

THE OPPORTUNITIES OF INFORMATION AND COMMUNICATION TECHNOLOGIES
FOR SMALL AND MEDIUM SIZE ENTERPRISES AND REGIONAL DEVELOPMENT IN
TANZANIA

EBENEZER G. LAISSER

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University of Joensuu

Department of Computer Science

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Abstract

Small and medium size enterprises (SMEs) play a key role in the economic growth of any country. The application of modern information and communication technologies (ICTs) can improve the performance of SMEs, governmental and non-governmental enterprises. Improving performance through the application of modern ICT reduces operational costs and speeds up production.

Tanzania as a developing country has poor ICT infrastructure, few ICT skilled laborers and few ICT users. In other words, there is a small market for ICT services and infrastructure in Tanzania. ICT based media like the Internet, e-mail, mobile phones, TV, radio, and ecommerce are available in Tanzania, but in a small scale and unevenly distributed.

Poverty, lack of skilled laborers, lack of ICT knowledge among the public, cultural differences, the digital divide, lack of motivation, and personnel resistance have been among the reasons for slow and uneven ICT development in Tanzania. This has led some enterprises in the region to continue using outmoded ICT infrastructure (like typewriters for information processing, paper folders for information storage, and human based information dissemination).

Based in the analysis, we recommend that the Tanzanian government, business enterprises, academic institutions and ICT service providers should work together to update the ICT structure in the region. For example, use of the existing infrastructure like the landline telephone network, the mobile phone network, the railway cable network and electricity cables to expand the Internet in the region. There is a need for scholars to do more studies on how to improve ICT and its application in Tanzanian small and medium enterprises.

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Through him all things were made; without him nothing was made that has been made. (John1: 3). The master's program in Computer Science was rather difficult, but its accomplishment is a great achievement for me. I had a background in Business Administration from Tumaini University - Tanzania (1996 - 1999) and I joined the master's program in Computer Science at the University of Joensuu – Finland (2000 -2002). I would like to take this opportunity to express my sincere thanks to individuals and organizations that have made remarkable contributions to make my studies possible.

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List of Figures

Figure 1 LAN, WAN and Internet -----	10
Figure 2 One-Way Satellite Internet Connections -----	12
Figure 3 Two-Way Satellite Internet Connections -----	13
Figure 4 Internet Connection by mobile phone -----	17
Figure 5 Information Circle -----	20
Figure 6 Information Cycles -----	21
Figure 7 Price Elasticity -----	28
Figure 8 ICT as a Link between Institutions-----	29
Figure 9 Net Send Window's Command-----	32
Figure 10 MSN Chat Systems -----	32
Figure 11 DiRECWAY Chat Systems -----	33
Figure 12 Enterprise H before Modern ICT -----	38
Figure 13 Initial Costs for H Plans -----	39
Figure 14 Enterprise H after Modern ICT -----	39
Figure 15 Enterprise Cost and Profit Curves-----	40
Figure 16 Relationships Between ICTs, SME and Regional Development---	40
Figure 17 MSN Messenger Advertisements -----	62
Figure 18 Yahoo E-mail Advertisements-----	63
Figure 19 Digital Isolation for Africa -----	65
Figure 20 Internet Structure in Africa -----	66
Figure 21 Possible Internet Connections in Tanzania-----	68
Figure 22 Tanzania Railway Cables -----	71
Figure 23 Imaginary Tanzania Universities Network -----	73
Figure 24 Imaginary East Africa Universities Network-----	73
Figure 25 Finnish Universities Network -----	74

List of Tables

Table 1 Economy Facts about Tanzania -----	5
Table 2 Economy Facts about Finland -----	6
Table 3 Enterprise Classifications -----	7
Table 4 Networks Technology and Applications -----	8
Table 5 Satellite Internet Service Providers -----	13
Table 6 Fees for Satellite Internet Service Simunet – Tanzania -----	14
Table 7 Internet at Tumaini and Joensuu University -----	14
Table 8 ICT Distribution in Tanzania (Individual level)-----	25
Table 9 Basic Types of Telecom Services Providers in Tanzania-----	26
Table 10 Prices for Different ICTs Media and Tools-----	49
Table 11 Prices for Internet Connections in Tanzania -----	58
Table 12 PH Radio Connection Charges -----	59
Table 13 Elisa Internet Oy ISDN Internet Connection Prices-----	59
Table 14 Mobitel TZ Price List-----	60
Table 15 TTCL TZ Price List -----	60
Table 16 Computer Prices in Tanzania -----	61
Table 17 Computer Monitor Price List -----	61

Abbreviations

AISI	Africa's Information Society Initiative
B 2 B	Business Selling Goods or Services to other Business
B 2 C	Business Selling Goods or Services to Customers
CODE	Canadian Organization for Development through Education
DC	Developing Countries
DVB	Digital Video Broadcasting
GDP	Gross Domestic Product
EDI	Electronic Data Interchange
GNI	Gross National Income
GNP	Gross National Product
Kbps	Kilobyte per second
LAN	Local Area Network
LDC	Less Developed Countries
HIPC	Heavily Indebted Poor Countries
ICT	Information and Communication Technology
IMF	International Monetary Fund
ISP	Internet Service Provider
PDA	Personal Digital Assistance
POP	Point of Reference
SME	Small and Medium Size Enterprises
TCP	Transmission Control Protocol
TANESCO	Tanzania Electric Supply Company
TRA	Tanzania Revenue Authorities
Tsh.	Tanzanian Shillings (1 € = Tsh 976, 28 October, 2002)
TCC	Tanzania Communication Commission
TTCL	Tanzania Telecommunication Corporation Limited.
WAP	Wireless Application Protocol
WWW	World Wide Web
VTP	VLAN Trunk Protocol

The terms enterprise, firm, business and organization will be used interchangeably

Table of Contents

Abstract.....	II
Acknowledgement	III
List of Figures.....	IV
List of Tables	V
Abbreviations.....	VI
Table of Contents.....	VII
1.0 Introduction.....	1
1.1 Related Literature	2
1.2 Research Problems.....	3
1.3 Methods Used	4
1.4 Background.....	5
1.5 Definition and Explanation of Key Terms.....	6
2. 0 Enterprises, Information and Communication Technology in Tanzania.....	22
2.1 Small and Medium Size Enterprises for Country Development.....	22
2.2 Modern ICTs in Tanzania.....	23
2.3 Factors that Influence Modern ICTs in Tanzania	27
2.4 Improve Small and Medium Size Enterprises	28
2.5 Imaginary Enterprise.....	36
3.0 Information and Communication Technologies in Social Services.....	41
3.1 Governmental Uses.....	41
3.2 Information and Communication Technologies in Education.....	45
3.3. Information and Communication Technologies Promoting Even Development.....	50
3.4. Improving Health Service.....	51
4.0 Problems Facing SMEs and ICTs in Tanzania	54
4.1 Factors Hindering the Growth of SMEs in Tanzania	54
4.2 Factors Hindering Use of Modern ICTs in Tanzania.....	55
5.0 Recommendations.....	67
5.1 Establish Information Centers	67
5.2 Subsidize PH Radio E-mail Program for Rural Areas.....	70

VIII

5.3 Encourage ECommerce Enterprises in Rural Areas	70
5.4 Use the Existing Infrastructure to Expand the Internet Network.....	70
5.5 Establish Tanzania Universities Network (TUNET)	72
5.6 Collaboration between Schools and Small and Medium Size Enterprises	74
5.7 Advertisement of free Information and Communication Technology.....	75
6 Conclusion	76
Bibliography	78

1.0 Introduction

The thesis will discuss the opportunities that Information and Communication Technologies (ICT) offer small and medium size enterprises and regional development in Tanzania. We will discuss the available opportunities and threats facing modern ICTs in Tanzania. It is obvious that modern ICTs provide opportunities to improve the performance of the SMEs and to promote regional development. On the other hand people's willingness and commitment to learn are required. Why a computer kept playing screen saver while a secretary is busy with a typewriter? Why do personnel resist the introduction of new technology? Why do religious institutions and some individuals see the Internet as a new technique of the devil? Why do computers and other ICT based tools stay longer on shelves in shops than on users' desks? Why most of Tanzanian academic institutions are not connected to the Internet? These are not among the research questions, but their answers reflect factors that hinder development of new technologies in Tanzania and Africa as a whole. We will discuss how ICT programs minimize enterprises' operational costs. For example, how e-mail applications reduce telephone charges and WWW minimize advertising budgets? Instead of renting a big shop to display your products, a networked computer and WWW can be used. Delegates can participate in a meeting from their desktop computers; traveling expenses and time are saved. Through application of electronic communication within an enterprise's units and between enterprises, the number of secretaries and messengers employed for data processing can be reduced to work for other productive tasks. Some people argue that this will cause another problem of unemployment, but the work force that is reduced by modern ICTs can be assigned other production tasks. Modern ICTs provide educational and health opportunities to the marginalized groups like women and people in rural areas. The use of videoconferencing and a distance-learning system can increase the capacity and quality of education in the region. We recommend utilization of the existing infrastructure like TTCL telephone lines and railway cables to expand the Internet network and other ICTs in the region. We also recommend that the ICT free service and software should be promoted to the Tanzanian public.

Therefore, this Chapter 1 will furthermore outline the research problems that will be answered by this thesis. We will discuss background information that tells briefly about Tanzania's location and her economic situation.

In the same chapter, we will define key terms to give a broad understanding of the subsequent chapters. Chapter 2 will discuss the structure of modern ICTs in Tanzania and their role in improving the performance of small and medium size enterprises. Chapter 3 will discuss the role of ICTs in other development sectors like education and health. In Chapter 4 we will look at the factors that hinder the growth of ICTs in Tanzania. Chapter 5 will offer recommendations to the Tanzanian government, SMEs, ICT service providers and academic institutions.

1.1 Related Literature

Information was collected from different sources from various fields like information technology, communication technology, small and medium size enterprises and regional development. Both electronic literature from different web pages and hard copies from different libraries were used to support the concepts expressed in this thesis. In many areas of this analysis I have used my own experience from studying in Tanzanian academic institutions and working in Tanzanian enterprises. There are only a small number of literatures, few journals and articles about information and communication technology in Tanzania, which is caused by the fact that the subject is new to the region. However, I have used all available and possible means to reach different sources to collect information that have answered questions of this thesis. Secondary and primary data has been useful to support the hypotheses and conclusions that are made in this thesis. For example, ICT books like *Modern Database Management* by Jeffrey Hoffer et al (2002) as secondary sources, which provide the standard ways of how ICT should be implemented, while interviews and questionnaires as primary sources provide the reality on the ground. The difference between standards requirement and the actual situation shows that there exists a problem. It is through this comparison between the standard and actual situation we have been able to support and answer the questions of this thesis. Possible different solutions are derived from the analysis of collected data.

Discussion with different people who have experience about Tanzania development, knowledge on ICT and small and medium size enterprises has been another useful way of gathering information. For example, Juha Hakkarainen who is a technician at the University of Joensuu. I have discussed many technical concepts with him. Erkki Sutinen who is a professor at the University of Joensuu and has experience on ICTs and SME for regional development.

I have as well had discussion with Susanna Wolf from Center for Development Research in Bonn University Germany. She has written articles on ICT and SME in East Africa. Eberhard Blochure who is a director of East Africa home pages has shared with me his experience on ICT and Tanzanian SMEs.

1.2 Research Problems

Below are the questions that this thesis will answer:

1. What information and communication technologies are available in Tanzania?

Under this question we will discuss different ICT organizations that are operating in Tanzania. We will look at both quantity and quality. It is important to know what kind of ICTs we have and analyze their contribution to SMEs and the regional development. This question will be discussed in Chapter 2.

2. How can modern ICTs improve the performance of Tanzanian SMEs?

From question 1 above, we already know what ICTs are available, and then in this question we look at how Tanzanian small and medium size enterprises can use the available ICTs to improve their performance. For more clarification, an imaginary business enterprise is formulated whereby we will show how modern ICTs can reduce operational costs. We will compare the advantages that can be brought by modern ICTs over traditional way.

3. What is the role of ICTs in other development sectors?

ICTs are not only important in small and medium size enterprises; there are other organizations that require ICTs to improve their performance. In discussing this question we will focus on the application of ICTs in education, health and rural development in Tanzania. We will see how modern ICTs can be used to improve the quality and quantity of education and health services in the region. Other factors like how modern ICTs can be used in providing education and health service to the marginalized groups are also discussed.

4. What are the factors hindering ICT development in Tanzania?

ICTs can make a big contribution to improve the performance of small and medium size enterprises and regional development. There might have been more rapid economic and development if ICTs were highly developed and evenly distributed in the country. Unfortunately this is not the case.

We will discuss question 4 in Chapter 4. We will discuss different factors like the lack of ICT skills, low income, and high prices for ICT devices, we will also discuss about the digital divide and cultural differences.

5. What is the relationship between modern ICTs, SMEs and regional development?

There is exists a relationship between information and communication technology, small and medium size enterprises and regional development. If there is high-developed information and communication technology in the region, investors will be motivated. The analysis has shown that the presence of ICTs in the region leads to the expansion of small and medium size enterprises which all-together result to regional development. This question is discussed in chapter two.

1.3 Methods Used

As mentioned above, my own experience from studying in Tanzanian schools and working in small size enterprise has been a foundation in this study. I have used different sources and methods to collect data like online articles and journals, books from different libraries, online and telephone interviews and e-mail questionnaires. For example, I have been in contact with Tanzania Communication Commission, which is responsible for registering enterprises (ICTs included) in the country. I have sent questionnaires, made telephone and online interviews with different enterprises and individuals. For examples, I have conducted interviews with Juha Hakkarainen (Computer Technician at the University of Joensuu) about different possible approaches for Internet expansion in Tanzania. I have retrieved information from web pages of different organizations dealing with information and communication technologies, small and medium enterprises and regional development. I have attached some questionnaires in the appendix page for reference and rested remained in my archive.

In the data analysis I have used different visualization tools like tables, graphs, charts and figures to show different levels of ICTs in Tanzania. I have used other figures like maps and relationship diagrams to explain the relationship that exists between different entities like ICTs, SMEs and regional development.

1.4 Background

Tanzania is a developing country and a member of the Heavily Indebted Poor Countries (HIPC) located in East Africa (International Monetary Fund, August 2002). Tanzania gained her independence on December 9, 1961.

Since then it was under socialism until the 1980s when private sectors were allowed in the country. Before that there was “Serikali kushika hatamu” which means that all sectors of the economy were under the government’s control. In other words, no private sectors were allowed to run enterprises. The World Economy Factbook (1996/97) reported, “*Tanzanian economy was for centuries based on agriculture. Today the economy is structurally different from the economy at independence, which bore the imprint of the colonial rule.*” How this has affected the country’s economy is outside the scope of this paper. Today the government is selling most government owned enterprises to private sectors (Privatization) (Jean M. Due et al. 1999). The main subject of this thesis is to discuss the opportunities ICTs can bring to SMEs and finally to regional development. Table 1 will show facts about Tanzania.

Table 1 Fact about Tanzania (Adopted from Susanna Wolf 2001 and World Fact Book 2002)

Indicator	Size
Population (Million)	32.9
Area (Square km)	945,000
Annual Population Growth	2.6% (2002 est.)
GDP Per Capita (US\$)	\$610 (2001 est.)
Population below poverty line	51.1% (1991 est.)
Budget (US\$) 2001 estimates	Revenues 1.01 billion Expenditure 1.38 billion
Exports	\$827 million (2001 est.)
Imports of goods and services	\$1.55 billion (2001 est.)
Industrial growth rate	8.4% (1999 est.)
Debts external	\$6.8 billion (2000 est.)
Primary school enrolment (% net, 1997)	48.4
Secondary school enrolment (% net, 1997)	5
Tertiary school enrolment (% net, 1995)	1

Comparing the economy indicators from tables 1 and 2, the difference reflects how the economy of developing countries like Tanzania is low. Table 2 shows economy facts about Finland, which is one of the developed countries.

Table 2 Economy facts about Finland (World Fact Book 2002)

Indicator	Size
Population	5,183,545 (July 2002 est.)
Population growth	0.14% (2002 est.)
GDP Per Capital (US\$)	25,800 (2001 est.)
Export of Goods and Services	\$40.1 billion (f.o.b., 2001)
Debts external	\$30 billion (December 1993)
Industrial Growth	5.1% (2001)
Unemployment	9.4% (2001 est.)
Inflation Rate	2.6% (2001 est.)
Population below poverty line	NA %
Budget (2000 estimates)	Revenues 36.1 billion Expenditure 31 billion
Imports	31.2 billion (2000 est.)

1.5 Definition and Explanation of Key Terms

This section defines key terms from an ICT and business context. Some terms will be defined based on the Tanzanian context, which is our case study. The explanation given about these terms will give a broad understanding to readers not proficient in computer and business terminology. The definition of terms will be in categories of development and investment, small and medium size enterprises, and information and communication technology.

