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COLLABORATIVE OPPORTUNITIES FOR ICTs DEVELOPMENT IN A CHALLENGED AFRICAN ENVIRONMENT

Gabriel Kabanda

Abstract

The emergence and convergence of information and communication technologies (ICTs) has remained at the centre of global socio-economic transformations. The required ICT revolutionary technological change or productivity levels in Southern Africa is a function of both skilled labour (high technical competence) and capital for investment. Technological progress in Southern Africa can be measured as an index composed of measures of personal computers, Internet hosts, fax machine, mobile phones and television, etc., across the various member countries. The paper presents a synopsis of the ICTs indicators for Southern Africa and the opportunities therein, together with an analysis of technological progress and opportunities for ICTs development in Southern Africa. A regional ICT collaboration strategy is proposed, underpinned by best practice elements. The proposed Regional ICT Collaboration strategy largely depends on human resource development, information sharing platforms, and the degree of development of the ICTs industry and support services in the individual member countries. The design of virtual collaborative systems is a useful paradigm for the development and sustainability of virtual collaboration for Southern African countries, so that higher levels of collaboration may be achieved among geographically dispersed work groups. Knowledge may be shared between people through face-to-face or through technology, either asynchronously or synchronously, commonly known as virtual collaboration.

Keywords: innovation implementation; technology diffusion agencies.

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1. Introduction

Information and Communication Technologies (ICTs) is a term that refers to technologies that are used for collecting, storing, editing and passing on information in various forms through various media. As a result of the convergence of information, telecommunications, broadcasting and computers, the ICT sector now embraces a large range of industries and services. The emergence and convergence of information and communication technologies (ICTs) has therefore remained at the centre of global socio-economic transformations. It is worth noting that Information has become a strategic resource, a commodity and foundation of every activity. Globally, ICTs have emerged as strategically important tools for social and economic change. If implemented properly and carefully, these technologies could reduce or eliminate the imbalance between rich and poor, powerful and marginalized.

Collaboration is the process intended to foster sharing that is necessary among involved or affected groups or organisations in order to achieve the collective gains or minimise the losses. It is promoted by collective goals, mutual understanding, informal activity, shared resources, and common vision. The purpose of the ICT collaboration is to build research relationships and networks through shared training and technological and product development agendas. The collaboration between any two entities, initially based on exchanges and periodic meetings, should evolve towards a process of reflection, planning and concerted actions. Collaborative ICT strategies would be of tremendous benefit to Southern African countries in making significant strides in reducing the digital divide. Collaboration denotes communicating and working together across organizational boundaries (Baker, 1992). Virtual collaboration, on the other hand, refers to the use of ICT for supporting the collective interaction among multiple parties involved (Hossain & Wigand, 2003; Kock, 2000). Virtual organizing is an essential prerequisite for ensuring a higher level of virtual collaboration, and so the development and sustainability of virtual collaboration have to be guided by common business goals (Wigand & Imamura, 1997; Wigand, Picot & Reichwald, 1997). This, in turn, will ensure the linkages among ICTs, organization structure, and geographical dispersion (Hossain & Wigand, 2003).

The ICT revolution, at institutional and regional collaboration levels, requires extensive investments into people (labour) and capital for the infrastructure and equipment. The Cobb-Douglas production function relates the revolutionary technological change or productivity levels from ICT to labour and capital. A Cobb-Douglas production function of the form

$$Q = A K^a L^b$$

is used for the analysis of technological progress and attended economic growth, where A, a and b are empirical parameters.

- K = capital input (very meaningful mounts)
- L = labour input (high technical competence)

The paper presents a synopsis of the ICTs indicators for Southern Africa and the challenges in the telecommunications infrastructure. The purpose of this paper is to identify and present opportunities for ICTs development, and determine a collaborative framework for ICTs for Southern African countries, premised on the developmental indices for establishing an information and knowledge society.

The potential of ICTs to transform development is now receiving greater attention worldwide. The ICT development indices shown below were considered in the ICT connectivity and diffusion for Southern African countries, and can be used as a benchmark for assessing the growth rate of ICT development.

