

**FACTORS AFFECTING THE FUTURE OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) IN ZIMBABWE**

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**Abstract**

*Most developing countries have acknowledged the information revolution, although, the ability to effectively harness the technology varies from country to country. This paper sets to elicit the factors affecting the future development of information and communication technologies in developing countries. The forecast will be on the existing Information and Communications Technology (ICT) infrastructure with special attention to Zimbabwe as one of the developing countries in southern Africa and tries to figure out opportunities for better technology in future.*

**Introduction**

“Information and communication technologies (ICT) are enabling technologies used in almost all industrial sectors and facets of our lives” [1]. While there are many key drivers of change (e.g. demographic change, environmental sustainability), there is also consensus that science and technology and, more specifically, ICT will be a fundamental driver of change in the future. There are commonly cited science and technology drivers for this change [2]

**Table 1: Commonly cited science and technology drivers**

<ul style="list-style-type: none"><li>• Growth of ICT (increased technological globalization) and greater sophistication of computers.</li></ul>
<ul style="list-style-type: none"><li>• Access to technology: Increasing access to ICT or creation of a ‘knowledge gap’ as information access is restricted to those who can afford it.</li></ul>
<ul style="list-style-type: none"><li>• Increasing reliance on and use of ICT in business, medicine, industry and leisure.</li></ul>
<ul style="list-style-type: none"><li>• Increasing use of biotechnology (including genetic engineering), particularly in medicine.</li></ul>
<ul style="list-style-type: none"><li>• Increasing use of artificial intelligence.</li></ul>
<ul style="list-style-type: none"><li>• Increasing use of nanotechnology and miniaturized technologies.</li></ul>

• Greater reach of the media.
• Increasing reliance on ICT in western military (especially the USA).
• Greater use of ‘asymmetric’ military technologies in developing countries and by paramilitary groups.
• Use of vastly improved, more robust and renewable materials.
• Continuing US dominance in the field of technological innovation.

There is consensus in these studies that “ICT will shape the future world through growing reliance on the technology itself, in all aspects of life and in all sectors - at work, at home, in medicine, in the military, in transport, etc” [1]. This paper aims to unveil the factors affecting the future ICT development in Zimbabwe and most developing countries.

Chelley [3] points that “the advent of the information infrastructure or information technology revolution and its unprecedented capabilities to process, store, refine and disseminate data, information and knowledge in a variety of ways across borders has dramatically changed the ways in which governments, the public and private sectors operate World-Wide”. This has been acknowledged by most developing countries. The elaboration of Information Technology (IT) policy, an integral part of the Economic Community of Africa (ECA), is a major determining factor in setting-up the underlying supporting infrastructure and enhancing the optimal use of the technology.

It is a general consensus that information is an indispensable tool for the continued survival of an organisation, be it private or public (BECTA, 2003) [4]. Information is needed for production of goods and services, and for making wiser decisions that still must be collected, processed, stored and utilised. However, the on-going information explosion and extensive use of infrastructures in industrial economies contrast sharply with the “information poverty” of developing countries (Okiy, 2006) [5]. This poverty takes many forms of planning without facts, an unreliable information support to decision-makers, inadequate financial control and

cumbersome reporting and monitoring systems, limited access to information within and among countries, professionals and researchers without access to national statistics and internal research findings, scarce information support to knowledge workers, insufficient information on natural resources, underused indigenous and locally produced knowledge, poor access to timely information on national and international markets by developing countries like African countries where manpower face major problems in acquiring, retrieving, processing and disseminating various types of information. Many other problems or factors that have affected and still affect the development of information infrastructure and information transfer in Zimbabwe are examined and noted in this work.

### **The concept of information infrastructure**

Information infrastructure reflects technological tools, methods and access models needed to facilitate efficient knowledge management and transfer in today's massive flow of information from various sources. They are information and communication systems required for the widespread sharing and use of information or resources such as computers, software and all the components of telecommunication infrastructure for processing data and information. Popoola (2002, p. 42) [6] highlighted information infrastructure as “human regulation, telecommunications, information technology, government support and other information institutions”. There are IT infrastructures that build on centralised system architectures such as Web servers. It can be seen as IT and other basic infrastructures needed in the acquisition, processing, storage and dissemination or transfer of information by means of computers, office machines and telecommunications. Computers provide the processing, inputting, storage and retrieval facilities; while telecommunications

provide the facilities for the transfer or communication of data and information that further facilitates the establishment and use of the information highway (internet), a network of independent information and communication technologies (telephone lines, televisions, cables, communication satellites, computers, data transmitters etc) that are converging into an integrated system.