1.5.1 Development and Investment

For the purpose of this paper we will discuss development based on technology and the economy. TDM Online Encyclopedia Britannica (September, 2002) provided the definition that suits our meaning. “*Development* as a progress toward a community’s economic goals, including increases in economic productivity, employment, business activity and investment.

Economic development reflects qualitative factors such as human health, environmental quality and equity, and so can differ from economic growth, which reflects only the quantity of material wealth (Sustainability)” The Online Dictionary defined development as the determination of the best techniques for applying a new device or process to the production of goods and/or services. ICT infrastructures and skills are among the devices and techniques required for development.

Investment is defined as the creation or acquisition of new business assets and includes the expansion, restructuring or rehabilitation of an existing business enterprise, ‘local investor’ means a natural person who is a citizen of Tanzania; a Company incorporates under the laws of Tanzania in which the majority of the shares are held by a person who is a citizen of Tanzania; or a partnership in which the partnership controlling interest is owned by a person who is a citizen of Tanzania (Tanzania Investment Act, Act No.33 of 1973. 12 of 1996 and 13 of 1976). In other words, if foreign investors would like to invest in the country they need to find local investors who will be operating with them and who will hold more shares. Foreign investors who want to run an enterprise in Tanzania need to find a Tanzanian who is able to be among the shareholders. I have tried to search for the new investment Act, but none is found. It is possible that there are changes for these old policies that have not yet been published. I have retrieved the above information from Tanzanian government web page in September 2002.

1.5.2 Small and Medium Size Enterprise

The word SMEs stand for small and medium size enterprises. The following table describes the characteristics of different classes of enterprises.

Table 3 Enterprises Classification (Business Statistic Organization 2002)

Enterprise/Specification	Small Enterprise	Medium Enterprise	Large Enterprise
Number of Employees	50 or less	250 or less	More than 250
Annual Turnover (\$ Million)	4.50 or less	17.90 or less	More than 11.2
Balance Sheet Asset (\$million)	2.20 or less	8.95 or less	More than 5.6

1.5.3 Information and Communication Technologies

Information and communication technology (ICT) can be defined as electronic means of capturing, processing, storing, and communicating and disseminating information.

Elsag (2002) defined Information and Communication Technology (ICT) as an integrated set of information and communication technologies used not only to code and process data, but also to manage information and processes to achieve more efficient and effective results by optimizing the management of resources and the flow of information and know-how. There are two terms involved in the word ICT; namely Information Technology (IT) and Communication Technology (CT). Information Technology deals with how to gather, process, and store information; computers and different software are involved in this area.

The other term is Communication Technology, which is about the means of sending and receiving messages. In other words, Communication Technology is more about Information dissemination. Telephones (both landline and mobile), Internet (e-mails), television and radio broadcasting, newspapers, magazines, chatting and NetMeeting, and videoconferencing are involved. In communication there are a lot of techniques, protocols, methods and applications that are involved; our aim is not to explore technical concepts of communication but their application in improving small and medium enterprises performance and regional development. The construction of communication networks; information coding, and transmission of data through different network media are out of scope of this thesis. However we will discuss their importance to improve small and medium enterprises performance and regional development.

1.5.4 Technologies for Information and Communication

Table 4 shows different communication networks technologies and applications that are discussed in this section.

Table 4 Communication Networks Technologies and Applications (Sutinen 2002)

Technology Application	Dialup	ISDN	Satellite	Cable	DVB	VSAT
LAN				X		
MAN				X		
WAN				X		
Internet	X	X	X	X	X	X
Intranet				X		
Extranet				X		

Saleem Bhatti (1995) has classified the communication networks into the following categories, which will be described in relation to improvement of small and medium size enterprises and regional development:-

- Small. These networks are for the connection of computer subassemblies. They are usually contained within a single piece of equipment.
- **Local area networks (LAN).** These networks connect computer equipment and other terminals distributed in a localized area, e.g. a university campus, factory, office. The connection is usually a cable or fiber, and the extent of the cable defines the LAN. The bigger the bandwidth of the cable the higher the data can be transmitted. The LAN connects workstations, personal computers, printers, servers, and other devices. Through this technology an enterprise can connect its computers from different departments in the same building or different buildings where information can be shared easily and fast. This can be done even if the enterprise is not connected to the Internet. In other words, those Tanzanian enterprises that are not connected to the Internet can still use this technology to improve their information processing and communication within the organization. There is maximum utilization of facilities through LAN connection; for example multiple users from different departments can use a single printer. Large software and databases like warehouse can be installed in one big computer (Server) from which others can access through LAN.
- **Metropolitan area networks (MAN).** These networks are used to interconnect LANs that are spread around, say, a town or city. This kind of network is a high-speed network using optical fiber connections. In other words, when we connect different enterprises in the metropolitan area we construct a MAN. In Tanzania context we can have MAN for different cities like Dar es Salaam MAN, Arusha, Mbeya, Mwanza, Zanzibar etc.
- **Wide area networks (WAN).** These networks connect computers and other terminals over large distances. They often require multiple communication connections, including microwave radio links and satellite. Thus, when the MAN are connected together they form WAN, which are connected together to form Internet 1.

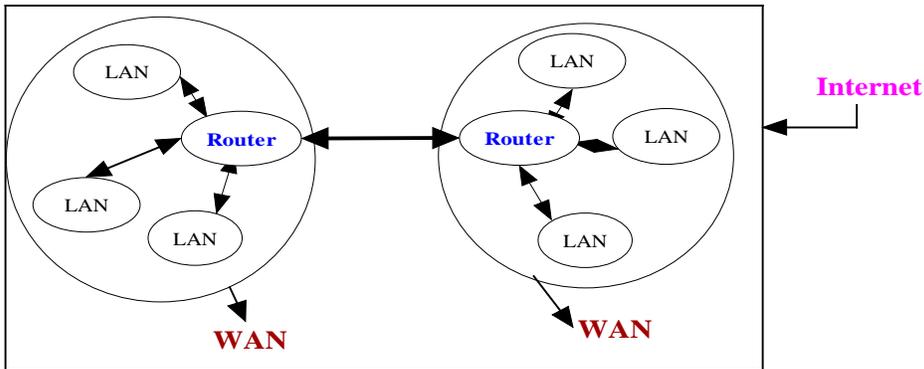


Figure 1 LAN, WAN, and Internet

Information Technology and Communication Technology are used together to increase the efficiency and quality of information within and between the enterprises.

Internet is the worldwide network of computers; networks that use the TCP/IP network protocols to facilitate information transmission and exchange. TCP stands for transmission control protocol that is responsible for transferring message packets from client to server (from sender to receiver). IP stands for Internet protocol, which is responsible for moving messages from nodes to nodes. IP is the protocol that holds the original and destination addresses of the messages sent through Internet networks. Sometimes the Internet is called the network of networks that are:

- Physically connected. This means that there should be a physical link between networked devices such as computers. Some connections are cables based and other are wireless.
- Capable of sending and receiving data to and from each other. Based on the connection, one device in the network should be able to send and or receiver a message from another device from the network.

Network tools on one network can communicate with tools on other networks, and send data, files, and other information back and forth. The Internet connection can be built through the following technologies:

ISDN Connection

ISDN stands for Integrated Service Digital Network. The connection offers 64kbps download and upload rates faster than the dialup connection. The other advantage of this connection is that you can use Internet and telephone services simultaneously. This is because there are two lines; if both lines are used for Internet service, the download rate can be as good as 128kbps. The Tanzanian telephone network is reported to have capacity of 140Kbps, which shows that this technology can be built from the existing infrastructure. Tanzania has planned to build an ISDN communication system and other modern ICT systems (TCC 2001). Tanzanian schools can use this technology to build a network that connects them, and the videoconference can be used as one way to overcome the teachers' shortage problem. Juha Hakkarainen (2002) reported, "Videoconference requires a minimum of 128Kbps to be able to operate". This means that the TTCL network can be used to build ISDN Internet network, which will be used by Tanzanian schools and enterprises. On the other hand, the Central Railway and TAZARA cables used for railway communications are now used for Internet connection between Dar es Salaam, Morogoro and Dodoma.

The cables can transmit up to 156Kbps, which is good enough to support ISDN connection; (Z. Yonah, 19 September, 2002). Protocal.com (2002) reported that public telephone network is not the sole media for ISDN connection, other networks like packet switched networks, Teleprinter exchange service (telex), and Cable Television (CATV) networks can be used.

Satellite

This is a specialized wireless receiver/transmitter that is launched by a rocket and placed in orbit around the earth. There are hundreds of satellites currently in operation. They are used for such diverse purposes as weather forecasting, television broadcasting, amateur radio communications, Internet communications, and the Global Positioning System, (GPS) (Encyclopedia Britannica 2002) This kind of connection is divided into two forms; namely, one-way high speed and two way high speed connection. The one-way high speed has high speed to download data (400kbps) and the upload speed is as low as modem speed (56kbps). On the other hand, two-way high-speed connection has high speed to download data (400kbps) and high speed to upload data (128kbps). Most African countries Tanzania included are connected to the Internet through satellite (Figures 19 and 20).

Howstuffworks (October, 2002) reported that satellite Internet connection is the ideal solution for people who live or work in rural areas and need broadband Internet connection (high speed connection).

Cable and DSL (digital subscriber line) have higher download speeds, but satellite systems are about 10 times faster than a normal modem. DSL technology uses a modem that downloads 512Kbps. Figure 20 shows the Internet connection by two ways high speed. The arrows that facing upward are for upload and the arrows that are facing downward are for download. This system works through Internet protocol multicasting technology whereby 50,000 users can be served. Multicasting technology is the technology where by data can be sent from one source to many recipients. This study is not about set of satellite in practice, but here under there are two figures to show how one-way Internet satellite connection differs from two-way connection.

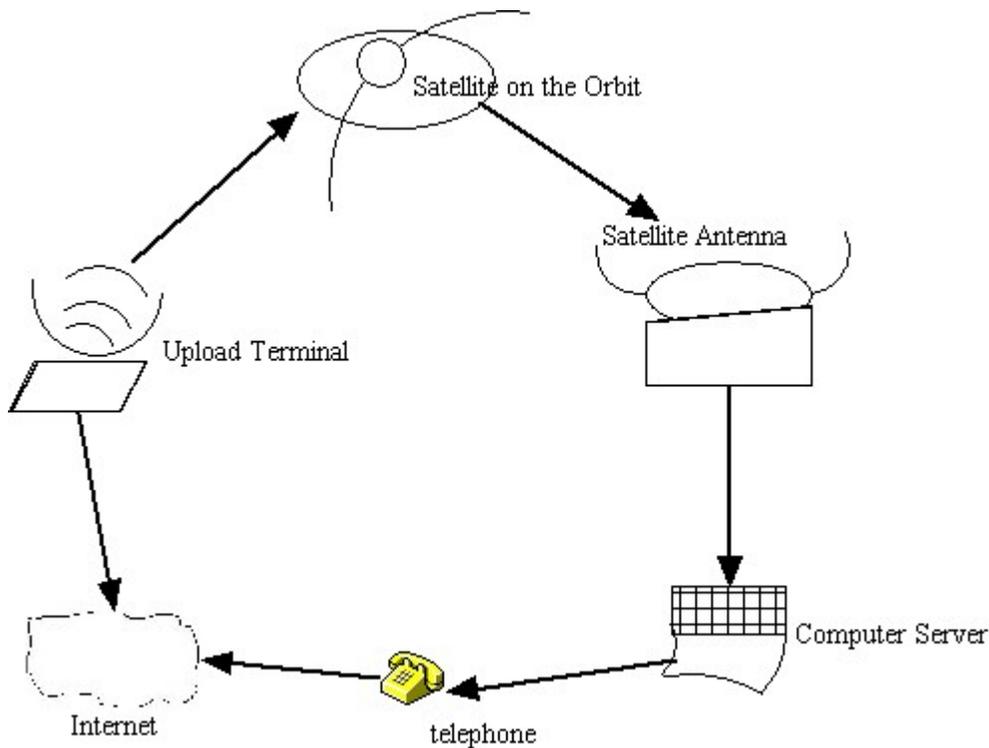


Figure 2 One-way Satellite Internet Connection (adopted Christopher D. Gaydos 2002)

Figure 2 shows two ways satellite Internet connection. As we can see from the figures, the download and upload are done differently in two and one way connections. In one-way, upload is done through a different channel from download while in the two-ways system it is done on the same channel.

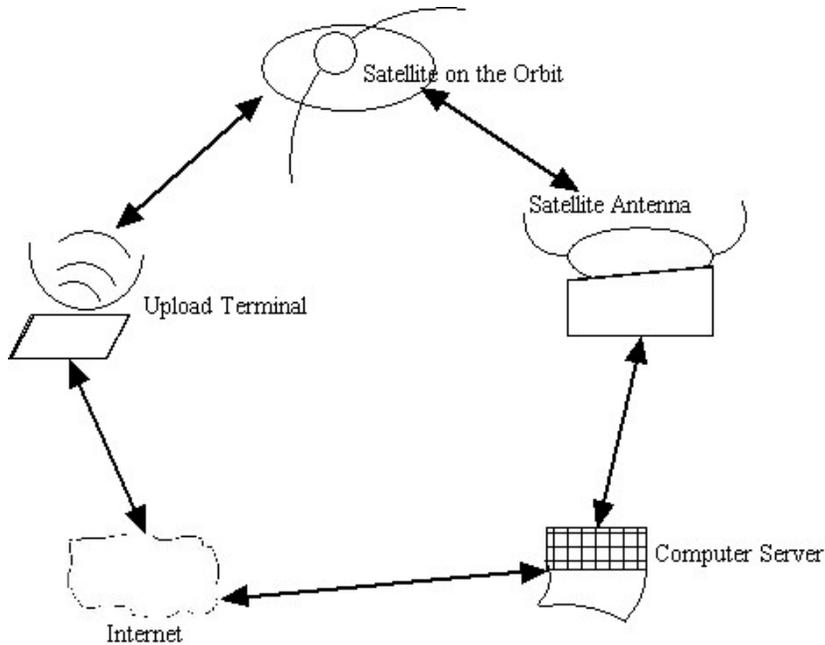


Figure 3 Two-Way Satellite Internet Connection (adopted from Christopher D. Gaydos 2002)

Tanzania Communication Commission (2002) reported that Tanzania is currently having satellite Internet providers of up to 8Mbps downstream and upstream. This is good news for Tanzanian business enterprises and educational institutions. From a technical point of view, schools can solve teachers' shortage and book problems through the satellite Internet connection. The major problem with this service in Tanzania is the cost associated with it. For example, Table 5 shows costs associated with satellite Internet connection in Europe and America, and in table 6 there are costs associated with connecting Tumaini University in Tanzania to Internet through satellite. Tumaini University is one of the Tanzanian universities owned by the Lutheran church, which is located on the Southern Highlands 600km from Dar es Salaam.

Table 5 Satellite Internet Service providers (www.grantszone.co.uk/netconnect/satellite.html)

Provider	Monthly Cost (US\$)	DownStream	UpStream
Aramiska	153	256Kbps	64Kbps
Bridge Broadband	246	512Kbps	128Kbps
BTOOpenWorld	Varies	500Kbps	150Kbps
DirecPC	N/A	Up to 400Kbps	Up to 400Kbps
Isonetric (Satellite –ADSL)	246	64 to 512 Kbps	128Kbps
Realtouch	542	2Mbps	256Kbps
SkyDSL	14	Varies	Varies
StreamBeam (Cedar)	186	512Kbps	256Kbps
TISCALISAT	93	150 to 400Kbps	150 to 400 Kbps
Xantic Broadband	40	128Kbps	128Kbps

Table 6 Fees for Satellite Internet Service in Tanzania (Yonah 2002)

Size	Monthly Price (US\$)
64Kbps	4700
128Kbps	6000
256Kbps	7800

Simunet offers learning institutions a fifty percent discount allowed for Internet service (Yonah 2002). In other words, the above-mentioned prices will be reduced to half price, but they still remain very high for academic institutions in developing countries to afford.

As we will see in Chapter 4, high prices are one of the major factors that hinder expansion of modern ICTs in the region. The high cost of Internet in the region is a major factor that makes it difficult for Tumaini University and other academic institutions to have Internet connections.

Internet costs Comparison between Tumaini University and Joensuu University

Table 7 Internet at University of Joensuu and Tumaini (Erkki Vänskä and Tumaini web page)

Name/Indicator	University of Joensuu	Tumaini University
Type of Connection	Cable	Satellite
Annual cost (US\$)	33,087:71	93,600:00 (See table 6)
Size	Up to 2.5 Gbps	256Kbps
Number of Students	6900	500
Staff members	1200	52
Number of Computers Connected	Workstation 2800 Servers 100 Network printers 200	Workstations 170 Servers NA Networked Printers NA

University of Joensuu in Finland that has more faculties, more computers, more students and faster Internet connection than Tumaini University pays less Internet costs. Erkki Vänskä (2002) reported, “The costs depend on traffic. The basic cost for whole University was last year 162,000 FM (this cover also all traffic inside Finland). The cost for traffic (outside of Finland) was about 194,851FM, all together make a total of 356,851FM” 1FM = US\$ 0.169810 (November 12, 2002). He reported further that the university has 2800 workstations, 100 servers and 200-networked computers. 1200 people are working and 6900 students are registered at University of Joensuu.