- Telephone mainlines per capita
- Number of PCs per capita
- Cellular subscribers per capita
- Internet hosts per capita

2. Synopsis of ICT Indicators for Southern Africa

A synopsis of the ICT developmental indices for Africa in general and specifically for Southern Africa was conducted. A summary position of the ICT infrastructure and connectivity was derived and is presented below. All information concerning the ICT indicators was obtained from International Telecommunications Union ITU web site and is available on the public domain, *http://www.itu.int/home/index.html*.

Africa has the lowest telephone densities (main lines per 100 inhabitants) in the world. On the occasion of ITU TELECOM AFRICA 2008 held from 12th to 15th May 2008 in Cairo, Egypt, ITU published the 8th edition of the African Telecommunication/ICT Indicators (*http://www.itu.int/ITU-D/ict/publications/africa/2008/index.html*). The first edition was prepared 18 years ago, for the African Regional Telecommunication Development Conference in Harare, Zimbabwe in December 1990. At that time, there were only 8.6 million telephone subscribers in Africa, most of them in Northern Africa and South Africa. In 1999, the ITU estimated that Africa had about 18 million telephone lines – amounting to a teledensity of 2.0%, an improvement over the level of 1.85% of 1997. With the North Africa and South Africa excluded, the teledensity was about 0.5%. In fact, Norway had more telephone subscribers than all of Sub-

Saharan Africa and mobile communications was virtually non-existent with only six networks in operation. Outside of Mauritius and South Africa, there were none in Sub Saharan Africa. It was also reported by ITU that no African country was connected to the Internet in 1990. Sub-Saharan Africa (SSA) is one of the poorest regions in the world and has the lowest access to information and communication resources.

However, the telecommunications situation in Africa has changed dramatically, with all countries having mobile networks and all connected to the Internet. The number of mobile subscribers has increased dramatically over the last few years. In 2007, the African continent added over 60 million new mobile subscribers and mobile represents some 90 percent of all telephone subscribers, and mobile penetration in the region is close to 30 percent. (*http://www.itu.int/ITU-D/ict/publications/africa/2008/index.html*). Although Africa has made impressive strides, it is still far behind other regions. Investment in ICT infrastructure in Africa has improved dramatically in recent years, representing a total of USD 8 billion in 2005, up from USD 3.5 billion in 2000. These figures reflect an increasingly vibrant private sector investment environment, which has been stimulated by the opening of most African telecommunication markets to competition, coupled with the establishment of independent regulators in almost 90 per cent of countries in the region. This increasingly dynamic environment has resulted in lower prices for consumers and significantly widened access to telecommunications, particularly for mobile services in urban areas. The African mobile market has been the fastest-growing market of all regions, growing at twice the rate of the global market, with a leap from 16 million to 136 million subscribers between 2000 and 2005. Mobile now outnumbers fixed line penetration by nearly five to one in Africa. In addition, while urban areas are benefiting from increasing access to mobile telephone and Internet services, many smaller towns and rural communities remain without any ICT access. And, locally relevant content, applications and services, for both Internet and mobile, which would support growing usage, are not yet widely available.

The Southern African Development Community (SADC) has been in existence since 1980, when it was formed as a loose alliance of nine majority-ruled States in Southern Africa known as the Southern African Development Coordination Conference (SADCC), with the main aim of coordinating development projects in order to lessen economic dependence on the then apartheid South Africa. The Member States are Angola, Botswana, the Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, United Republic of Tanzania, Zambia and Zimbabwe. SADC headquarters are located in Gaborone, Botswana.