The Internet has been regarded as an integral part of the information infrastructure (Popoola, 2002, p. 45) [6]. He inferred that it is believed that information infrastructure must serve as a means to support GNP (Gross National Products) goals across the globe. It could therefore be described as the range of equipment including computer technology, applications, basic technologies that help to process information, which also culminated in the development of the GII (global information infrastructure.). This is a seamless web of communication networks, computers, database and consumer electronics that puts vast amounts of information at user's finger tips (United States Information infrastructures Task Force, 1994) [7]. Through the GII, users around the world will be able to access libraries, databases, government departments, and private organisations located anywhere in the world (Chisenga, 1999) [8]. Information infrastructure development leads to economic development and nation building in every area of our endeavours because infrastructure has the potential to improve and develop economic, social academic, moral and environmental background in our contemporary society. This is because information and communication infrastructure requires widespread technological resources for its operation.

### **Factors affecting the developing of information and communication technologies in Zimbabwe**

### *Inadequate coordination of physical networking organisations*

A number of networking projects have made substantial efforts to set up grassroots links in Zimbabwe. However, many steps are redundantly duplicated due to a lack of mutual nation, regional and inter-organisational coordination. “Everyone wants to coordinate, but no one wants to be coordinated.” This peculiar problem is compounded by a lack of quantitative information on connectivity with implications for not knowing who is doing what, what are the costs, what are the plans? (Adam, 1996)[9]. Adam added that there are a number of situations where national networks connect to each other via intermediaries in Europe or North America, so that a message that would take less than 5 minutes by taxi takes a full day to arrive via e-mail. The same can be said of e-mail and mobile SMS systems in Zimbabwe due to a problem of infrastructure backbone. At the organisational levels there are no plans for backbones that interconnect organisations in the country. Lack of adequate technical knowledge to develop gateways between these links, competition for resources and donor requirements is making it difficult to develop active collaboration (Dede 2000) [10].

For information to be beneficial to the development of a country, it must be available, accurate, and current. In many developing countries, information needed for development has become highly segmented, divisive, and uncoordinated (Adeyemi, 1991) [11]. Similarly, in Zimbabwe, the sources that provide for the flow of information have become monopolistic and without direction, thereby affecting availability as well as accuracy and currency of information.

### *Information poverty and poor availability of indigenous information via network*

Omekwu (2003) [12] points that, “the major bottleneck and a cause of stagnation to the development of technological networking in Africa has been its

weak information infrastructure. Strategic information for better health, functioning industries, prompt social services, transparent governance, sustainable environment and development are lacking. Africa continues to depend on the North for its own local information”. Zimbabwe as a country has recently adopted the “look east policies” in its different sectors of the economy. This dependency needs to be reversed. On the other hand, the “NET” itself is becoming a widely used mechanism for the exchange of information worldwide. Yet, in Zimbabwe, it is often difficult to find relevant information and in a very short time. It can take long periods of time before information is retrieved from the Web and in most cases relevant information is rarely found. Local aids and information concerning different sectors beneficial to the country is not readily available. As Richard (2003) [13] points out that” It is very costly for African networks that cannot afford to waste scarce bandwidth surfing on the web”, the burden lies on Zimbabwean networks also for a little benefit. Lack of quality assurance measures for documents locally posted on the net is another biggest problem in this regard. The network is usually flooded by less important poor material and music being downloaded from the Internet.

*Telecommunication monopoly by government and obsolete regulatory framework in Zimbabwe*

The networking problem in Zimbabwe generally stems from obsolete policies and a negative regulatory framework by the Government. Telecommunications has been considered as a public (Government) property like in many developing countries. TelOne (a government owned telecommunications company) is responsible for telecommunication services in Zimbabwe. Government owned telecommunication operations are usually inefficient. Just as Adam (1996) [9] highlighted, Commercial service providers are not allowed to provide value added services. There are three

mobile operators in the country, Telecel, NetOne and Econet and some aspiring operators from the neighbouring South Africa. However their services are yet to be standardised with the blame mounted on government policies with regard to communication. The majority of African governments still require longer times to understand the value networking offers to their competitiveness and its abilities to foster positive changes in quality of life. Issues such as cultural erosion, pornography, privacy, security, loss of revenue are often amplified by government controlled media as opposed to promoting empowerment via networks and what it can achieve. Omekwu (2003)[12] has however suggested that to prevent monopoly in the information industry, it is necessary to regulate the process of conglomeration whereby vertically and horizontally integrated corporations are concentrating ownership of the information services. This measure is gradually taking shape with the Zimbabwean government privatising the provision of most services to the public.

