Mozambique, Tanzania and Uganda can consult on patient treatments and learn new re-constructive surgery techniques.

4.2   Agriculture

Lack of timely information is well known to be the largest constraint on small-scale agricultural production and natural resource exploitation - a sector that provides livelihood for 70-80 percent of Africa's population. However, thus far the potential for ICTs to impact this sector has not yet received much attention.

In Kenya, mobile phones are helping farmers obtain a fair price for their produce in the country. Vodafone's associate company in Kenya, Safaricom, has introduced a text messaging service which provides quick and easy access to updates on agricultural markets. Buyers and sellers of agricultural commodities can keep track of prices using the Sokoni Short Messaging Service (SMS) on their Safaricom mobile

phone. This helps users obtain a fair price for their goods. The Sokoni service transmits daily reports from the Kenya Agricultural Commodity Exchange (KACE), an NGO that helps to link farmers and traders, and provides daily reports on commodity prices from all major Kenyan markets. Users simply text the name of the commodity they are interested in, such as 'maize' or 'sheep', and receive an instant reply with an update on its price that morning at each market. This enables them to assess the best place and time to buy or sell. By using the Sokoni service, traders and farmers can get market updates on the day, rather than waiting for the next day's newspaper. The service also allows traders to offer their goods for sale or place bids, as well as post short messages or agricultural questions.

In Tanangozi, a farming community in west Tanzania, most butchers cannot stock large amounts of meat because they have no electricity or cannot afford a refrigerator. Butchers frequently run out of meat and cannot serve their customers. Customers can now use mobiles to place orders ahead of collection, enabling butchers to buy the right amount to satisfy their customers' needs, enabling efficiencies in the whole value chain.

4.3   Industry

The impact of ICTs on industry in Africa is addressed in the framework paper by Oyeyinka. According to Oyelaran-Oyeyinka and Lal, 2004, the intensity of ICT tools adoption was not affected by factors such as profitability, size of operation, age of firm, and per capital investment at the industry level. However, there are significant variations in the conduct and performance of firms that employed the lowest levels of e-business tools from the more advanced users of new technologies within an industry as elaborated further in the framework paper by Oyelaran-Oyeyinka. It is suggested that supply side factors significantly impact on the adoption of new technologies in SMEs.   The most important factors are availability of physical infrastructure, technological infrastructure as represented by availability of Internet connectivity and speed of communication and human knowledge and skills represented by availability of computer literate workforce.

4.4   Governance

African countries can adopt ICT to enhance governance in reducing poverty, providing basic human needs, improving public administration, and enhancing democratization. Despite efforts by African leaders and their development partners, Africa's use of ICT for improving governance is inadequate. Where it has been used effectively has brought significant impact including facilitating informed decision making, regional co-ordination and integration, intra-governmental coordination and

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communication, enhanced interaction between government and citizens and improving public administration and efficiency.

In Egypt, through use of customized software that can help to forecast resources, policymakers can make better decisions. The software computes requirements for hospitals in each of its 27 governorates in the next 20 years thus, helping to develop analytic capability in the health sector. While in Ghana, an Environmental Information Network has been set up to strengthen the effective information handling capacity in networking between participating institutions and to improve on the system of delivery of information to the users of environmental information. This has enabled environmental institutions to gather information faster and enhanced capacity for data collection, storage, processing and dissemination. ICT has also enhanced interaction between government and citizens in by enabling them to communicate with each other and with the government electronically in writing the country's new constitution through the Constitutional Assembly's website and a database containing official documentation, draft constitutional text, submissions from political parties and the public, committee reports and minutes, and other public documents.

In Morocco, the Public Administration Support Project is an effort to use ICT to enhance the efficiency of its ministries of Finance and Planning. Such functions as tax administration, auditing, public investment planning, and monitoring have been carried out with the use of computers and computer modeling to assist with expenditure management, resource allocation and collaboration between different ministries involved in economic management. The coordination of the activities of different ministries is also enhanced by the use of ICT and since the project began in 1989, the time required to prepare the budget has been halved. In Tanzania, ICT has promoted equity and empowered minorities – the Masai pastoralists who have used the Internet to voice their opposition to Government conservation management policy that threatened their land and their livelihood by putting their stories on the World Wide Web, in Ki-Masai. The website has made them feel less isolated from the rest of the world.

5.0 THE FUTURE OF ICT AND IMPLICATIONS ON ECONOMIC DEVELOPMENT AND PUBLIC POLICY

Information Technology is considered to be a key resource essential to development goals but not a goal in itself, instead is a means of achieving development goals. Thus, the modernization of information systems and introduction of ICT should be fully integrated into the process of organizational and societal change, driven not by the technology itself but by the real needs for economic, social and institutional development.