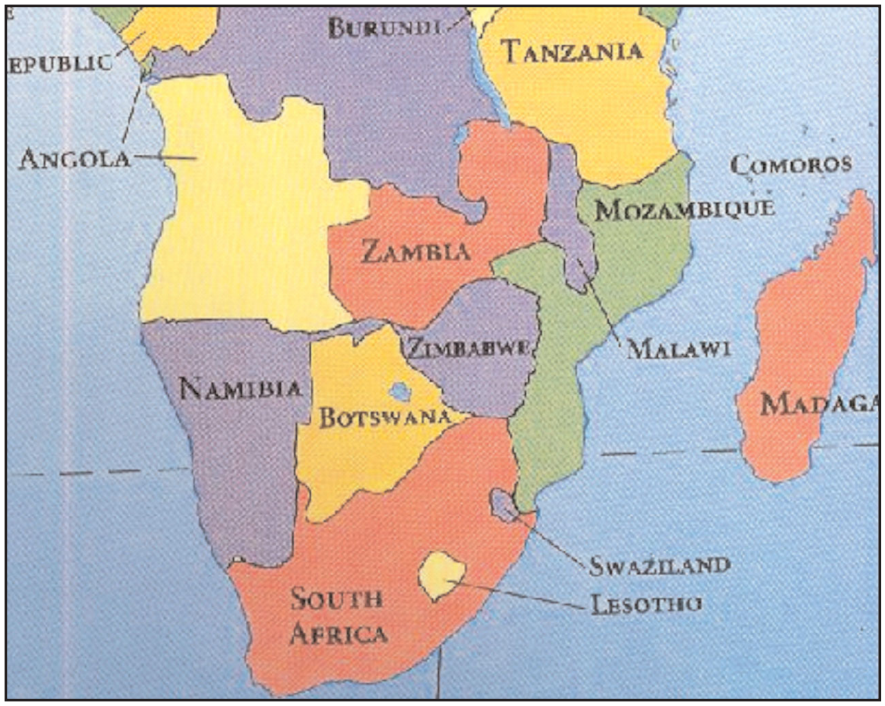

Figure 1: Map of Southern Africa showing the SADC countries.

The SADC vision is one of a common future, a future in a regional community that will ensure economic well-being, improvement of the standards of living and quality of life, freedom and social justice and peace and security for the peoples of Southern Africa. This shared vision is anchored on the common values and principles and the historical and cultural affinities that exist between the peoples of Southern Africa (*http://www.sadc.int/index/browse/page/64*). The political will for collaboration already exists in Southern Africa through the establishment of the SADC. However, there is need to explore and establish a collaborative strategy for ICT development.

A list of core ICT development indicators as agreed upon by the international community is presented below for Southern African countries. The synopsis of the ICT indicators for teledensity, mobile access, internet access and number of PCs per 100 people for the SADC is summarized in the charts shown on Figures 2 to 5, respectively. The average teledensity for Africa and Sub-Saharan Africa is 3% and 1.5%, respectively, and this is the lowest in the world, as of December 2007 (*http://www.itu.int*), as shown on Figure 2. The average mobile access level for Africa and SADC countries is 20% and 10%, respectively, as shown on Figure 3.