*Minimum involvement of research institutions in network building and diffusion in Zimbabwe*

Most projects in Zimbabwe are centred on NGOs (Non Governmental Organizations) and the private sector without the involvement of the academic community. The research and academic community that would have been a vehicle for the development in information and communication technologies through teaching and multiplying technical capacity has been overlooked over the years. Users from the academic community were unable to effectively exploit networking. The local information economy requires advances in the local capacity for software research and development. Zimbabweans have the highest potential to develop their own local software as Adam (1996) [9] points out that, African countries can become full actors in the area of software development if considerable attention is given to this area.

With the literacy rate of 90.7% (The world factbook)[22] and the endeavour for technological development through the ministry of science and technology, surely Zimbabwe can soon realize a new era in information and communication technology if academic institutions take the lead.

*Unreliable telecommunication infrastructures*

In addition to high tariffs and non-favourable traffic, Zimbabwean telecommunication infrastructures remain unreliable. Many organisations still use TelOne's analogue links, which are difficult to integrate with newer communication technologies such as Digital and Wireless technologies. Other innovations in telecom networks that bypass local analogue loops are unavailable and the licensing processes for them are antiquated. The recent development of cellular telecommunication system (Econet, Telecel and NetOne.) services of the private sector has not been completely reliable due to frequent excuses by the TelOne infrastructure breakdown and other related factors that have consequently brought about distorted information transfer in the country and beyond the borders. The outdated network infrastructure system of TelOne has negatively affected other sectors of the economy in the country such as the banking sector with some banks operating offline for several weeks. The emergence of the Real time Gross Settlement (RTGS) in the banking sector has seen transfers being handled quickly in matter of minutes however due to TelOne's faulty lines, the system's benefits are hardly realised. Network infrastructure the industry has seen delays in getting their funds. The flow of information in the country is also negatively impacted and some business brought to halt due to fault data lines. How can you expect the local people to link with partners around the globe when even Internet cafes have to close for several weeks? Poor maintenance has also contributed in a way to the inefficient utilisation of the existing network. The telephone system

was once one of the best in Africa, but now suffers from poor maintenance; more than 100,000 outstanding requests for connection despite an equally large number of installed but unused main lines (The world factbook) [22]

#### *Power shortages*

Southern Africa is facing power shortages and Zimbabwe is no exception. A considerable majority of people in Zimbabwe lives in rural area, about 37% (Mutseyakwa, 2007) [14] where there is no electricity. The government has once embarked in a programme of rural electrification but the progress has since come to halt due to lack of funds. The urban community have been hit by power outages for the past years. The situation of power cuts seems to be worsening throughout the country. Electricity normally returns at odd hours during the night that even for those households with television sets and radios have since packed them safely in their boxes. If the situation continues, it obviously has a drastic effect on the growth of ICT. Power cuts have led to a destruction of the existing telecommunication infrastructure through theft and vandalism during dark nights.

#### *Inadequate human resource*

Ofsted (2002) [15] saw that, “Leaders and experts world-wide increasingly recognise human resource capacity development as potentially the most crucial constraint in the effective deployment of NICI to build sustainable information societies. Hence, preparing Africa for the information age primarily necessitates appropriate investment in its human resources”. Zimbabwe had such a pool of human resources in the region but professionals and experts in different fields have been migrating to other countries in the region and overseas in search for economic refuge since 2000. Human resources development involves a process aimed at providing continuous and proper staffing in such a manner as to ensure that appropriate skills

are available within the work force when needed to meet the organisation's varying requirements and to enable the organisation to discharge its legal, statutory, and social responsibilities and that the public has its services and the society at large (Adimorah 1993) [16]. The exodus of experts especial in the field of science and technology from Zimbabwe has left the country as only a training ground.

#### *Inadequacy of technical personnel cooperation*

The networking of trained individuals is very critical for organisational cooperation and the development of a country as a whole. Cooperation and coordination of systems managers and the advocates of networking have been less successful in Zimbabwe. Technical personnel have also been unable to coordinate networking activities and are less interactive. There is need for a sufficient number of forums to bring the majority of networking managers together. Although there are IT workshop and exhibitions being held in the country such as IT Africa and some workshops by the Computer Society of Zimbabwe, participation is reluctant from most organizations.