Jyri Kempainen (2002) reported that Tumaini University is now connected to Internet through TTCL telephone line (Figure 21) with downstream of 128Kbps and upstream of 64Kbps and cost US\$ 720 per month. “We have five Internet cafes in town now and I am afraid that they are too many. I think there are enough customers only for three ones. They all are using TTCL’s shared line 128/64Kbps and it costs US\$ 720 per month for them. The surfing cost for customers used to be Tsh. 1000 (US\$ 1) per hour.” Small market problem (few customers) will be discussed in Chapter 4, but the main causes for this problem are low income and lack of computer skills among the Tanzanian society. This type of connection is limited to only one computer so that it can work efficiently. For example, if the line (128Kbps) used by Tumaini University is linked to ten computers, each computer will receive 12.8Kbps. In other words, if they want to use videoconferencing, other computers have to be disconnected from the Internet.

Cable Connection

In this kind of connection, coaxial or twisted pair cables and a network card connect the computers and other network devices. This kind of connection offers higher download and upload high speed than others. For example FUNET network of Finnish universities provides up to 2.5Gbps Figure 26. Cable connection can also be used in building a LAN system, Intranet and Extranet so that information can be shared within an enterprise and between enterprises. Intranet is a technology used by enterprises to share information with their employees; computers from different departments of one organization are connected together to enable information sharing. Extranet is a technology used to share information between enterprises; computers from different organizations are connected to enable information sharing between those organizations. Sharing data within and between enterprises through connected computers is known as electronic data interchange. (EDI) is reported to be growing fast as a business competition tool. (Jeffrey A. Hoffer, et al 2002).

The digital divide affects most African countries; they are connected to the rest of the world through the satellite system, which is not as strong and reliable as a cable connection. Heavy rains that fall in many parts of Africa are one bottleneck of satellite Internet connection as transmission of data can be damaged by rain.

Generally speaking, the weak connection in Tanzania is one of the factors that hinder the employment of modern ICTs and the growth of SMEs. Zaipuna (2002) reported that Tanzania is not yet connected to the Internet by submarine (under-ocean) cables; however, a project called AfricaOne, works on connecting the continent by submarine cables.

DVB Technology

The abbreviation DVB stands for Digital Video Broadcasting. This is the technology, which uses the existing video broadcasting infrastructure for Internet transmission. This means Internet transmission and video use infrastructure in parallel. Gilat Europe Ltd (2002) reported that the distributed data via DVB might represent sound and video signals, data files, or other basic information structures.

VSAT Technology

VSAT is the abbreviation for Very Small Aperture Terminal. VSAT integrates the satellite, telecom, and computer and Internet technologies to transmit data from a central hub via antenna to several dispersed clients. Gilat Europe Ltd (2002) reported that VSAT is typically a point-to-multipoint data network that uses a small antenna of usually 0.9-1.8 meter (3-6 feet) diameter.

Dialup connection

A telephone line is used to transfer information to and from the Internet. Downloads and uploads work at more or less the same speed: up to 56Kbps (kilobits per second) downstream and about 28Kbps upstream, much depend on the telephone line if is good enough, the mentioned download and upload can be achieved and otherwise will result to less than that. The telephone line is connected to an internal or external modem that is attached to the computer. In this system it is not possible to use the telephone and Internet simultaneously. Users need to pay fees for the Internet connection and telephone services. The main requirements for the dialup Internet connection are: computer with modem, telephone line and Internet provider. Since TTCL has already distributed telephone lines to almost all towns in the country, many Tanzania towns can be connected to the Internet through the dialup connection. TTCL was a government owned Telephone Company, which is now undergoing privatization. Business enterprises, government and nongovernmental organizations can take advantage of the existing telephone network.

Mobile phones can also be used through an infrared connection or a data cable connection. In connection through infrared, the mobile phone is brought near to the computer and connection is made through infrared waves. Or a data can be used to connect a computer and mobile phone to access the Internet. These features are not available in some mobile phones (Figure 4).

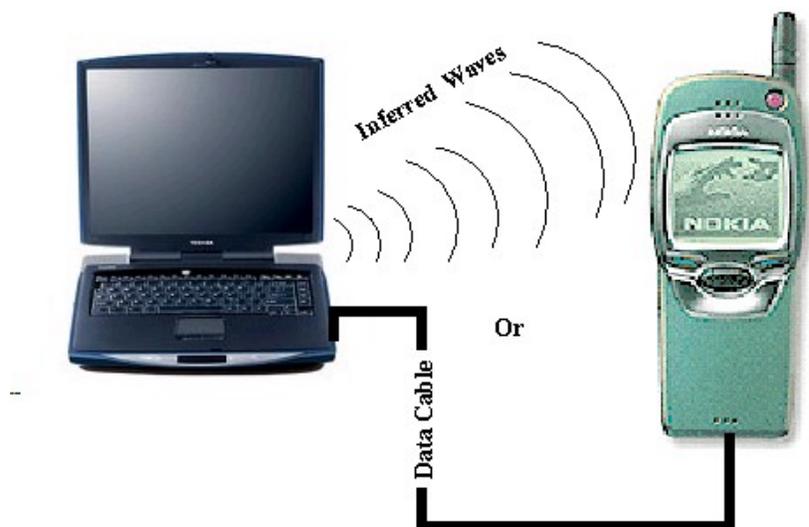


Figure 4 Internet Connection through Mobile Phone Source (Juha Hakkarainen 2002)

1.5.5 Application for Information and Communication Technologies

The mobility of cellular phones and the portability of laptop computers make ecommerce mobile. People with mobile phones and laptop computers can place orders or sell their products even when they are out of their offices. The personal digital assistant (PDA) works the same way. The PDA is hand held computers that are more portable and mobile and can be connected to Internet like the laptop above; some of them have a built in cellular phone. Mobile phones with WAP service can be used to access e-mails and browse Internet. Modern ICTs make business communication and others more mobile and portable than before. (howstuffworks, 2002). GPRS (General Packet Radio Service) is the technology used to update cellular phones from just talking devices to semi-computer. Rad Com (2002) reported that GPRS is used as a data service upgrade to any GSM network, which is a global system for mobile communication. In other words, GPRS is the technology whereby the mobile network is integrated with the Internet network so that a user can send information from a mobile phone to a computer and the vice versa is true. Rad COM reported further that this inter-network allows transmission bit rates from 9.6 Kbps to more than 150 Kbps per user.

Simputer will be another kind of cheap hand computer that will benefit people from the Third World who cannot buy the expensive PDA, Laptop and Desktop Computers. Wired News (Wednesday September 18, 2002) reported, "A Bangalore-based group of seven professors and engineers have developed what they call a 'Simputer' -- short for "simple inexpensive mobile computer. And it will cost only \$200." The Simputer operates with a source power of three AAA batteries and has 32MB of RAM and 16MB of flash memory and runs on the free Linux operating system. The hand computer can be connected to a telephone line or mobile phone to allow the user to access Internet. This device can improve business communication, health service and education. For example, a businessperson who owns a simputer and mobile phone or landline phone can make orders and even communicate with customers from different locations. Doctors or hospitals can provide counseling to the patients who own simputer. A University can send messages to students who own a simputer. Hentie Wilson (September 2002) reported "South Africa University communicate with students through text messages sent from computer to their mobile phones." She remarked further that this is a fast and reliable way of communication between university and students.

PH Radio E-mail system

PH Radio is an e-mail system that operates using radio waves as a transmitter from the local computers to the satellite. The system can operate hundreds of miles away from the satellite station. The requirements of this system are: PH radio, computer, special modem known as SCS PTC II, and Internet service provider (ISP). Providers of this service have given themselves names like BUSHMAIL, SAILMAIL, and SEAMAIL, which express the targeted groups. This system is suitable for many areas in Tanzania where people do not have satellite systems nearby; for example, Mtwara and Lindi (Southern Tanzania), Singida and Rukwa and other rural areas. These regions are not likely to get satellite systems in the near future because of their location and the lack of economic activities. PH Radio system is limited to e-mail service only. Its high installation costs will hinder most people from accessing it. (<http://www.bushmail.co.za/>)

ECommerce

The term ecommerce can be defined as online trade, including marketing as well as selling products or services over the Internet. These transactions can be either between businesses (B2B) or between a business and its customers (B2C) (Wolfgang Greller, et al, October 2001, p. 2).

The big advantage of this business is that it can operate from remote areas; communication is done through electronic mail, telephones and WWW. For example, when I buy books from Amazon bookshop located in the UK, I do not know the specific location of this shop, but I use online forms to place orders, pay electronically and receive books within four days. Ecommerce is one way of bringing development to the rural areas as people in those areas will be employed, social services like roads; telephone, power supply, water supply will be near to the people living there. The company will need these infrastructures in the daily operation. There are few ecommerce enterprises in Tanzania because of the lack of knowledge and the confidence of businesspeople in the region, which might have been caused by lack of skills. The government and Internet providers need to encourage businesspeople to start ecommerce in the region.

Telemedicine

Susan Zollo (1999) defined Telemedicine as “the use of electronic information and communications technologies to provide and support health care when distance separates the participants from doctors and/or nurses.” This is another approach to solve the problem of doctor and nurse shortage in the country. The information centers, which are recommended in chapter 5, can provide health information to the neighborhood. The information can be downloaded from the Internet, CDs, videocassettes, diskettes, DVD, projector films and any other means that the majority can access. For example, distribution of prevention information to the society is so far the most common way to control HIV AIDS. The disease is reported to have claimed more lives than any other disaster happened in the world. Malaria is another disease that can be controlled by good environment management. S. Baghri and R.A Reed (1998) reported, “We can control the environment in which many diseases thrive and minimize the opportunities for infection. The most common diseases controlled by these measures are those related to excreta and insects.”

To summarize this chapter we will use figures 5 and 6 to show information cycle and the structure of information and communication technology respectively. One user searches information that is stored by another user, processes and stores it where it becomes another source of information. For example, we search information from the Internet that is processed and stored by other users, we process the information to fit our needs and then store it, and we can also allow other users to access our information.

For information to be of high quality, modern ICTs are needed in all stages like searching, processing, storing and dissemination. Lack of modern ICTs in one stage can cause the whole system to be less effective as if there were no ICTs at all. For example, if an enterprise possess good tools information processing like computers but do not have good communication network to share the information with customers, suppliers and sub units, the change will be less visible. Figure 5 show how different units of the same enterprise can share information through database where all departments upload and download information.

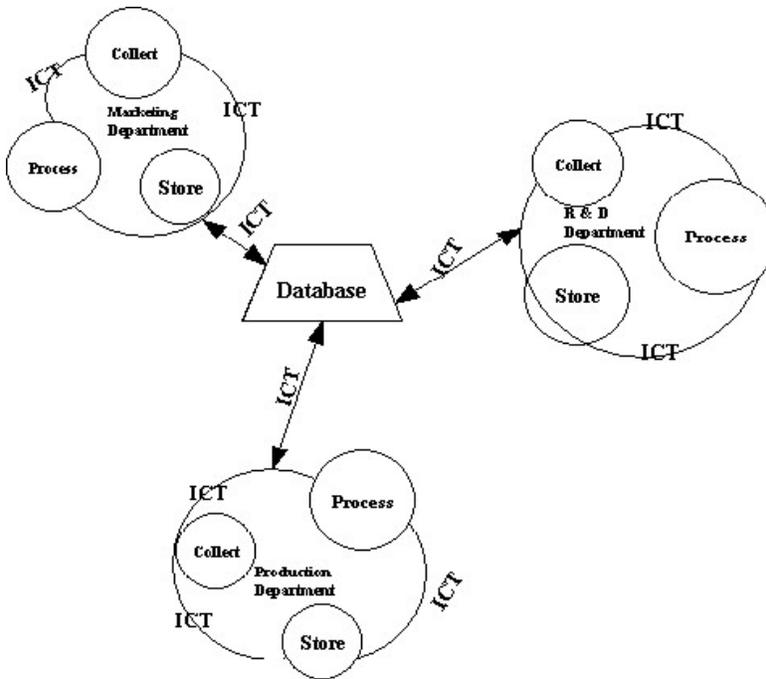


Figure 5 Information Cycle

In order to be able to search and disseminate information efficiently we need to have modern communication network like Internet and telephone communication. In processing of processing and storing information we need to have computers and different software. The devices like Simputer facilitate information mobility and its price makes it usable in developing countries.

Figure 6 shows the structure of ICT where we show what elements are on the side of information technology and what are in communication technology.

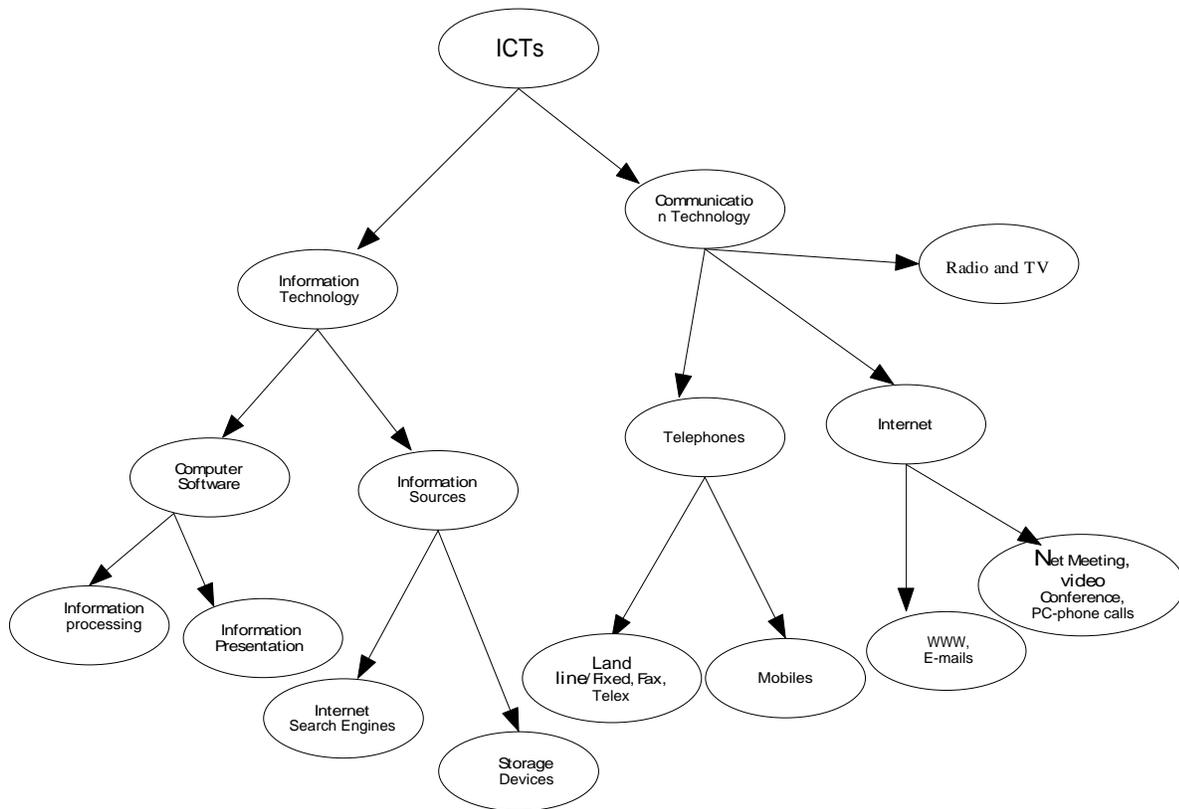


Figure 6 ICT Structure.

2.0 Enterprises, Information and Communication Technology in Tanzania

This chapter will discuss the introduction of modern ICTs in Tanzania. We will see what types of ICTs are available in the region and why Tanzania has to adopt modern ICTs. The chapter will also discuss the general roles of ICTs in improving the performance of SMEs. In other words, the chapter will answer the questions one and two from our research questions list, (i.e., what ICTs are available in Tanzania, and how modern ICTs can improve the performance of Tanzanian SMEs?) At the end of this chapter we will show one figure that expresses the relationship between modern ICTs, SMEs and regional development to answer our fifth question.