The rapid growth in mobile telephony offers prospects for extending basic telecommunications to a broader user base and for overcoming some aspects of the digital divide.

The challenge if to foster Internet development through the liberalization of international gateways; the development of low-cost fixed Wireless Technologies for broadband access; and the establishment of national Internet Exchange Points or IXPs so intra-Africa information flow does not have to be routed through US or Europe.

Promoting value-added services pose a major challenge for Africa if Africa is to carve for itself a niche in this part of the "value-chain".

Production and use of ICT stands on the pillars of information infrastructure, human capital, and an innovative system. An appropriate policy regime for promoting production, trade and investment is needed.

Development of capabilities for producing and using the appropriate information is a major challenge. The bulk of the appropriate information has to be locally generated and managed, that is, gathered, analysed and synthesised, maintained and made available in a form beneficial to the interested parties. The categories of information that are relevant in the African context include market information (costs, prices and suppliers of products and services); Research, development and experiential information; Regulatory and normative information (information on standards, norms and good-practice); and Performance information (information on actual quality of products and services or actual performance levels of industries and institutions, etc.)

One important area of future concern is the prospects of improving official statistics on ICT, and making the available data more comparable internationally. The

challenge is still on capacity-building and training activities, and on creating regional and international databases on ICT indicators.

Policy initiatives will need to be taken to grapple with the challenges of spreading the use of ICTs especially to the rural areas in Africa. The main challenges include geography which plays a very strong part in the determination of communications costs and functionality especially where the population is sparse. The penetration of TVs and radios is increasing but is still not sufficiently high in rural areas. Adaption of content to reflect local conditions and the use of language that is widely understood in African countries is a major challenge.

Another challenge is that of establishing the information needs and skills of the majority of users if ICTs are to effectively enhance market integration especially in the rural areas in Africa.

The transformation from hard copy style of dealing with transactions and markets and trade to sophisticated and technologically advanced digital methods and standards presents its own complexities such as the digitization of relevant literature on development especially rural activities and the integration of searchable data bases which can then be accessed by the majority of small and medium size producers.

A major concern relates to the implications of ICT for women and other disadvantages groups in society. Although the potential for ICT to serve as an empowering force for these groups is real, the currently low participation of these groups at the ICT kiosks suggest the risk of further marginalization unless deliberate initiatives are taken to address the challenge.

Policy implications include the following:

1. Various actors such as enterprises SMEs need institutional support for their survival in the era of globalization and rapid technological advances.

2. State policy should encourage greater private sector participation in setting up training and information service centers within industrial clusters.

3. Second, human development policies need to emphasize both general and specific knowledge types and training. Human resource development is an important dimension of the existing knowledge gap. In today's world, knowledge gaps may be filled through international educational and technological collaborations and strategic industrial alliances. Given such opportunities, what is important for African countries therefore is to set

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appropriate developmental goals, realistic and achievable over a given timescale and within available resources, to identify the missing gaps in knowledge, and to concentrate efforts to remedy the situation, that is, to acquire, assimilate, adapt or refine the missing, or the insufficiently developed, areas of knowledge.

4. Infrastructural support is necessary for the adoption of advanced e-business technologies and in order to reap the benefits of ICTs and develop the capabilities to contribute to economic development. Policies and programs aimed at providing required infrastructure need to be initiated in developing countries in order to make various economic activities more competitive in the domestic and international markets. One of such policies is the provision of *collective services.*

The experience of developing countries which have been transformed in recent years suggests that the following factors are important determinants:

- Visionary political leadership
- The need for a liberal economy and an appropriate stable political framework
- Proactive role of governments
- Instilling a sense of 'common purpose' among citizens
- Having a strategy for raising the level of the human capital
- Timely setting up of required technological and other infrastructures
- Having a strategy for phased development of ICT and other high-tech industries
- Promotion of English language for technical education

This overview of the Evolution, Status, and Future of ICT in Africa shed some light on the challenges Africa is facing on its journey towards the digital economy of today's globalized world.

Awareness and capacity building remains one of the major challenges to ICT policy formulation and implementation in the region. The development of national and sectoral strategies, implementation of programmes and projects in key areas development requires highly skilled and committed policy makers.

There are options for **learning from experiences** of other countries' good practices but these have yet to be effectively harnessed.

There is room for increasing **regional cooperation and integration** among African countries to fully harness the potentials of the ICT for economic development.

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