#### *Harsh fiscal policy (taxation)*

Fiscal policies (such as tariffs, duties and licenses fees), drastically increase import tariffs and taxes on information and communication technologies, and has escalated the cost of telecommunications services and non-interest to serving the rural areas and the grassroots level, as well as non-provision of tax holidays for information technology industries. Policies such as import duty have categorized various IT components as luxury goods and require duty to be paid in forex thereby hampering companies from importing these components.

#### *Financial problems*

Eadie (2001) [17] cited that the major obstacle hampering the development and extension of information systems was lack of funds and absence of the engineering infrastructure needed for the development and production of spares and components. Foreign exchange restrictions are effected by adverse foreign exchange transactions. High cost of ICT facilities or information infrastructure has been reported as one of the factors that influence provision and use of ICT services (Adomi, 2006)[18]. Poverty has led to under funding which has continued to inhibit the rapid development of telecommunications in the country. This situation has worsened in recent years because of large-scale devaluation of the national currency, inflation and the shortage of foreign exchange with which to prosecute many projects. As a result of this, Zimbabwe does not find it feasible to extend telecomm services to the rural areas.

#### *Under-utilization of information infrastructures in Zimbabwe*

Duffy (2001) [19] wrote that both business and social entrepreneurs that include young people are creatively using information technology to address community needs and meet global challenges. In many developing countries, it is estimated that half of all capital investment by firms goes into IT systems but adoption of new technology is however hampered by a requirement for new routines and behaviour (Prusak 2002) [20]. Apart from under utilisation, these requirements may lead to technological rejection and non-use. This frequently results in failure to meet objectives and frustration on the part of senior managers and investors. However, understanding how and why variations occur will help firms avoid the common and experience failure witnessed (Rena, 2006) [21].

## **Research Methodology**

In this research ICT indicators were collected.

*Why collect ICT Indicators?*

- Necessary for:
  - Informed regulatory decision-making
  - Monitoring and evaluating operators' performance in terms of:
    - Growth (universal service and Internet penetration.
    - Quality of service
    - Productivity
    - Efficiency
    - Regulatory compliance
  - Monitoring and evaluating sector performance in terms of:
    - Contribution to GDP (Gross Domestic Product)
    - Gross capital formation
    - Contribution to the fiscus.
    - Employment

*Indicators Collected*

- The indicators collected are in line with International Telecommunication Union (ITU) indicators as follows:
  - Public phone network indicators
    - Number of fixed subscribers
    - Number of mobile post paid and prepaid subscribers
    - Number of telex lines
    - Switching capacity
    - Level of digitalization in the fixed network
    - Cellular phone coverage

Traffic in minutes: national, and international

- Tariffs: Connection, monthly rentals and per minute charges
- Staff levels in licensed operators: categorized male and female
- Capital expenditure.
- Turnover

*Public data/internet*

- Leased line subscribers
- Dial up subscribers
- International bandwidth
- Quality of service indicators such as:
  - Waiting list
  - Number of faults per 100lines per year
  - Billing complaints per 100 lines
  - Faults cleared by following day

*Household ICT Indicators*

- The Central Statistical Office collects some ICT indicators

There are household surveys such as:

- The Income, Consumption and Expenditure

Survey (ICES) has useful ICT indicators

- There results of ICES done in 2007 are not readily available.

*Major Sources of ICT indicators*

Indicators are collected from:

- Operators (major source)
- Government ministries

- Central Statistical Office (CSO)
- Other regulators like Broadcasting Authority
- Agents of licensed operators such as ISPs

*Methods of collection*

- Questionnaires
- Letters requesting a specific indicators e.g. international traffic
- Telephone interviews
- Audited accounts
- Tariff proposal submissions
- Regulatory reports (bi-annual)
- Quarterly MIS return templates
- Observations
- Statistical Data from CSO, Population Services International (Zimbabwe) Computer Society of Zimbabwe And United Nations

*Challenges in ICT indicator collection*

- Low response rate. (Supply of indicators to the Regulator is not an operator priority)
- Partly completed questionnaires
- Data Inconsistencies.
- The problem of information asymmetry (Some operators might not supply all indicators) requested for confidential reasons.
- Inadequate financial and human resources to carry out comprehensive surveys.