2.1 Small and Medium Size Enterprises for Country Development

Countries need enterprises for their development. SMEs provide employment to citizens of that particular country, which leads to an increase in GDP and the government income. Enterprises play a key role in employing the human, natural and the man made resources of the country. Tanzania Chamber of Mines (2002) reported that since 1992, the Tanzanian government has actively sought to promote the mining industry and as a result a number of international companies have already invested in gold mining and others. Ahmed Zakaria (2002) from tourism industry reported "... Tanzania is gifted with abundance of wildlife and many other tourist attractions including Mount Kilimanjaro, the endless Serengeti wildlife park, the Ngorongoro Crater." He argued further that "Tanzania is having a diversified culture and it is the home of warrior Maasai tribe (the lion's nightmare). It is a peaceful country with a fast growing economy". This shows that Tanzania has many natural resources to support tourism enterprises and ICTs can be used to advertise them. The main idea is that small and medium size enterprises play a key role in the economy growth of Tanzania. The development of developed countries cannot be spoken without mentioning the remarkable contribution of SMEs. The development of the developing countries is expected to follow the same approach.

After the introduction of privatization policy in Tanzania, the employment of both human resources and natural resources has increased. This is due to the fact that the government is no longer the major employer, the policies allow domestic and foreign individuals and organizations to start and run small and medium size enterprises in the country.

Business Times (2002) reported, “Local investors are now turning out in big numbers at the Dar es Salaam Stock Exchange (DSE) for buying shares in listed companies”.

The main objective of this thesis is to analyze how modern information and communication technologies (ICTs) can be used to attract both domestic and foreign investors to open and run small and medium size enterprises in Tanzania. The thesis also analyzes the opportunities ICTs offer to these enterprises. Furthermore, we look at the role modern ICTs for regional development. The definition of development in Chapter 1 shows that ICTs are among the important tools in the development process. For example, the use of computers to produce data of high quality and quantity, e-mails and Internet to disseminate information and robotics for bulk production are all modern techniques and skills. Developing countries like Tanzania need these modern ICTs to improve the performance for their enterprises and facilitate the regional development. Karima Bounemra Ben Soltane (2001), reported, “It has now become clear that African countries cannot simply afford to ignore the opportunities provided by the new Information and Communication Technologies (ICTs) to harness their development.”

2.2 Modern ICTs in Tanzania

This section will describe communication technology and information technology infrastructures that are available in Tanzania.

2.2.1 Information Technology in Tanzania

Tanzanian enterprises use computers to process information; however, some still use old devices like typewriters that are not efficient enough to meet the challenges of modern business like data processing and storing. The lack of computers is among the factors that hinder many Tanzanian enterprises from adopting modern information technologies. The lack of skilled people is the other factor, as SMEs might have modern infrastructures but none of their personnel can use them. These two factors make Tanzanian SMEs less competitive, as information technology has become one of the competitive tools in business. There are computers kept in storage by management because they do not have personnel who can use them. Other officials use computers as office decoration by which they set screen saver to play throughout working hours.

Some SMEs have both computers and typewriters, but typewriters are more used because people are well trained to use them. The computers have mostly come from donors who thought that computers could solve the IT problem in the region, but that is not the case. Sutinen et al (2002) reported, “Knowledge and skills are prerequisites for mastering information and communication technology.” **Infrastructure** should go together with **training**; one without the other will not solve the problem. For example, when I was working at a computer-training center in Dar es Salaam – Tanzania, many employees from different organization came to study computer application at their own costs. Susan Baker quoted by Howard Shilla (1994) reported that donors funded more than 37% of computers imported to Tanzania by June 1993. Magreth G. Laizer (2001) reported the computer which she currently using has been in the Iringa Regional office for years, but since nobody in that office had skills to use it, it has been kept in the storeroom until when she started using in 2001, her predecessor had been using a typewriter while a computer was lying down in the basement. This reflects the fact that skills and tools are all needed for information technology changes to be viable in Tanzania. A lot of formal and informal teachings for basic computer skills are available in Tanzania, but the problem is that the majority cannot afford to pay for this education.

On the other hand, the high price of computers, software and other information technology tools limit small enterprises to use modern IT in the region. Despite the fact that the Tanzanian government has exempted computers and computer accessories from tax, the computer prices in the region are still higher than in Europe and United States. Among the reasons that cause high prices for computers and software is the distance from production centers. Businesspeople buy computers (hardware and software) from overseas which adds transportation costs to the price. Many individuals and small enterprises cannot afford to buy computers in Tanzania. High prices and the inability of Tanzanian to purchase up to date computers is the reason for the high flow of old computers to Tanzania and Africa as a whole. A BBC reporter from Uganda (2002) has informed that old computers originally destined for the rubbish bin are to be given a new lease of life in Africa (Alfred Hermida 2002). So, we are suggesting that, those organizations, which are helping Tanzanian enterprises to acquire computers, should prioritize training as well. Table 8 shows the distribution of ICTs in Tanzania.

From the table we can learn that only few people in the society have access to modern ICTs that caused by financial inability to buy and lack of skills to use them. We will compare the figures with one European country (Finland).

Table 8 ICTs Distribution in Tanzania (Adopted from Wolf et al 2001)

Indictors	Figures
Landline Telephone in use	127,000 (1998 estimates)
Mobile phones in use	30,000 (1999 estimates)
Fax machines (per 1000 people) '97	0.1
Personal computers (per 1000 people) '99	2.4
Television broadcast stations	3 (1999)
Internet users	25,000 (2000 estimates)
Radios	8.8 million (1997 estimates)
TV Sets	103,000 (1997 estimates)
Radio broadcast stations	3 (1999)
Satellites	2 (1999)

We will use these statistics in Chapter 4 to show that the low level of modern ICTs is among the major factors that hinder investors to start and run small and medium enterprises in the country. For example, Table 8 shows that only 30,000 (0.1%) out of 33.3million people of Tanzanian population own mobile phones where as in developed countries like Finland there is less population but the market of ICTs is bigger than in Tanzania. 4.7m (85%) of 5.5 Finnish population own mobile phones (Statistics Finland 2000). From this analysis, investors who use mobile communication as a decision criterion will invest in Finland rather than in Tanzanian. The same applies to the Internet users; in the year 2000 there were 25,000 users in Tanzania while during the same year 2000 more than 80% of Finnish population use computers and Internet.

2.2.2 Communication

Tanzania has taken steps towards modern communication technology as one of her development strategies. Balancing Act News (June 23, 2002) quoted Yonah, "As of 14th September, 2001: 2Mbps Points of Presence (POPs) are now available at the following regional nodes:

Dar, Morogoro, Dodoma, Iringa, Mbeya, Arusha, Moshi, Tanga, Mwanza and Musoma. Next Kibaha, Tabora, Singida, and Shinyanga.” Simunet, which is among the Internet service providers in Tanzania reported its aim to wire all of Tanzania. However, starting and finishing time for this project was not mentioned. These plans aim to improve communication in the region. Yona (2002) reported that there are several isolated initiatives managed individually by ISPs and data operators and even closed user groups in Tanzania. He argued further that the collective Internet in Tanzania has a downstream over 50Mbps by which some are delivered via DVB technology. “Within Tanzania we have over 100Mbps local bandwidth distributed over a backbone carved out of microwave and fiber-optic links all over the country” Tanzania is currently having cable connections (local connections), VSAT systems, wireless connections, copper-based leased lines or private wires, fiber and twisted UTP cables for access layer. UTP cables are twisted pairs of copper cables sealed by plastic sheath (Web Classes 2002). Microwave systems and fiber are deployed at the backbone-core (long-distance) level. Table 9 shows types and providers of ICTs that operates in Tanzania, the names are attached in the appendix pages

Table 9 Basic Types of telecom Services Providers in Tanzania (TCC 2002)

Type of Service	Size
Land line Telephone	2
Mobile Telephone Servcie	5
Public Data Communication Operators	14
Internet Service Providers	23

The two-telecommunication companies mentioned in Table 9 were previously government owned and for decades they have monopolized the telecommunication system in Tanzania. The monopoly system has delayed the development of ICTs and of the country at large by discouraging domestic and foreign investors. Daniel Edward (1999) reported that TTCL and Zanzibar telecom were fully owned by the government and operated under Tanzania Telecommunications Incorporation Act of 1993. “The government has initiated a program to privatize public utilities, with privatization of TTCL planned for 2000.” The major improvement of business policies is the undergoing privatization. The business liberalization leads to fair prices and quality and availability of goods and services.

Most of Internet service providers are concentrated in Dar es Salaam while other parts of the country do not have even a single provider. This has been the reason for more Internet cafés in Dar es Salaam than other parts of the country. As a result, some of the Internet cafes are reported to be running under a loss because the price charged is low and is caused by high competition in Dar es Salaam (US\$ 0.50 per hour). It is cheaper than European and American Internet cafés, but outside of Dar es Salaam the cost is as high as US\$ 2 per hour. For a majority who are earning US\$ 50 that is a big amount and is the reason why communication is considered as luxury service rather than means of improving production of good and services. In western countries, Internet cafes do charge also high prices; during my visit in the US August 2002, Internet cafes were offering service at US\$ 1 per hour and in the UK in April 2002 at £ 1 per twenty minutes. The difference is that in western countries organizations like libraries and universities offer Internet services free of charge to the public.

Ernest J. Wilson (1996) wrote, "Is the information revolution coming to Africa? As with many other questions about Africa, the answer is "Yes, but . . . It is coming slowly, ambiguously, and unevenly."

2.3 Factors that Influence Modern ICTs in Tanzania

There are major forces that drive the African governments to encourage the development of ICTs. The privatization policies that are now in place throughout Africa cause individual countries to compete for foreign investors. The competition is forcing the African governments to improve the investment environment like policies for domestic and foreign investors, road construction, sufficient water supply, modern health services, security systems, and introduction to modern ICTs. Globalization is also pushing the region to employ modern ICTs for real competition. The goods/services made in developed countries where ICTs are fully implemented are cheaper than those made in Africa. Eva M. Rathgeber et al (2000) reported that developing countries previously had the advantage of cheap labor over developed countries, but this has become less significant with emergence of new ICTs. In other words, if African countries do not implement modern ICTs in the production of goods and services, their products will not be able to compete with those from developed countries. According to economic principles, low price attracts high demand

Figure 7.

Price elasticity is the situation where by a small changes in price causes a big change in demand. Price elasticity is also called price sensitive. This is to say, enterprises that will use ICTs to produce and sell cheap products will win the market.

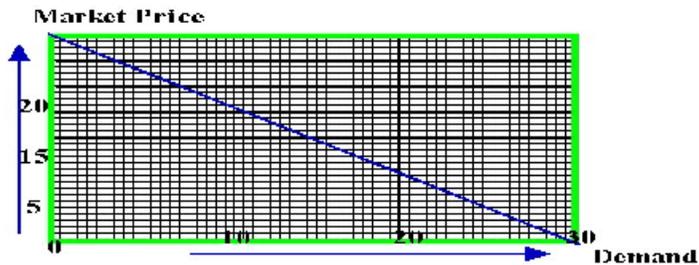


Figure 7 Price Elasticity (Digital Economic 2002).

Hence, lack of modern ICTs in Tanzania is one of the reasons for high prices for products produced in the region.

Most African countries are against globalization from this background, the products imported from developed countries are cheaper than from domestic manufacturers, and the customers go for cheaper products. Therefore, privatization and globalization are among the major forces driving Tanzania and other African countries to modern ICT development.

Improvement of education and health services in the country are other reasons for Tanzania to invest in information and communication technology. ICT applications are among efficiency tools to improve education and health in country. We will discuss the role of modern ICTs in education and health in Chapter 3.

2.4 Improve Small and Medium Size Enterprises

What to communicate, how to communicate, to whom to communicate, where and at what price are the major questions that provide useful ICT information to the management. For example, in the problem solving and decision making process, people involved will need to search for source information, and formulate possible alternatives. The Internet, e-mails, telephones and faxes are very useful in gathering and disseminating information, computers play a key role in processing data and storing information. In problem solving, people would like to search if the same problem happened in another enterprise and how it got solved. In starting and expanding business enterprises, directors and managers need to search information about the market size, suppliers and competitors.

Organization and information structure built by an enterprise is a major determinant for decision making, the lack of or poor information makes the decision-making process hard or leads to poor decisions. Information systems are among the main factors that determine the success or failure of an enterprise; how data are collected and processed, how information is stored and how easy it is to retrieve, and what media are available for information dissemination.

Information is a resource that is required by an enterprise just as it requires other resources such as human resources, skills, technology and money (Heeks and Duncombe, 2001). Communication technology is the link between enterprises and suppliers, government, customers and competitors. For example, from web pages of an enterprise can make orders from its suppliers, advertise to its customers, learn from its competitor's, and be informed about new government policies. Other enterprises, customers, suppliers and government can do the same (Figure 8).

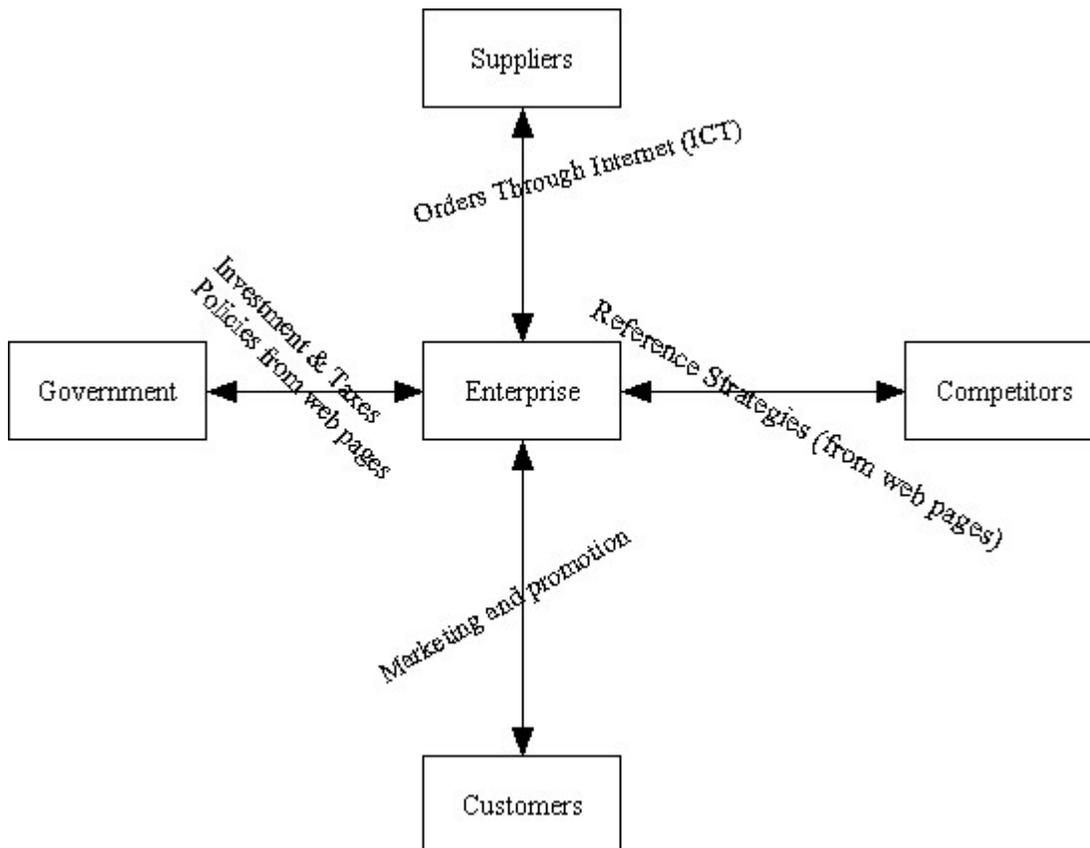


Figure 8 ICT is the Link between Institutions

Modern ICTs make information available at the right time, the right place, to the right people and at a fair price. The SMEs that are well equipped with modern ICTs have higher profits, expand, and employ more employees than those still using old ICTs. In the subsequent sections we will discuss the role of modern ICTs for improving the performance of small and medium size enterprises.

2.4.1 Speed up Production of Goods and Services

Let us take an example of a teacher in a school that is supposed to teach the same course to the three classes. Where there are no computers and documents cameras or modern projectors, the teacher has to use black board and chalk to write his or her lecture three times (once for each class). There is much time wasted to write lectures on the black board. The black and white boards are still useful in teaching, but the process is rather slow when used as the only presentation alternative. With modern ICT tools like computers, network and projectors, a teacher will use lectures material from his or her office computer that is connected to the network. Since in most Tanzanian schools there are many students than the class size, it is normal to split one class to two or three subclasses. Thus, modern ICTs will increase teaching efficiency in Tanzanian schools.

The fact that Tanzania has poor ICTs is not only due to the lack of infrastructure, but also is the lack of technical know how among the prospective users in Tanzania. Some personnel for some reasons are reluctant to learn modern ICTs skills. There are some schools in Tanzania, which are well equipped with modern ICTs facilities like computers, projectors, document cameras and local networks, but teachers are not willing to learn how to use them. This is the reason why there many typists in Tanzanian organizations. This problem is not only in Tanzanian academic institutions but also in other enterprises.