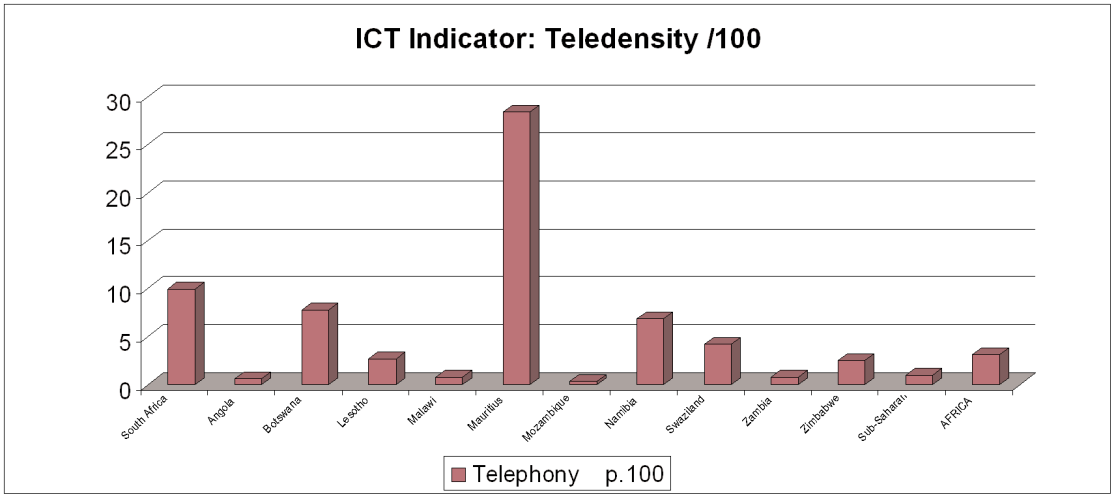

Figure 2: Teledensity of fixed telephones in SADC per 100 people

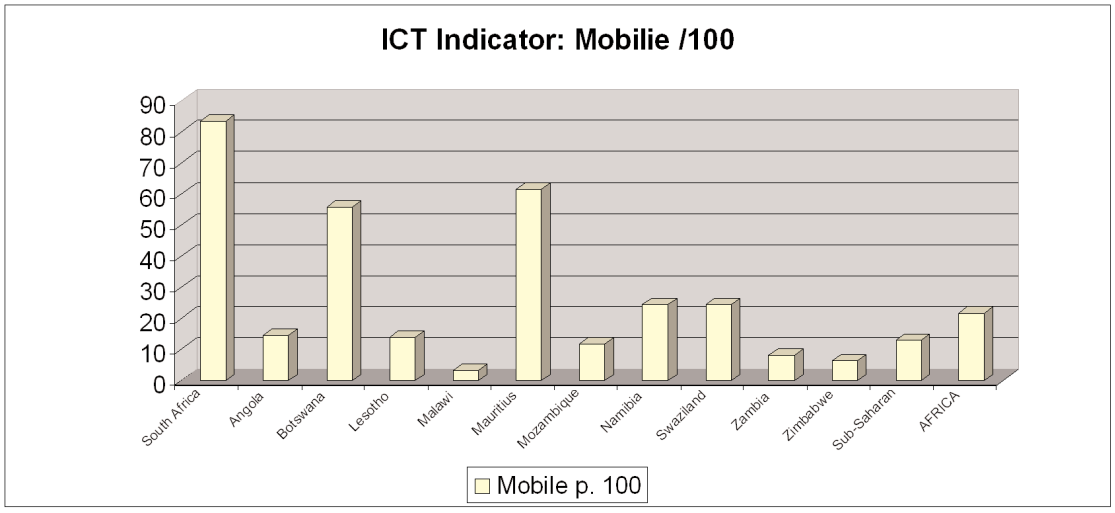

Figure 3: Mobile access in SADC per 100 people

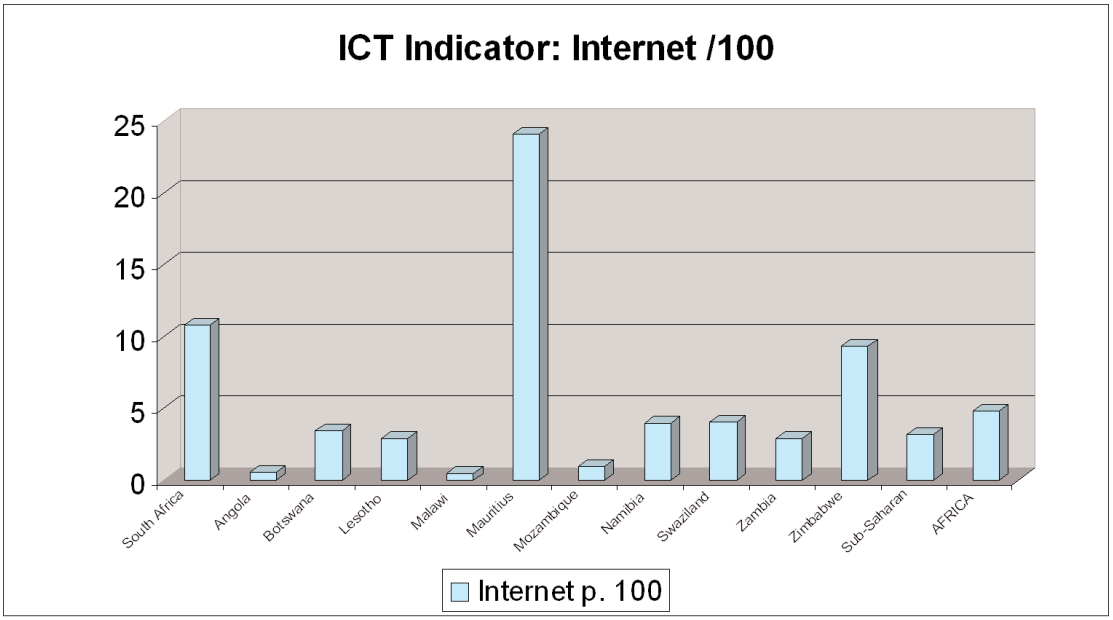

Figure 4: Internet access in SADC per 100 people

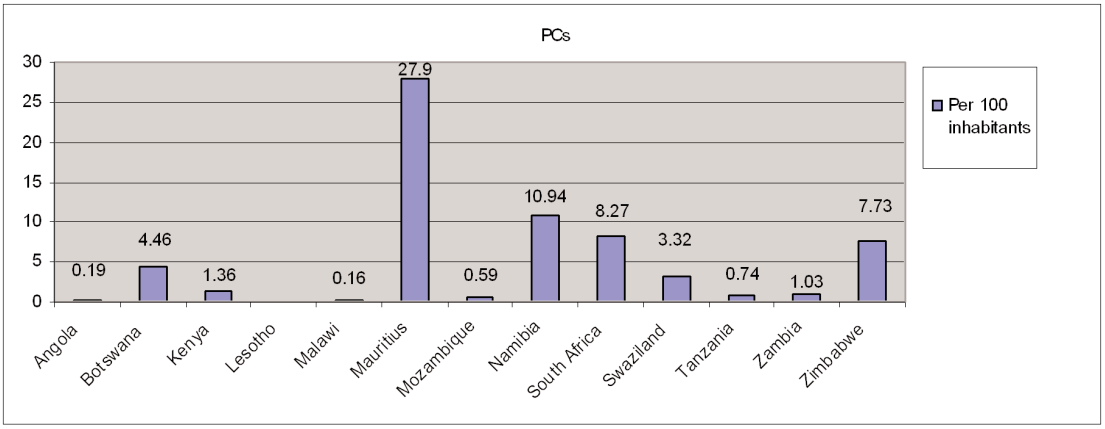

Figure 5: Number of PCs in SADC per 100 people

3. ICT Position & Opportunities

The summary position for ICT indicators for Africa, based on Figures 2 to 5, is as follows:

- Africa has the lowest growth in teledensity of any developing region in the world.
- Has 12% of World population, but 3% of World's main telephone lines.
- Average level of income is the lowest, but the cost of installing telephone line is the highest.
- Highest profit per telephone line and long waiting period for telephone lines.
- Internet connectivity is 1.5% of the world-wide connectivity.

One of the challenges in measuring ICT development indices is the non-availability of data specific for each indicator from the developing countries, especially Southern Africa. The global picture for data analysis is shown below in Figure 6 obtained from UNCTAD in 2006, and shows the challenges in data collection including the following:

- Lack of continuity in data collection (one-off surveys)
- Differences in types of surveys, sampling units, frames, sizes, and denominators used by member countries
- Differences in response categories (e.g. modes of access and activities the Internet is used for)