## Results

- Zimbabwe is a landlocked country with land area of 390 580 square km. [22]
- The population is about 12,311,143 million (based on July 2007 estimate)[22]
- The rate of natural increase for the population is 0,595%(2007 estimate)
- About 37 % of the population lives in rural areas
- Zimbabwe has one fixed and three mobile operators with subscriber bases of 331 700 and 832 500 respectively. (2006 estimate). [22]
- ICTs are concentrated mainly in urban areas and Universities.
- General assessment: system was once one of the best in Africa, but now suffers from poor maintenance; more than 100,000 outstanding requests for connection despite an equally large number of installed but unused main lines domestic: consists of microwave radio relay links, open-wire lines, radiotelephone communication stations, fixed wireless local loop installations, and a substantial mobile cellular network; Internet connection is available in Harare and planned for all major towns and for some of the smaller ones
- International: country code - 263; satellite earth stations - 2 Intelsat; 2 international digital gateway exchanges (in Harare and Gweru)
- Internet country code: .zw
- Internet hosts: 15,507 (2007)
- Internet Service Providers (ISPs): 6 (2000)
- Internet users: 1.22 million (2006)

**Table 2: The results of 2001 ICES**

Households owning or having access to	Number of households	%
Radio	1 265 548	53.6
Computer	18 116	0.8
Television	542 541	23
Electricity	872 008	36.9

**Table 3: Trends in ICT use**

	Year					
	1990	1994	1997	2000	2003	2005
Fixed line and mobile phone subscribers (per 1,000 people)	11.7	11.6	17.8	41.0	51.7	78.9
Internet users (per 1,000 people)	0.0	0.0	0.3	4.0	62.2	76.9
Personal computers (per 1,000 people)	0.2	1.9	9.0	15.5	48.2	92.2

Source: World Development Indicators database, April 2006

## Discussion

Results from table 3 shows that there was an increased use of phones. This can be attributed to the emergence of Mobile phone providers, Econet licensed to offer mobile services in 1997(<http://www.mbendi.co.za/orgs.clmf.htm>) and NetOne in December 1999(<http://www.netonetech.com>). The increase in Internet users and people owning personal computers was a result of the increased computer awareness by the majority; however we encourage more participation in training/workshops on ICTs so that countries will be able to benchmark against each other and learn others` experiences.

Lessons can be learnt from countries with established ICTs in the region like South Africa. As South Africa realised the need for replacing professionals leaving

the country for greener pastures in Europe, it introduced a system of offering quota work permits attracting ICT and other experts in the region. There is need for strong measures in retaining ICT experts in terms of remunerations that are comparable to those offered by other countries in the region.

There is need to handle incompatibility of existing information equipment or infrastructure among the licensed organisations, operation of public switches, trunks and associated infrastructures. Measures have to be put in place for the generation or sourcing of adequate power for future development of the country in different sectors of the economy.

The results from table 2 are not up to standard considering the total population. Very few households own computers. The exclusion of certain social groups from participation in the information society, in particular its benefits, is a major concern to politics. For this reason training and education for the use of information technologies (IT) and for IT related professions have to be high on agendas.

Sustainable development is a major concern for all countries, so that several have required their foresight studies to address this as an underlying issue. ICT can play a variety of roles in this respect, e.g. monitoring, control of cleaner production, optimization of resource use, environmental management etc. But ICT can also have a negative impact, e.g. through waste from obsolete technology.

There is little homogeneity across country studies in terms of scope, motivation, methodology, treatment of ICT, time horizon, method, participation, etc. Developing countries should work to address this.

Wireless will become more and more important, supporting mobility of services, people and devices. Devices will evolve from independent and analogue to

connected intelligent digital devices. Academic institutions should take a lead in researches along those lines.

## **Conclusions**

Based on the foregoing inadequacy of much of developing countries to meet the basic needs of improving the development of infrastructure in information and communication technology, there is the ongoing need for these issues to be re-addressed by National citizens and see what they can do before other concerned nations come in, provide some aid so as to improve their economic development and nation building in every facet of their endeavour. Infrastructure has the potential to improve the economic development of countries in diverse areas e.g. agriculture, education, environment, telecommunication/networking, public/private organisations because information and communication infrastructure requires a widespread technological resources for its operations

In the near future, therefore, we should expect to see attention focused on building confidence in ICT applications, a faster and more secure Internet, measures to support ECommerce, encouraging telework, more emphasis on education and training in ICT, etc. However, it is difficult to say much about the nature of the problems that might emerge.

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