Traditionally, Tanzanian enterprises used human based systems to carry information from one place to another or from one enterprise to another. Let us compare this with transferring information through computer networks. A computerized information system is faster than a human based one.

If you send a person to deliver information from your office to another office, say 200 Km away, it will take longer than sending the information by e-mail or uploading the information to the Internet and informing the other side to download it.

Another example is checking and buying goods from suppliers. Without modern ICT we need to send a person to ask suppliers if they have products, how much they cost, guarantee etc. Then the person has to bring the information to the management to decide. With web pages and the Internet, it is easy and it takes less time to browse suppliers' web pages and collect all information that is needed by the management to make the decision to buy.

I can provide some Tanzanian enterprises as examples, which from my own experience between 1998 and 1999 when registering an enterprise I was not satisfied because of slow operation. The first one is Tanzania Revenue Authority (TRA), I recall I spent the whole day in a queue waiting to pay taxes. The main problem from my observation is the lack of computer skills. There were computers on each desk but still most paper work was rather supported. If there could have been electronic payment system, I and other customers could have opted for that. The same problems persisted in an electricity company (TANESCO), some local banks etc. Rural Europe News (2002) reported that the biggest drawback of many SMEs is insufficient resources (human, financial), but ICT can offer solutions to overcome this handicap because they provide inexpensive access to quality advice and assistance via the networks.

2.4.2 Share Information

The opportunities provided by the Internet or local area networks eliminate a number of meetings held by management to consolidate data from different units. Through the networking (LAN) different units of an enterprise can access information from each other. Without modern information and communication technology, the enterprise has to hire people to carry information from one department to another. Sharing information within an enterprise without modern ICT involves a lot of movement in the organization. Each department can upload information into the server from which other departments can retrieve it.

A computer network has a lot of simple to use features that allow management and other employees to communicate without moving from their desk or somebody to carry information. For example, if computers are connected, different window commands like “net send” can be used for communication that requires quick response Figure 9

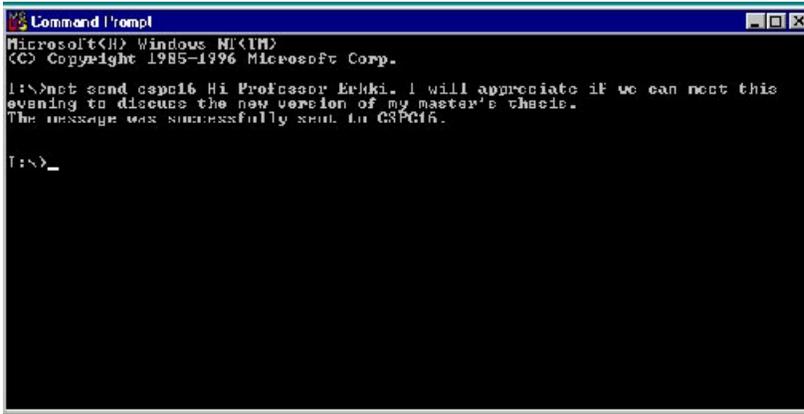


Figure 9 Net Send Window Command

There are other messaging systems like msn chat which are build in the Internet and support long distance online communication by chatting Figure 10

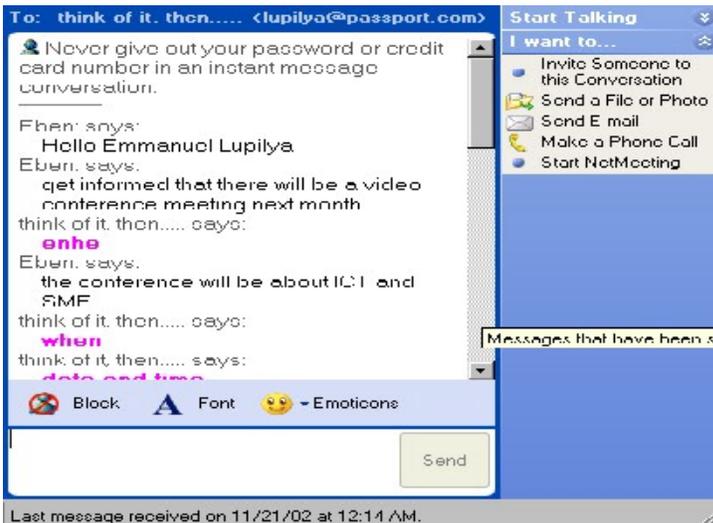


Figure 10 MSN chat system

Some organizations like DiRECWay have adopted chatting systems for customers' services. The customers log into the organization chatting system and interact with help desk. Figure 11 shows communication with DiRECWAY inquiring if they offer service in Africa.



Figure 11 DiRECWAY Chat System (DiRECWAY 2002).

These systems reduce telephone traffic and queues in customers' service desk. Long distance customers can be offered a quick support at cheap cost.

Samuel Mugisha (2001) argued that the capacity of ICT to access and transmit information, timely and accurately, helps entrepreneurs to make better business decisions in negotiations. Again the ICT' capacity to store information with easy retrieval, makes the decision making process easier and quicker which again translates into reduced costs and on the other hand high profits. Jeffrey A Hoffer (2000) has urged, "Data management is becoming a competitive factor ". An enterprise uses modern ICTs as a tool to win the market. For example, the low production cost brought by modern ICT leads to low prices, which can generate higher demand.

2.4.3 Increase Marketing Opportunities

The Internet globalizes business. Enterprises that are not connected to the Internet are limited to customers from the neighborhood. The Internet provides an opportunity for an enterprise to win both domestic and international customers.

Through the Internet an enterprise can show, advertise and sell its products or services to the entire world. Pictures, audio and video can be used to show the product or service features to the customers. Rural Europe (2002) reported that ICT provides SMEs with worldwide marketing channels and mechanisms. Through ICT Tanzanian SMEs can easily search information from other enterprises and they can join together to form a partnerships or a joint ventures. Samuel Mugisha (2001) argued that the ICT, particularly the Internet and other global online networks are creating new commercial opportunities for enterprise development. These include advertising and selling tangible goods over the Internet. For example, Tanzania has coffee, sisal, cotton and other agricultural products that need strong promotion in order to solve marketing problems facing farmers in Tanzania. The mining and tourism industries can benefit from modern ICT in the same way. Rural Europe News (2002) argued, “Information technologies can help widen the markets for rural products at the European or even world level, thus retaining more added values at home and reducing the cost of doing business.”

2.4.4 Simplify Money Transfer and Security

How do you feel traveling with a lot of cash especially in a region where you know there are robbers? The lack of modern ICT in the banking system is what makes people travel with cash; otherwise it is safer to travel with bankcards or other documents than with money. Modern ICT provides financial security for enterprises and individuals. Many Tanzanian enterprises are cash based which requires businesspersons to carry a lot of cash from their towns to Dar es Salaam or to other towns to purchase goods or services. Traveling with cash reduces human and financial security.

Tanzanian business enterprises can work together with banks in the regions to buy finance computer servers to introduce electronic money transfer in the region. This has many advantages for banks, customers and other enterprises.

This environment will also attract more investors to start and run SMEs in the region. Each bank could also build at least a local network and introduce a local ATM system. This will enable people to access their accounts within the country and at their convenience.

2.4.5 Reduce Operational Costs

Modern ICT minimizes traveling costs as some meetings can be held through videoconference and other communications can be conducted through telephone and emails. Purchase of goods can be done from Internet (commerce). Using emails can minimize calling charges. E-mails have not so far completely replaced telephones nor has the Internet replaced faxes or the face-to-face business system. However, ICT can be used more widely with less cost. The initial costs to install ICT infrastructure are high but has long-term benefits. Modern ICT reduces the number of employees needed by an enterprise to do one task. In other words, fewer resources are used for the same or at high production level. Using web pages for advertisement will reduce the cost spent in TV, radio and newspapers, which are more used in the absence of the Internet. The TV and radio are still useful, but the use of the Internet can minimize advertisement cost. Rural Europe News (2002) reported that with information technology is reducing the cost of doing business, flexibility and the ability to swiftly react to new business situations are becoming major assets. This is to the advantage of SMEs whose small size enables them to adapt more easily than large companies.

2.4.6 Communication Mobility

The communication mobility has enabled businesses to be mobile as well. Mobile phones that have Internet and WAP, PDAs and laptop computers have increased business mobility. This enables people to do business during traveling, in airports, lunch breaks, sports grounds, during their vacations etc. Enterprises' managers and others can be reached when they are out of their offices through mobile communication. The study carried out by Susan Wolf about "the role of ICTs for the performance of SMEs in East Africa" has shown that in Tanzania the use of mobile phones is growing faster than the use of landline telephones. This has been caused by the fact that mobile phones services take a short time to get connected and their mobility.

However, due to other factors like low income, lack of Tanzanian language in the mobile phones, the growth is rather slow compare to the developed countries. The statistic shows that in 2000 there were 30,000 mobile phone users.

2.5 Imaginary Enterprise

Here we will use an imaginary enterprise to describe how modern ICTs affect operational costs of an enterprise. Say we have a business enterprise H which is located in Morogoro Tanzania and deals with tourism; they receive orders from customers who want to visit different tourist sites like Mikumi national park, Ngorongoro Crater and Mount Kilimanjaro. This enterprise has domestic and foreign customers. People are employed to advertise the business to the arriving guests in Airports, Bus stations, railway stations and harbors. This is to say, the advertisement is more based on human resource. There are 3 in Dar International Airport, 3 in Kilimanjaro International Airport, 3 in Zanzibar Airport. For harbors, there are 3 in Dar, 3 in Zanzibar, 3 in Mwanza and 3 in Tanga. For railways stations, there are 3 in Dar TRC and 3 in TAZARA. For Bus stations, there are 3 in Arusha, 4 in Dar, 3 in Mbeya, 3 in Mwanza and 3 in Moshi. In addition to this personally based advertisement, the company advertise weekly in three television stations where they pay US\$ 50 and four radio stations where they pay US\$ 25 each per advertisement. The enterprise employed 5 senior managers and 10 junior managers. The 5 senior managers work at headquarter in Morogoro while the 10 junior managers work in ten sub branches in other areas (Arusha, Dar es Salaam, Kilimanjaro, Mbeya, Mwanza, Tanga, Zanzibar). The company has 10 drivers who are specialized to drive tourism cars. The company employed a typist for each senior and junior manager, which makes a total of 15 typists.

Furthermore, the company employed 8 messengers for carrying information from one place to another, two at headquarters and one at each sub branch. An enterprise gets an average of 400 customers per month from different countries. The tour price differ from one tourist to another depends on how many sites will visit. It cost US\$ 100 per tourist per day. This includes meals during tour, tents for nights during the tour and other tourism costs. The company does not have a guesthouse where tourists can be accommodated while waiting to start their tour or when came back from the tour. However, they can arrange with other neighborhood enterprises which run hotels services.

The enterprise does not have any other ICT infrastructure than telephones (landline and mobile) and post mail. The communications between branches are done through telephone, post mail and meetings. The enterprise is planning to implement modern ICTs like computers and networks to improve the production performance and reduce operational costs. The management has decided to use modern ICTs to minimize communication and information processing costs in terms of telephone bills and human resource involved in information processing. Furthermore, they plan to use modern ICTs like web pages to minimize advertisement budget that is currently based in human resource, TV and radio channels. The Tanzania TV and radio stations are not international while most of the targeted customers are from overseas. The company is planning to buy computer for each senior and junior manager so that they will type their own tasks and the typists will be assigned other production tasks. The computers will be connected into LAN and to the Internet so that there will be electronic information sharing within the branch and between the branches. The senior and junior managers will attend one-month course in basic computer and Internet skills, which will be offered within the enterprises. Another plan is to put electronic advertisement and company brochures in Airports, railway stations, bus stations and harbors so that there will be no need to have personnel in those centers or the number should be reduced.

The company is planning as well to start to offer hotel services where the personnel from information and communication, and advertisement will be employed. Another plan is to increase number of cars and drivers so that the other personnel reduced from above sectors will work as drivers. Through these plans the enterprise expects to maximize utilization of its personnel, increase sales, lower operational costs and increase profit.

The following are the accounting estimations analysis to support the above plans. Some of the facts are; it's true that managers can type their own tasks if they have computer skills, it's also true that presence of e-mails and Internet will minimize use of telephones, building electronic screens in guest arrival stations like Airports, Bus stations, railway stations and harbors, and putting company's brochures at help desks of these station will not only reduce the number of personnel required, but also more effective than that old system. Using web pages for advertisement make more sense since the most targeted customers are foreigners and Tanzanian televisions and radios are not international, this will also increase the number of customers.

Starting hotel services as a new business will add both convenient to the customers and increase revenues. The analysis below show estimates before and after the introduction of new plans. Note that most elements that are included are those affected directly by the above-mentioned plans.

Before Modern ICTs

Monthly sales from tourism -----	40000:00
Less Operational costs	
43 employees for advertisement (each 100) -----	4300:00
5 senior managers (each 300) -----	1500:00
10 junior managers (each 200) -----	2000:00
Television and Radio advertisements -----	300:00
10 drivers (each 150) -----	1500:00
15 typists (each 80) -----	1200:00
8 messengers (each 60) -----	480:00
Telephone bills -----	2000:00
Other operational costs -----	12000:00
Total operational costs -----	25080:00
Profit before tax -----	14920:00
Less tax 20% -----	2884:00
Net Profit -----	12036:00

Figure 12 Enterprise H before Modern ICTs

Figure 13 below shows the initial cost associated with the implementation of the above mentioned plans.

15 computers (each US\$ 847:75) -----	12716:25
7 servers (each US\$ 847:75) -----	6782:00
Linux -----	00:00
Open office or star office -----	00:00
Local Area Network construction (each 400) -----	3200:00
Training costs (Each branch 200) -----	1600:00
Electronic advertisement (each 1000) -----	8000:00
Hotel construction at headquarter -----	50000:00

Total Initial costs ----- 82298:25

Figure 13 Initial Costs for plans implementation

The following is estimated accounting analysis after the implementation of the plans. The expectations is that the number of customers will rise from 400 to 600 (50% increase) which will be a result of efficiency advertisement in guests arrival stations and through Internet. The hotel service will increase sales. It is estimated that each tourist will stay there at least 2 days and will pay US\$ 45 per day. The workers who were working as typist, messengers and at advertisement centers are now working in hotels and tourism sites. They salaries remain the same.

After ICTs

Monthly sales from tourism-----	60000:00
Sales from Hotel -----	54000:00
Total sales -----	114000:00
Less Operational costs	
43 from advertisement, work in hotel and tourism -----	4300:00
5 senior managers (each 300) -----	1500:00
10 junior managers (each 200) -----	2000:00
Television and Radio advertisements -----	150:00
10 drivers (each 150) -----	1500:00
15 were typists; work in hotel (each 80) -----	1200:00
8 were messengers, work in hotel (each 60) -----	480:00
Telephone bills -----	300:00
Other operational costs -----	20000:00
Total operational costs -----	31430:00
Profit before tax -----	82570:00
Less tax 20% -----	16514:00
Net Profit -----	66056:00

Figure 14 Enterprise H after implementation of Modern ICTs

The observation shows that modern ICTs can be used to reduce the number of personnel in one task to work on other production tasks. For example enterprise H expanded its tourism business and opened a new business but did not employ more employees. The work force replaced by modern ICTs is used to expand production and as a result more sales and high profit are realized.

Figure 15 shows the revenue and cost lines, the point where these two lines meet is called break-even point (revenues = costs). Application of modern ICTs tends to push the cost line down by minimizing operational costs. However, capital or initial cost for ICTs is higher Figure 13.

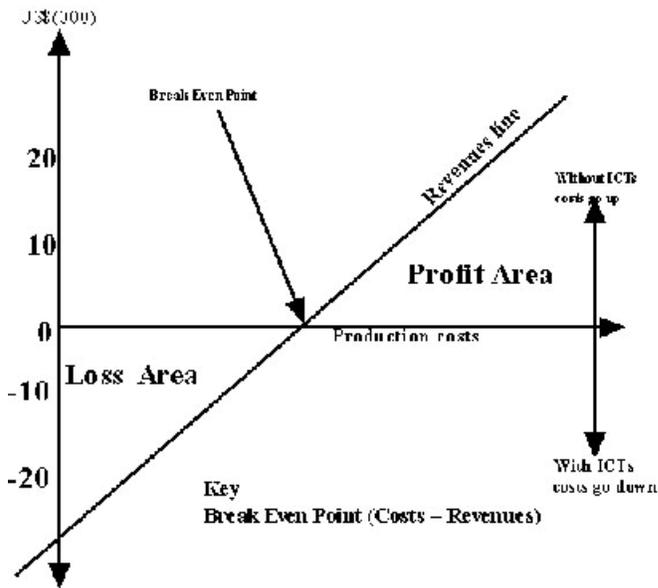


Figure 15 Enterprise Cost and Profit curves

So far we have seen that there is a visible link between modern ICTs, SMEs and poverty alleviation/development in the region Figure16.