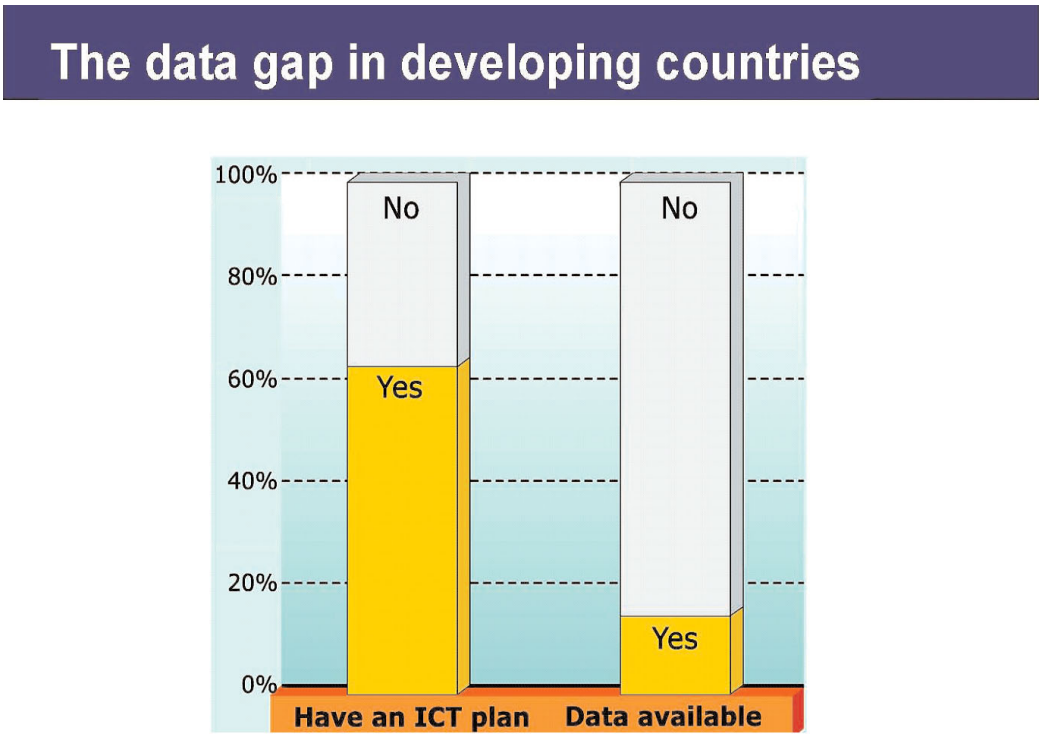

Figure 6: Availability of ICT data in Africa. Source: UNCTAD (2006)

However, since the mid-1990s, countries that have adopted deregulation and privatization policies have experienced rapid growth in the expansion of communication networks. The Internet, for instance, is beginning to be utilized in urban areas but the constraints to expansion are considerable and include lack of basic connectivity to telephone networks, high connection charges, and low computer skills. The prices for fixed line network access in many SADC countries are still well ahead of the world average for low –income countries. Taken overall, fixed line telecommunication tariffs are about 112% of GDP per capita in very low-income economies compared with 8.25% and 2% of GDP per capita in middle and high-income economies. By contrast, many countries have experienced a real revolution in mobile networks particularly where fixed wire networks are underdeveloped. But tariffs for mobile cellular access represent a considerably higher proportion of GDP per capita at present.

The advent of ICT provides opportunities to communicate, share and collaborate on projects to achieve common business goals. This may lead to a higher level of knowledge sharing and therefore help build and sustain collaboration, and in turn, is critical (a) to the development and sustainability of virtual collaboration and (b) to ensure the optimal use of ICT. The key components of the collaborative strategy are:

- Infrastructural facilities for connectivity and access,
- human resource development,
- a common electronic–business framework
- information and content sharing platform,
- a conducive political, legal and technical environment,
- ICTs industry and support services.

4. ICT Collaboration Strategy

"If I have seen further, it is because I have stood on the shoulders of giants..." -- Isaac Newton..

The purpose of the ICT collaboration is to build research relationships and networks through shared training and technological and product development agendas. Collaborative ICT strategies would be of tremendous benefit to Southern African countries in making significant strides in reducing the digital divide. The Regional Collaboration partnerships are beneficial to many entities due to the following reasons:

- Shared ownership, risks and rewards, and is more sustainable;
- Enhanced social cohesion, transparency and accountability;
- Pooled knowledge and resources;
- Enhanced efficiency and effectiveness, as collaboration reduces duplication and draws synergies;

- Extended reach and relationships;
- Mutual capacity building;
- Holistic perspective and approach to development, which includes an integrated approach and can address actual need of target communities in the region.

Generally, the collaboration between two institutions in Southern Africa could embrace a number of areas including the following:

- Teleconference meetings
- Periodic physical meetings
- Web-based collaboration with organized structure
- Coordinating efforts and collaborating on common projects to avoid inappropriate duplication of efforts and achievement of common key objectives
- Brainstorming to identify the best ideas/approaches in the ICT arena, and problem-solving to overcome major obstacles in the delivery of ICT services.

Many projects and collaborative strategy implementation have failed in Zimbabwe due to missing best practice elements. Best practice elements are a necessity for successful implementation of the collaboration strategy that explicitly defines the scope and direction of the action plan. The following elements have been found to be effective in successful implementation of projects and collaboration partnerships:

- Clear top level sponsorship
- Complete involvement of collaboration partners
- Clearly defined collaboration plan and deliverables
- Practical and stringent monitoring of collaboration implementation performance
- Commitment of adequate resources
- Clear definition of roles and responsibilities
- Adequate technical and collaborative work training
- Clear change management and communication process
- Steering committee that adds value

Effective virtual collaboration is guided by the principles of virtual organizing. The design of virtual collaborative systems is a useful paradigm for the development and sustainability of virtual collaboration, so that higher levels of collaboration may be achieved among geographically dispersed work groups. The social process is critical to understanding how ICTs may be used effectively to support geographically dispersed work groups in Southern African countries. The social structures precipitate patterns of interaction, their development and influence on the behavior of actors in the social systems and recognition of endogenous knowledge systems. Knowledge may be shared between people through face-to-face or through technology, either asynchronously or synchronously, commonly known as virtual collaboration.

Computer Supported Co-operative Work (CSCW) is defined as "*Technology which allows people in remote places to interact with each other and with the same documents and files through voice, data and video links*". CSCW is broken down into two dimensions, namely Time (synchronous and asynchronous) and place (co-located and remote). This classifying by place appears to put too much emphasis on hardware dependencies arising from geographic location. The following are a few CSCW examples classified according to the conventional time/space model.

- Synchronous, co-located: Shared work surfaces
- Synchronous, remote: Video conferencing
- Asynchronous, co-located: Active badges
- Asynchronous, remote: E-Mail and electronic conferences

Today, we are seeing a rapid growth in the use of networks and applications to support CSCW and considerable development of the early applications such as E-mail. Previous ICT-enabled physical collaboration (CSCW) and Computer Mediated Communication (CMC) supported by some level of face-to-face communication, help us to understand virtual collaboration. ICT-enabled physical collaboration is as technology-based collaborative systems with the presence of some level of face-to-face communication (Ludwig, 1999). It may also be referred to as electronically supported communication media ranging from telephone to Internet to low-earth orbit satellite cellular technologies that organizations use to support linking individuals in electronically mediated communication (Adhikari, 1998; DiMartino & Wirth, 1990; Hiltz & Turoff, 1992; Kiely, 1993; Niederman & Beise, 1999; Papows, 1998).

The Regional ICT Collaboration Strategy for Southern Africa should be established on the following areas pillars:

a. Humanware /social issues
b. Software Oriented Technologies
b. Hardware Oriented Technologies
c. E-mail styles and problems
d. Multimedia mail
e. Shared Applications

5. Conclusion

The African ICT environment and infrastructure faces tremendous challenges. Africa has 12% of World population, but 3% of World's main telephone lines. Southern Africa is one of the poorest regions in the world and has the lowest access to information and communication resources.

The purpose of the ICT collaboration is to build research relationships and networks through shared training and technological and product development agendas. The proposed Regional ICT Collaboration strategy largely depends on human resource development, information sharing platforms, and the degree of development of the ICTs industry and support services in the individual member countries. The design of virtual collaborative systems is a useful paradigm for the development and sustainability of virtual collaboration, so that higher levels of collaboration may be achieved among geographically dispersed work groups. Knowledge may be shared between people through face-to-face or through technology, either asynchronously or synchronously, commonly known as virtual collaboration. Virtual organizing is an essential prerequisite for ensuring a higher level of virtual collaboration, and so the development and sustainability of virtual collaboration have to be guided by common business goals, human resource development, information and content sharing platform, ICTs industry and support services. Best practice elements are critical ingredients to successful implementation of collaborative work.

Early systems were software oriented and asynchronous due to the limits imposed by network bandwidths. However, network speeds are now increasing towards the Gigabit per second, and the limiting factor is becoming the hardware available on the desktop or in the meeting room rather than the network in between. With Gigabit per second communications now being available in most parts of the world, the limiting issues for CSCW aren't going to be where people are located, but will be determined mainly by software functionality, desktop hardware and social issues, rather than network hardware. Another trend has been for CSCW to expand from just a computer perspective with difficult to use tools intended for hackers, e.g. UNIX Mail, to more people-oriented forms of communication. These new forms are suitable for assisting people who might not normally be computer users to hold interactive group meetings.

Today, we are seeing a rapid growth in the use of networks and applications to support CSCW and considerable development of the early applications such as E-mail. As a result of these developments, there are also tremendous social changes which arise now that people in remote locations can communicate with people as easily as those in cities, and people move out of the office and start to work more off-site and in their own homes. Although Teleworking (working at a distance) is big enough to be considered a separate subject, CSCW and teleworking are closely related as CSCW technologies (i.e. E-mail and Notes) have helped many teleworkers. The growth of teleworking is also a major reason for interest in CSCW. Previous ICT-enabled physical collaboration (CSCW) and Computer Mediated Communication (CMC) supported by some level of face-to-face communication, help us to understand virtual collaboration. Research done elsewhere suggest that virtual teams are most effective in making decisions.

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