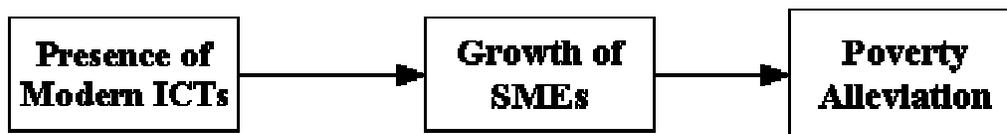


Figure 16 Relationships between ICTs, SMEs and Development

Figure16 shows that the presence of modern ICTs encourages the growth of SMEs, which both lead to poverty alleviation in the region.

3.0 Information and Communication Technologies in Social Services

This chapter will discuss the role of information and communication technology in other sectors like education and health services in Tanzania. We will analyze the problems that face education and health systems and show the opportunities that ICTs can offer. There is a positive correlation between the level of education and development in the country; the same applies to the health services. UNESCO (2002) reported, “Education is considered as a social instrument for developing human resources and for human capital information.” UNESCO argued further that people who are educated in the society are productive and qualified in their fields, are highly paid, have a limited number of children, are respected by the society and generally have better quality of life as compared to uneducated families. Literacy rate in developed countries is higher than in the developing countries and this is among the reasons for better quality of life in western countries. We try to show the importance of education for development and we will analyze how information and communication technology can improve the quality of education in Tanzania and allow more students to be enrolled.

ICT can play a key role in improving the quantity and quality of education, health, and other social services in a country like Tanzania. We will start our discussion with the analyses of information and communication technology in governmental and nongovernmental organizations in Tanzania. Most benefits of ICTs discussed in Chapter 2 like in increasing production, and reliable and cheap communications apply also to governmental and nongovernmental organizations. The chapter will answer question 3 from research questions i.e., what is the role of the ICTs in other development sectors?

3.1 Governmental Uses

The Tanzanian government and its constituents need modern information and communication technology as one of the tools to facilitate regional development. With modern ICTs like the Internet, the government will be able to advertise more effectively the investment opportunities that are available in the country. ICTs provide the government with such an effective media to reach known and unknown investors, domestic and international investors. Today investors use the Internet to browse the investment situation in different countries.

Before the introduction of the Internet people used magazines, newspapers, radios and TVs as information sources. On one hand, advertising on newspapers, TV and radio is costly for the government, on the other hand for investors information provided through traditional is not easy to process and store. For example, how can one store advertisements from TV? Advertisements from Internet can be stored on disks and are printable. The government needs to advertise her investment information through modern ICTs because investors from developed countries expect to find all necessary information on the web. Nowadays information that is not found on the web today may be overlooked as not existing. Information and communication technology will support the government to increase the level of democracy in the country. People will be able to air their opinions to the authorities through e-mails and the government will easily gather public opinions on different matters. In Chapter 5 we recommended to the government to open information centers where the public can send their opinions to the government authorities. The Tanzanian government needs computers, software, communication tools and skilled people to reduce the high cost involved in data collection, processing, storing and disseminating.

3.1.1 National Security

ICT supports the government's security agents like FBI and CIA in the United States government. I still recall the case of an American journalist who was kidnapped in Pakistan and the kidnapers were traced through the email messages sent during the occurrence (The Associated Press 2002). Every email sent carries the Internet protocol that includes the domain and name of the computer used. An email passes many nodes in the network before reaching its destination; server administrators at those nodes can easily open and read suspected messages. The simplicity and efficiency of modern information and communication technology motivate people to use it, but it also provides a significant security control.

3.1.2 Decision Making Process

Decision-making and problem solving require a timely supply of high quality information. The problem solving process involves formulating the decision-problem, creating possible options, evaluating the options, implementing the selected option, monitoring the process and evaluating the results. ICTs have a key role to play at every stage of this process.

The decision making process needs correct and sufficient information from reliable sources to enable decision makers to achieve an optimal decision. Samuel Johnson (1996) reported that the essential role of ICT is to support the decision-making process by providing valuable and timely information, while disseminating information of public interest. R.E. Leenes (2002) reported that the introduction and use of ICT in decision-making and problem solving could improve the democracy by supporting the consultation process, improving interactive discussions and accessibility of information. “In this area ICT can also improve the gathering, processing and presentation of all relevant information.” The problem remains on costs associated and lack of personnel in the country.

3.1.3 Community Development

Information and communication technologies provide useful information and communication possibilities to different development groups. Information about donor organizations and volunteers can be retrieved from the Internet and applications can be done through the same media. Janice Brodman (February 8, 2001) mentioned the following advantages of implementing modern ICTs into women group operations:

- *Generating networks.* ICT can support to building a network between Tanzanian women groups and those in other countries. In this network, groups can share information on viable projects and fund raising issues.
- *Building knowledge resources.* Members from Tanzanian groups can browse different projects managed by similar groups in other countries. Groups from developed countries can give online training to Tanzanian groups.
- *Raising global awareness.* Some groups in developed countries can publish the threats faced by fellows in Tanzania and other African countries. For example, the famine disasters that are facing South African countries, groups in the west that have ties with those in the affected regions are seeking concerns from their government. ICT helps these groups to find each other and keep them in touch.

There are several examples of other nongovernmental or not for profit organizations that need information about funding sources. One is the Equal Opportunities for All Trust Fund (EOTF), which is a nongovernmental organization.

The first lady Anna Mkapa of Tanzania founded the organization and its mission is to empower women and other disadvantaged groups through increased economic and educational opportunities. EOFT works with other international organizations like the Sabre Foundation to provide resources that enables EOFT to achieve its mission. There are other Tanzanian nongovernmental organizations like those working with street children and anti-HIV AIDS, which require ICT as a tool to support them to achieve their missions. ICT will help them in searching and communicating. The bottleneck remains in the lack of ICT skills and infrastructure in these organizations.

3.1.4 Migration Control

People move from rural areas to urban areas to look for information about employment opportunities, education, health services and other things. People in rural areas think that life in town is easier and cheaper than where they live (“pastures are always greener on the other side of the fence”). In many cases they get disappointed when they face a harder life in town than at home in rural areas. They do not find what they were looking for and they find it hard to go back. This why there are streets boys, beggars, thieves and other criminal groups in Dar es Salaam and other Tanzanian cities. In the year 2000 Dar es Salaam local authorities had to hire buses to return some of them back to their home regions. The main reason for migration into the cities is misconception and lack of information. ICT can help to control the situation by providing right information to people who live in rural areas.

3.1.5 Communication Costs

ICT will minimize high communication expenses in the Tanzanian government budget. The government is the major debtor of TTCL, which has weakened the company because the government does not pay telephone bills. The government took advantage of owning TTCL to accumulate telephone debts. This is because being a poor government does not minimize the need and importance of communication. The privatization of TTCL will make the Tanzanian government to rethink its communication policy, as the new owners will not accept accumulation of debts. ICT is the right choice for government organization to opt, e-mails and Internet services provide more communication possibilities at cheaper prices.

Chris Mburu (2002) quoted the Minister for Communications, Professor Mwandosya, who said that that government has failed to pay her debts to TTCL Company.

The Tanzanian government and the political parties like CCM, CUF, NCCR Mageuzi, CHADEMA, TLP and other non governmental enterprises will need to turn to modern information and communication technologies in order to minimize their budgets in the long run. The millions of shillings paid as travel expenses to participate in governmental or political meetings can be used for other development activities. Time that is spent in traveling to meetings can also be saved for other activities. Traditionally, more time has been spent on traveling than in meetings.

3.2 Information and Communication Technologies in Education

Many problems that face the educational system in Tanzania can be at least partially solved through ICT. For example, the lack of teachers is a problem which faces even developed countries, but the application of modern ICTs has minimized it. Unlike developed countries, Tanzania and other developing countries face also other problems in education such as the lack of books or the use of outdated books and journals. The small budget granted by the government for educational sector is not enough to buy all the required books. In addition, enterprises like religious organization that own schools do not have enough money to buy all the needed leaning materials. The Internet minimizes this problem as students can search and use online books, free journals and articles. Scarce resources for education are among the major reasons for high tuition fees in the region, which has lead to a growing illiteracy rate. People in rural areas and other marginalized groups like women are the most affected by the lack of educational resources. Benjamin W. Mkapa when he was the Minister of Science, Technology and High Education reported, "... In many countries, the poor are also uneducated." The following sections show how ICT helps marginalized groups to get education.

3.2.1 Teaching Efficiency

ICT could maximize the use of teaching resources. As we will see, one way of doing this is by using videoconferencing whereby one teacher can lecture more than one classroom at the same time.

For example, in autumn 2000 Universities of Joensuu, Lappeenranta and Kuopio in Finland shared one professor in a course on artificial intelligence. In those universities he taught three classes at the same time through videoconference. In Tanzania, this is not yet in practice due to the lack of sufficient ICT infrastructure. Tanzanian universities share teaching resources like teachers through traditional ways. Teacher has to travel to and from the University of Dar es Salaam to Tumauni University in Iringa (600kms) to offer lectures. Thus much time and money is wasted on traveling. Long traveling make teachers tired and lower working efficiency. Teaching capabilities supported by ICT like videoconferencing and online or distance learning can help to minimize this problem. The current number of teachers and professors in Tanzania will be enough if modern ICTs are used to facilitate maximum resource utilization. For example, the University of South Africa (UNISA) has more than 100,000 students and all are distance learning; however the university is still paper based whereby materials are printed and posted to students (Hentie Wilson 2002). The use of Internet and online learning increase the utilization of teaching resources

3.2.2 Teaching Through Video Conference

Videoconferencing is a teaching system teaching materials in video, audio and text are transmitted from one classroom (host) to other remote classrooms. The Internet or a telephone network can be used for this transmission. Students in the remote classrooms see the teacher on the white board; they hear the voice from speakers, and see the teaching materials on the white board. The students in the remote classrooms can ask or answer questions, as the system is interactive.

The telephone or Internet network should be able to transmit at least 128Kbps for videoconference to be possible (Juha Hakkarainen 2002). The videoconferencing system will solve many teacher shortage and literature problems faced by Tanzanian universities. It will also increase collaboration between local and foreign universities. For example, when there is a system between Tanzania and universities in developed countries, the students will get the same content of education as those in developed countries. The problem still remains on costs associated with Internet connection for Tanzanian academic institutions and lack of the skilled personnel.

3.2.3 Distance and Online Learning System

Tanzania does not have enough universities to meet the demands of her population. The University of Dar es Salaam's capacity is said to be 3,200 students but the current number of students on the campus is more than 8,000. Even though the universities are over registering, many qualified students are left behind. The government of Tanzania has started the *Open University*. The students can take course at their homes and attend examinations in the selected centers. The problem still persist, there many qualified students left behind at secondary, college and university level. Distance learning can be done without Internet support if paper based system is used. University of South Africa (UNISA) and Tanzania Open University use this system. When the Internet is employed to support the system, it is called online distance learning. Teachers upload learning material on the Internet and students download them from their computers. Through this online learning approach students take courses and examinations as in a traditional learning setting and earn certificates after the completion of their studies. This approach will help Tanzanian women and other marginalized groups to get more education. People who live in rural areas will have more opportunities to study even from qualified overseas universities.

For example, University of Joensuu in Finland has established the virtual distance school high education, which serves student in rural areas.

Since the fall 2000, the Department of Computer Science at the University of Joensuu began offering a university level Introductory Computer Science Curriculum (called Virtual Approbatur) to high school students in the surrounding rural region of the province of Pohjois-Karjala. (Sirpa Torvinen 2002).

The same program can be established by Tanzania Ministry of education and run by Dar es Salaam University, Tumauni University, or any other high academic institution in the country. The material can be prepared and at the university and sent to students and where there is access to the Internet students can access learning material online. This has minimized educational problems in different countries and there is no doubt will minimize educational problems in Tanzania. The online or distance learning system can handle many more students than any other existing system can do.

Different systems like WebCT can be used to carry out this learning system. Prentice Hall (2001) has reported the following features that are associated with online learning.

- Conferencing system
- On-line chat
- Student progress tracking
- Student self-evaluation
- Grade maintenance and distribution
- Access control
- Navigation tools
- Auto marked quizzes
- Electronic mail
- Course calendar
- Student homepages

The online teaching system requires fewer staff than traditional teaching systems; student collaboration is also maximized through the online chatting and conferencing system.

3.2.4 ICT Minimizes the Outdated Books Problem

Professors and teachers in developed countries know what the Internet contributes to the preparation of teaching materials, seminar papers and syllabuses. While most of professors and teachers in Tanzania are still depending on old, outdated books as sources of information, their fellows in the developed countries use sources that are updated every few hours, days, weeks or months. Almost every university in Tanzania has a library full of old books and few copies of new books for selected courses. These libraries are less useful for ongoing research in science, politics, gender issues, terrorism, health (HIV/AIDS), global warming. ICTs like the Internet are needed in Tanzanian schools in order to have better teaching material that will lead to the production of a competent labor force in the country.

A study done in Verbo Beach (2001), Florida, showed that student performance is positively affected by Internet access in their institutions. The Internet provides more and up to date learning resources like same course offered in another university.

For example, most of the courses in at University of Joensuu are offered in Finnish language, which I do not have enough commands of it. I have been downloading lecture material from UK and USA universities, which have a great help to pass my examinations. The Internet connection could help Tanzanian institutions that lack books and use old books. (Bruce J. Berman 2001). With Internet access, a school can subscribe for online journals service whereby students and staff can access several online journals. In the fields that develop rapidly scholars get more information from online journals than books because they are timelier. The lack of Internet connection in Tanzanian schools hinders staff and students from having access to up to date journals and other online resources. It is difficult for the Tanzanian academic institutions to get ICT systems because of the high costs involved.

Use of a CD-ROM as data bank for Tanzanian schools is one possible solution to the book shortage problem. Unlike a book, many students can access one CD-ROM inserted in a library computer at the same time. This is one advantage of having networked computers in school libraries. If the network is extended to other universities, then students from different universities can access the same resource at the same time. Another possible way of solving the book and teacher problems is to use videocassettes. The lectures get recorded for the courses that lack teachers and the videos are used in different schools. This is the simplest and cheapest ICT means that can be used in Tanzania to solve the teacher shortage problem. The costs associated are a TV set, a video player and the videocassettes themselves. Another possible solution is using floppy diskettes to save the text material and sending them to different schools. There are fewer excuses for not making use of CD-ROM, Videocassettes and floppy diskettes, as their initial costs are comparatively.

Table 10 Prices for different ICTs Media and tools (Electronics Shop 2002)

Media	Price (US\$)	Quantity
Recordable CD	3:50	1
Floppy Diskette	0:50	1
Videocassette	0:20	1
Video Camera	800	1
TV Set	300	1
Computer + CD Writer	847:75	1

3.2.5 Equal Learning Opportunities for All

Poor countries like Tanzania are said to have more illiterate women than men. The adult literacy rate is 66.8% whereby two thirds are men (CODE 2002). There are many reasons associated with this fact. The first one is the priority given to men by African traditions and cultures, which result in women being the most affected by short supply of resources. If more opportunities become available in the society whereby all can have access, the situation will change. Online distance learning, videocassettes, floppy diskettes and CD-ROMs will increase opportunities for women and other marginalized groups in Tanzania to get education. The Commonwealth meeting held in Zanzibar - Tanzania (March 2000) reported that distance-learning education provides opportunities through which women in the developing world are well represented. Distance learning helps to overcome some of the challenges that women and girls face when the only other opportunities for education are provided through conventional means. This supports the fact that ICT effectively increases educational opportunities for all in the Tanzanian society.

3.3. Information and Communication Technologies Promoting Even Development

Remote areas in poor countries are among those paying the highest price for poverty. In Tanzania for example, living in remote areas means lack of roads, power supply, communication, safe drinking water, and skilled labor in health centers and in schools. Professionals are unwilling to work in Tanzanian rural areas because of poor social infrastructures in those areas.

Through modern ICTs, those enterprises that operate as ecommerce or in e-business basis can operate from rural areas by which social infrastructure can be improved. The Internet makes customers able to buy goods and communicate with producers electronically. For example, customers can place their orders through electronic forms that are on an enterprise's web pages; payments can be done electronically through safe servers. The enterprise ships goods to customers through roads, waterways, and airways or even through Internet depends on types of good or service, customer location and possible transport means. The enterprises that are built in remote areas have brought many opportunities and advantages to those who are living in the neighborhood. For example, road construction, water supply, power supply, communication, health services are among the services that can be brought by enterprises operating from remote areas.

Tanzania needs ecommerce enterprises as one way of bringing even development in the region. There are big development differences that exist between rural and urban areas, which can be minimized by full implementation of modern ICTs. Building enterprises in rural areas will be another approach to limit migration from those areas to urban areas. On the other hand, there are many advantages that an enterprise will get by operating from rural areas. The first one is cheap operational costs like rent for both the enterprise and employees. Labor is also cheaper in rural areas than in urban areas from the fact that living costs like rent and food are lower in rural. Wolfgang Greller and Mary MacKay (2001) argued, “Offices can balance the situation in rural areas; loyal workforce and low staff turnover; customers appreciate friendly attitude.” They have argued further that ecommerce enterprises do not depend on location and they can take advantage of fully equipped offices and extensive support from local government. For example Kidugala Lutheran Seminary, which is operating from the interior of the Tanzania Southern highlands, is provided with land and other possible resources from local government authorities.

Given good weather conditions in some Tanzanian rural areas, there is no question that many professionals would like to work in those areas if social infrastructures like modern ICTs were improved. The high humidity in Dar es Salaam that is sometimes up to +35 degrees centigrade makes many people uncomfortable to work in the city. Many people like to work in areas with moderate weather conditions. Building modern ICTs in rural areas will be an added advantage and will attract many skilled laborers from cities. The Tanzania government needs to encourage investors to operate from rural areas as one way of bringing even development in the region and discourage migration to overcrowded cities.

3.4. Improving Health Service

There are many opportunities that ICTs can provide to health sectors in Tanzania and other African countries. Similar to the benefits we have mentioned in educational sector, modern ICTs maximize utilization of health resources like doctors and nurses through the program called telemedicine. This is the program whereby modern ICTs can be used by doctors and nurses to provide online service to the patients. Moreover, health information is an important resource to the society “Prevention is better than cure.”

People need information on how to prevent health problems. ICTs will take information to people on how to control their environment. Some diseases that are caused by poor environmental management can be minimized or eliminated by providing information to the society. Some diseases attack people because they lack information on how to control their environments. For example, people suffer from tuberculosis (transmitted through dirty water); others like cholera and malaria that kill thousands of people annually can also be minimized or eliminated through information supply. Scholars have published much useful information on how people can prevent HIV/AIDS, which is the leading cause for deaths. It has been unfortunate that many people in poor countries do not get this information because of poor ICTs infrastructure in the region, or lack of skills and money to access information. It is from this background we can see that modern ICTs can minimize if not eliminate many diseases in Tanzania and Africa as a whole.

The United Nations, donor countries, nongovernmental organizations and the Tanzanian government are setting big budgets to buy medicines for diseases that are caused by poor environmental management. The poor environment management is caused by lack of information in the society. Information about protection will rescue many in the society from HIV/AIDS. The HIV meeting in Barcelona (July 2002) reported that HIV/AIDS is killing ten people in every second and most of them are from Africa. The former president of South Africa, Nelson Mandela (July 13, 2002) reported further that “HIV/AIDS is killing more people than killed by wars and natural disasters put all together.” Some older studies like Oneworld.net (November 30, 2001) reported “Across the world, AIDS claims the lives of nearly 8,000 people per day. The epidemic has killed almost 25 million people since the first officially recorded case 20 years ago and 40 million people are currently living with HIV/AIDS”. The World Bank reported that there are 1.3 million people living with AIDS and 140,000 are dying annually from the disease.

Since HIV/AIDS has no cure to date, it will be prudent to distribute information about prevention throughout the society using different media that even the illiterate will be able to access. Modern ICTs like web pages is another effective way to communicate the messages in many formats. On the other hand, videocassettes, CD-ROM floppy diskettes, TVs, radios and newspapers are possible means to distribute information among the Tanzanian society.

Designing effective presentations like the suffering facing the victims and how they could have avoided the problem can be saved on videocassettes or CD-ROM and distributed to the society. Simputer that is developed purposely for the third world countries is another tool that can be used to disseminate information like HIV/AIDS prevention to the society. Lishan Adam (2002) has reported the following as opportunities that modern ICTs can offer health sectors; Tele-diagnosis (x ray, Ultrasound, blood examination, pathology), building co-ordination between medical structure (Medical network) and developing health databases.

On the other hand, modern ICTs like the Internet can be used in the society to carry out telemedicine services. Doctors can update their knowledge from information on the Internet. Susanna Zollo (1999) has urged, "Doctors can support patients who cannot reach the hospitals through use of telemedicine." This system can be used in Tanzania to support patients who live in rural areas to rescue their life. For example, those families that cannot afford a big computer for US\$ 847.75 can go for a simputer for US\$ 200 and mobile phone for US\$150. With these two devices the family gets connected to the Internet.

4.0 Problems Facing SMEs and ICTs in Tanzania

This chapter will discuss the problems facing small and medium enterprises and information and communication technology in Tanzania

4.1 Factors Hindering the Growth of SMEs in Tanzania

The same factors that hinder the expansion of modern ICTs in Tanzania also hinder the growth of small and medium enterprises in the region. On the other hand, a poor and unevenly distributed ICT infrastructure in Tanzania is another factor that hinders growth and expansion of small and medium size enterprises. We have already seen that there are few ICTs user like mobile phone and Internet users. This indicates that the country has small market for ICT services that discourage investors.

The other factor that hinders the growth of SMEs in Tanzania is lack of skilled labor. This is a problem in developing countries, as the educational system is not capable of producing enough skilled personnel. To make the situation worse, the few skilled people in Tanzania and in Africa as a whole are migrating to western countries because of better payments and other benefits. Those countries with a low number of skilled laborers are also the ones with low investment rate. Richard Heeks and Richard Duncombe (2001) reported that among the information that entrepreneurs would like to know is how to get more skilled workers for their business. That is to say, lack of competent skilled personnel in the country hinders the expansion of small and medium size enterprises in the region. Fidelis Mugenyi (November, 2001 p 9) reported that power interruption is not new in Tanzania. Companies have standby generators for producing their own power in cases of emergency. Efforts by the Government to get lasting solution to this problem are underway. The same applies for water supply and transport. The investors make comparison of these factors from one country to another; the country with skilled workers and good social infrastructures is likely to win a majority of investors.

Lack of sufficient financial sources in the country where domestic and foreign investors can take loans is another factor that hinders growth and expansion of SMEs in Tanzania. People can have good business ideas, but if there are no financial sources it will be hard to implement them. Inflation is the other factor that discourages investors.

People like to invest in countries where currencies are stable. Developing countries like Tanzania are the one with high inflation. Miller, et al (2001) reported, “The Bank of Tanzania (BOT) estimates inflation as 7.9% and 6.0% for 1999 and 2000 respectively and the Finance Minister aims to reduce inflation to 4.9% by end June 2001 and 4.4% by end-June 2002”.

Poverty seems to be the leading factor that hinders the growth of SMEs and modern ICTs in Tanzania. Kenneth (1979) defines poverty as “the first and foremost economic state of life, being poor is essentially lacking means of subsistence capable of providing what in this society and at this time could be considered a secure and adequate standard of living” He argues further “People are poor because they lack money, and they lack money because they are unable to sell their labor”. Poverty is the source of many consequences that Tanzania and Africa as a whole is facing. For example, the government is using a big part of its income to pay debts while education and health services in the country are deteriorating and not paying them cause the government to face economic sanctions from international financial institutions.

4.2 Factors Hindering Use of Modern ICTs in Tanzania

In the preceding chapters we have explored how ICT can be used to improve performance of SMEs and for regional development at large. We have seen that ICTs have key roles to play in the economic development in Tanzania and Africa as a whole. While modern ICTs are not all about development or poverty eradication, they offer best strategies for fighting poverty. The drawback is that modern ICTs infrastructure is not evenly distributed in the region, which is caused by factors like insufficient funds, the digital divide and skills as we will see in this chapter.

4.2.1 Lack of Information and Communication Technology Infrastructure

Tanzania is a poor country that cannot afford to buy modern ICT infrastructure. Poverty and a high population growth rate are major causes for poor economic development and technological backwardness in Tanzania. Like all other governments, the Tanzanian government has insufficient resources to meet the demands of its population. This is why the Tanzanian government and others in third world countries concentrate more on basic human needs like health and education.

For example, people need medicines in hospitals, they need water supply, roads, and students need books in schools. People do not want the government to buy satellite systems or lay cables from one town to another for communication purposes. In other words, in Tanzania modern ICTs are still perceived as luxury goods or services; they are goods or services that people can live without. Different from developing countries, developed countries perceive modern ICTs as necessities. For example, networks and the Internet are part of teaching and learning in developed countries.

4.2.2 Lack of Knowledge

As shown in table 8, the Tanzanian public uses more radio and TV as the main ICTs in the region. The statistics show that there are few users for computers, the Internet and telephones, which reflects that there are few people with basic computer skills in Tanzania. There are many people who do not even know about the existence of computers let alone how to use them. Telephones (mobile and landline) are the most advanced ICTs to them. The lack of knowledge reduces the level of demand. Some enterprises still buy carbon typewriters because that is what they know to use. People still depend on old, outdated sources of information because they do not know how to find up to date sources. According to Richard Heeks and Richard Dancombe (2001), “information creates knowledge, but knowledge is also needed to create information. It is knowledge that helps to access information, by knowing where to find and how to use information sources.”

There are institutions that teach basic computer skills in the region, but the problem remains that the majority cannot afford to buy that education. For example, the cheapest course in basic computer skills can be obtained by US\$ 40 for each course like Microsoft Word, Excel, Power Point, Access and Internet application. This is very expensive in a country where unemployment is high and the majority of the employed earn US\$ 50 per month. Some government secondary schools offer basic computer application courses, but with additional payment above normal school fees. Today 40% of children cannot even pay the costs associated with primary education.

Personnel who do not know much about modern ICT tend to resist the introduction of new technology in their work place. For example, if teachers don't know how to use ICT tools for teaching and they do not have an opportunity to learn, they will resist the introduction of new technology. Tumaini University staff (2002) reported, "The librarian was provided a computer program for cataloging books in 1995. The librarian refuses to learn how to use a computer even though there are at least 20 machines in the library and will not use the program. All the time the money spent making paper index cards with a typewriter between 1995 and 2002? 3? 4? is largely wasted because the work will have to be done over and over again when a computer literate librarian is finally hired and takes the library into the 21st century."

Unless decision makers are equipped with modern ICT knowledge, Tanzanian enterprises will continue to use outdated ICT, which does not meet the 21st century demands. On the other hand, other people resist modern ICTs not because of the lack of knowledge but because they fear replacement. The Hartford Courant (Friday October 4, 2002. Section B) reported the dropout prevention program that began earlier this year at Nonnewaug High School was using computers – not to assist teachers, but to replace them. Students take lessons on the computer with only teacher aides to supervise them. Therefore novices resist introduction of new technology because they lack skills and the experts resist because they fear job replacement. The second reason is more applicable in Western countries, but developing countries lack skills.

4.2.3 Few Users Discourage ICT investors

People or organizations that bring ICTs into the country do business and they would like to invest in countries with big markets (i.e. with many users). Tanzania has quite a high population of 33 million people, but still the market is small that it is hard to imagine how five mobile phones service providers share such a small market in Tanzania. Small demand and high supply is the reason for low prices. The low prices are good for users but not for providers. Even if these numbers of users should have tripled from 1998 and 2000, the market is still comparatively small. Finland is small country with a small population of 5.5 million people, but over 85% of this population is mobile phone and Internet users. The small market in Tanzania is among the factors that hinders the development of information and communication technologies in Tanzania.

4.2.4 High Prices Lower Customers' Demand

It is paradoxical but it is a market reality that an African country with a small consumer base will be charged more for communication than American or European countries with large concentrated consumer bases. When customers are few the prices are high to enable enterprises to meet their operational costs and earn a profit. For example, infrastructures and skilled laborers are imported and they are more expensive than domestic laborers. We have seen the cost associated with installing Internet at Tumaini University, which is US\$ 3000 per month. This is a huge amount of money and it is the main reason hindering Tumaini University and others in Tanzania from getting sufficient Internet connections. Tumaini University recently reported to have been connected to the Internet through the TTCL system that costs US\$ 720 per month. The drawback for this connection is usage limitation. For example, Tumaini University has managed to connect 10 computers and the campus has 500 students and 52. Hence the ten connected computers are not enough. Table 11 shows the connections prices from other providers.

Table 11 Charge Associated with Internet Connection in Tanzania (Marie Internet Society 2002).

Indicator	Unlimited (24hrs/day)	Off Peak (7pm – 7am)
Dialup (e-mail only)	\$ 30	\$24
Dialup (Internet Access)	\$48	\$36
High Speed Cable*	\$72 per computer	\$42 per computer
High Speed cable*	\$60 per computer (within the campus)	\$42 per computer
Domain name	\$60	
Domain fees	\$120 (two years)	
Host domain (ANM)	\$12	
Web hosting	\$18 per 1MB	

Note: The cable connection is from the satellite dish station to the customer's office or house. The whole region does not have submarine cables connecting it to other countries. Table12 shows the costs associated with PH Radio E-mail connection.

Table 12 PH Radio connection charges in Tanzania (Marie Internet Society 2002)

Indicator	Price
Initial Investment	\$ 1195
Modem (SCS PTC II/e)	\$ 680
BushLink radio (Mailer software)	\$275
Cables set, depending on radio make	\$ 80
Activation and training	\$100
Two month deposit	\$60
Monthly payment	\$30+\$ 0.12 per K byte sent and received

Note: - HF Radio is an e-mail system that can be used wherever there are radio waves. Refer Chapter 1 for definition of PH Radio. This is the proper connection for Tanzanian rural areas but people who are living in rural areas cannot pay US\$ 1195 as initial investment for e-mail service Table 12.

Table13 shows costs of the Internet connection in Finland to compare with those shown above.

Table 13 ISDN Internet connection price in Finland (Elisa Internet Oy 2002)

Indicator	Price (US\$)
Subscription fee	\$0
Monthly charge	\$8.24
Extra Disk space	\$3.20 for +15MB
SMS messages	\$0.20 per each message
Operating charge	Call charge (from telephone provider)

From the tables above, we can see that with less than US\$10 per month someone in Europe can be connected to the Internet (Dialup connection). For example, in our students' apartment there is Internet connection of 128Kbps that cost a total US\$ 20 per month. The monthly fees in Europe are affordable and majorities earn more than US\$ 1000 per month (Statistics Finland 2002). The income and skills levels are the reasons for high number of ICTs users in western countries. The Tanzanian people who lack skills and earn low income (US\$ 50 per month) are charged more for ICTs.

Table 14 show prices for one mobile telephone operator in Tanzania and Table 15 shows prices for TTCL telephone services.

Table 14 Mobitel (Prices are in US\$ per minute)

Phone	Peak/per minute	Off peak/minute	Night/minute
TO Mobitel	0.35	0.25	0.10
To other mobiles	0.40	0.30	0.30
To TTCL (0 – 50Km)	0.39	0.29	0.29
TTCL (51 – 500Km)	0.60	0.43	0.43

Table 15 TTCL (Prices are US\$ per minute)

Phone	Day Price	Night price
Local Call	0.039	0.039
50 – 500 Km	0.15	0.14
Over 500 Km	0.18	0.25
To Celtel	0.35	0.35
To mobile phones	0.45	0.45

By comparison, the calling charges shown above for local calls in Tanzania are more expensive than in Europe and America. International calls in Tanzania are also comparatively expensive. The cheapest mobile phone is a second hand that costs US\$ 80, which is still expensive for the majority who earn US\$ 50 per month. This is why people in the region perceive modern ICTs as luxuries instead of new development techniques. Tanzanian who face famine, do not think of owning mobile phones or computers, they work hard to solve their primary problem which is hunger.

Tables 16 and 17 show the prices for computers and accessories in Tanzania.

Table 16 Price for Computers, Monitors Excluded <http://www.arusha.co.tz/pr-computers.htm> (August, 2002)

Computers – Monitors Excluded	Prices (US\$)
Aopen 1.6GHz, 256MB, 20GB, 52xCD,	700.00
Compaq 1.2 GHz, 128MB, 20GB HDD, DVD, 56K modem, Win XP	838.10
Compaq 1.5 GHz, 128MB RAM, 20GB HDD, DVD, 64VRam, TV-card, SB Live, 56K modem, Ethernet	1,188.00
Compaq Deskpro EVO 300: P4-1.5GHz, 128MB RAM, 20 GB HDD, CDROM, NIC, Win98SE	1,216.00
Toshiba 1.6GHz/256/30GB/14.1"TFT/DVD-CDRW/56K/Ethernet/Win XP Home	2,450.00

Table 17 Price for Monitors <http://www.arusha.co.tz/pr-monitors.htm> (August, 2002)

Monitors	Price (US\$)
Acer 15" SVGA	147.75
Acer 17" SVGA	204.57
Compaq MV540 monitor: 15" SVGA with attachable loudspeakers	317.00
Compaq S510 monitor: 15" SVGA	252.00
Compaq FS740 monitor: 17" SVGA with attachable loudspeakers	364.00
Compaq S720 17" SVGA Monitor	331.26

Tables 16 and 17 indicate that the cheapest computer can be bought at US\$ 847.75. Many people in Tanzania cannot afford to pay this amount because of low income and high unemployment. This is the reason why computers and other modern ICT tools stay longer in stores than on users' desks. Out of Tanzania's population of 33 million people only 13.495 million people are working. This is about 41% of the whole population (www.cia.gov 2000). Therefore, high prices for modern ICT services and infrastructures, and low income are other major factors hindering their expansion in Tanzania. Simputer that cost about US\$ 200 will solve many problems caused by lack of computation facilities.

4.2.5 Cultural Differences

The Internet, mobile phone interfaces and other modern ICTs that are used in Tanzania are made by western and they reflect western culture. Swahili is not among the interaction languages between users and ICT, many people in Tanzania speak Swahili. The Internet page displays and pop-ups are not in accordance with what most Tanzanian would like to direct their eyes on. For example, the most widely used public servers that offer free e-mail services like yahoo and msn (hotmail) have some advertisements that do not conform to Tanzanian culture. Figures 17 and 18 show some of the advertisement captured from msn and yahoo email programs. The advertisement photos can go well in western societies, but in Tanzania especially in Zanzibar with many Muslims, this can be a serious problem.

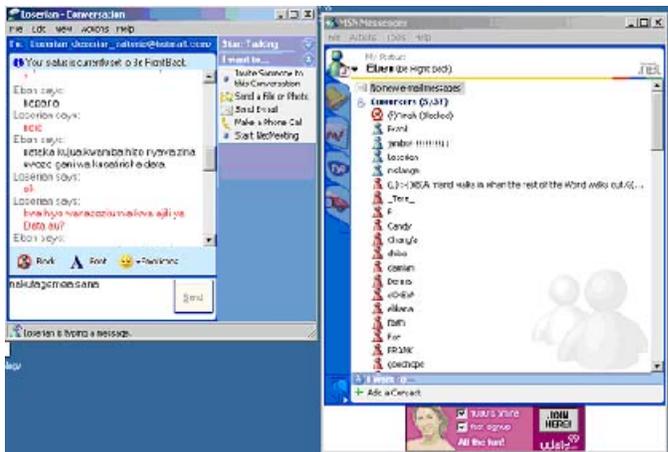


Figure 17 E-mail Advertisements (MSN Messenger 2002)

When I finished sending and reading my yahoo e-mails the following advertisement was on the closing page



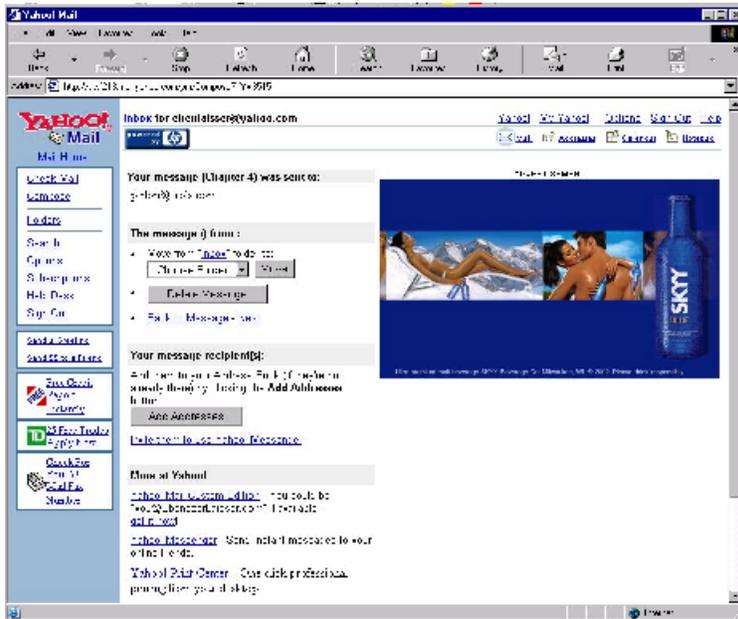


Figure 18 Yahoo E-mail advertisement (yahoo mail October, 2002)

Any Internet user has met this kind of advertisements, or even ones more pornographic than these. Because of this, some religious organizations teach their members that the devil is using the Internet. Parents also ask their children to stay away from the Internet. Figures 17 and 18 express how cultural differences can hinder the expansion of modern ICTs in Tanzania and Africa as a whole. Dressing in Africa and Arabic culture is different from dressing in Western culture. This has to be considered when designing web pages that are to be used globally.

The main concern is to see how modern information and communication technology can be brought to Africa in accordance with African cultural values. African culture has to be accommodated when transferring technology to Africa. Otherwise, the western culture, which is carried by modern ICTs, will create resistance from potential African users. There is a good example to learn from Finland with a population of 5.5 million people, computer's operating systems and other software have been translated into the Finnish language. Living in Finland, I have realized that computers with foreign language software are very rare. Most computers in Finnish schools are installed with software translated Finnish. In this way, Finland is maintaining her culture in information and communication technology.

Tanzania with the population of 33 million people does not have any computer operating system translated into Swahili, Tanzania national language. Karima Bounemra Ben Soltane (2001)

urges, “To make its participation in the information economy a success, Africa must face the challenges of globalization and accelerate the building of its ICT environment.” I agree with Karima that African countries, Tanzania included have to participate in the designing and production of ICT for Africa.

The process of translating or localizing software is expensive, but only by doing this majority will have access to modern ICTs. It is true that translating ICTs into Finnish is among the reasons why there are so many users in the country. There is no doubt that countries like Germany, France, Denmark, Norway and Sweden are doing the same. The mobile phone is another example; there are many languages that can be selected in mobile phones in which the user can interact with the system, but Swahili is not among of them. Therefore, a Tanzanian man or woman who does not know any of these languages inserted into the systems, cannot use them. Thus, also cultural difference is another factor that hinders the expansion of modern ICT in Tanzania.

4.2.6 The Digital Divide

The digital divide concept expresses to what extent the developing countries are technologically isolated from the developed countries. Modern ICTs are coming to Africa quickly but there is still a long way to go to empower the majority living in African societies to access modern technologies. There are many reasons for this; the lack of infrastructure, the lack of skills and the low incomes in the region. Currently, submarine cables that enable fast and massive communication connect the continents of the world, but part of Africa is still connected with weak cables and other parts of Africa are connected with satellite system, Tanzania included. This digital isolation has caused many consequences like high prices for communication services and insufficient Internet connection to support academic programs such as video conferencing. Miller et al (2001) report that there has been a plan for installing optic fiber cables to join South Africa and West Africa to Europe. Unfortunately, Tanzania is not among the countries that will benefit from this first phase. They reported further that the project was expected to be finished in December 2001, but as usual, most African projects require additional time to be completed.

This is due to the lack of sufficient funds and skilled labor. These reasons make the viability of most African projects uncertain. Sometimes projects in developed countries are also delayed, but

for different reasons such as underestimation and unforeseen technical difficulties. Figure 19 shows the network of submarine cables that connect all continents except Africa. For example, The Finnish universities Network (FUNET) get the Internet connections of up to 2.5GB from this network. This is sufficient to allow schools and other sectors in the country to access information. So far Tanzania is still connected to the world through satellite system.

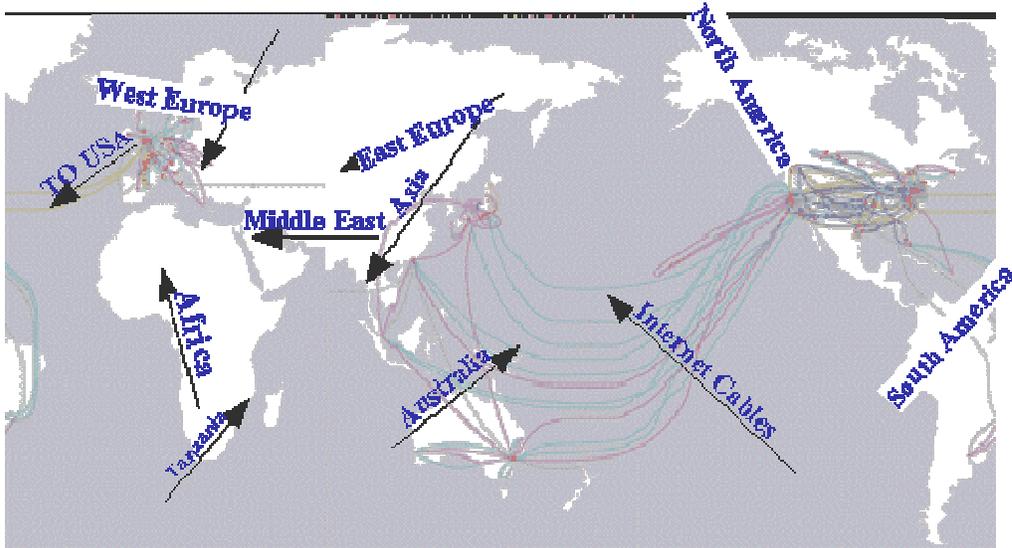


Figure 19 Digital Isolation for Africa (Adopted from <http://www.howstuffworks.com/>)

If you take a close look at the maps in Figure 19 you can see that the distance between North Africa and Europe is shorter than that between Europe and North America or between North America and Australia. There are many reasons for African digital isolation, some are economic and others are political. For example the crisis in Zimbabwe has both economic and political sides, the civil wars in Burundi, Angola, Sudan and parts of West Africa, the interregional wars between Uganda, Congo and Rwanda have caused many drawbacks in economic and technological development. These crises cause most donors' countries and international organizations to cease their development support, ICT included. The political and economic reasons for the digital divide are outside of the scope of this thesis. Our aim is to look at the consequences of this digital divide to the development of Tanzanian small and medium size enterprises and regional development as a whole.

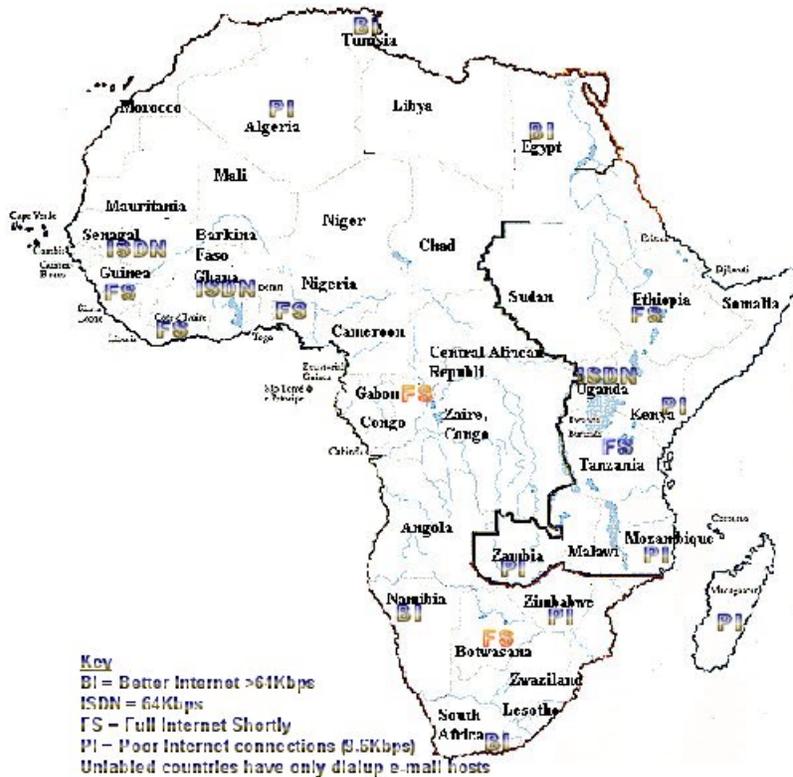


Figure 20 Internet Structure in Africa (Adopted from Mike Jensen 2002).

The digital divide has caused Africa to have poor communication systems that make communication centers to depend on European communication systems. The map in Figure 20 shows the Internet structure in Africa. However, in the near future the communication structure in Africa will change as some countries like South Africa and West Africa are reported to have cable connection of up to 20Gbps. The submarine cables link Northern and Western Africa countries to Europe and Asia were launched in Dakar in May 2002. Now, its 20 Gbps capacity between Europe, West Africa and South Africa is already fully subscribed and is to be doubled within a year downstream (AfricanOnline News 2002). Tanzania is not yet among the countries that are in this first phase of cable connection, but the fact that West Africa and South Africa are connected will encourage other countries in East Africa, Central Africa and Southern Africa to build the connection.

5.0 Recommendations

In this chapter we will offer some recommendations to different institutions like the Tanzanian government, business enterprises and academic institutions. As we have seen in the preceding chapters, modern ICTs can offer different and most effective opportunities for improving SME performance and poverty eradication in Tanzania. Here we will offer some recommendations on how to expand modern ICT infrastructures and services in the region.

The Tanzanian government has made remarkable changes to motivate investment and the development of ICT infrastructure in the country. The import duty exemption for computers and computer accessories has contributed much to the level of modern ICTs in the region. We recommend the following initiatives to the Tanzanian government as for expanding modern ICTs and bringing regional development in the country.

5.1 Establish Information Centers

Figure 21 shows that it is possible to connect every Tanzanian town to the Internet through landline telephone networks that already exist. The TTCL telephone network is reported to have the capacity of transmitting 2Mbps. In other words the ISDN system can be built in this network because it requires cables with at least 64Kbps bandwidth. And as we have mentioned above, the ISDN system can be built in a way that the telephone and the Internet can be used simultaneously. See Figure 21 for possible Internet connections in Tanzanian towns.

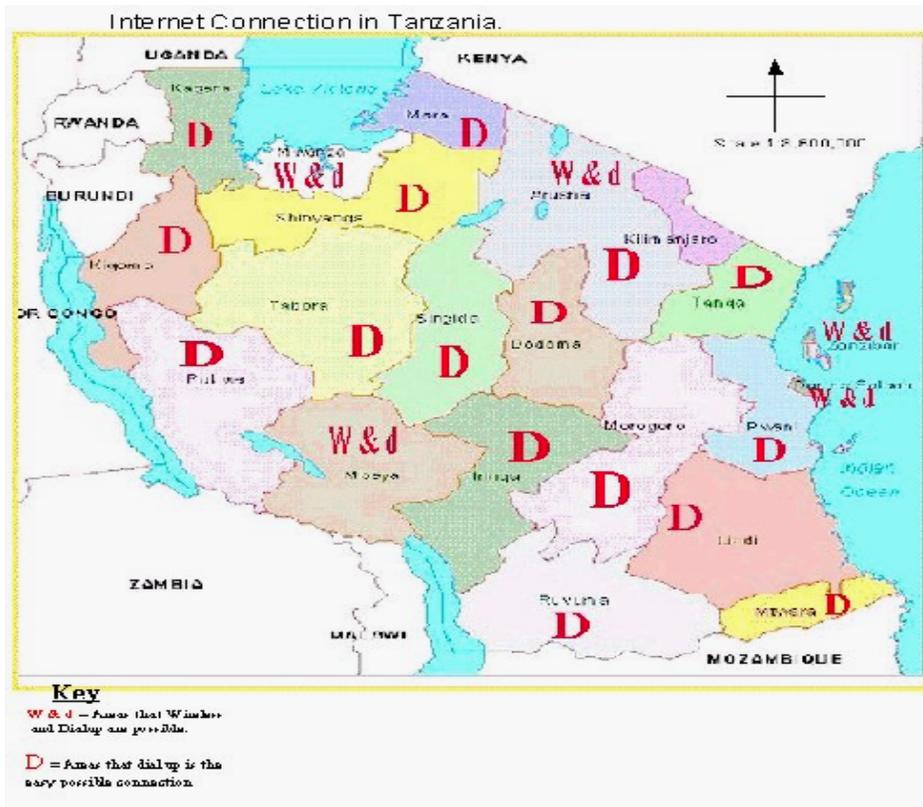


Figure 21 Possible Internet Connections in Tanzania

In the following we estimate the cost of establishing public information centers in Tanzanian towns. Say the government starts with centers each having ten computers. The advantage of free Internet services from SimbaNet will be used. So the cost for Internet connection will only be the telephone bills. There are 26 regions in Tanzania, so we will calculate the costs for one region and then multiply this by 26. The important information will be downloaded and set offline every evening when telephone charges are low. Offline setting allows users to access web material without Internet connection. Since the computers are networked at the center, the information is downloaded into one computer (server) and then distributed to other computers. Say the download will take one hour to be online. The cost per minute calling mobitel (SimbaNet) during off peak is US\$ 0.43 per minute.

10 Computers (US\$)	8477.50 (see Tables 16 and 17)
Furniture	<u>1000.00</u>
Sub total	9477.50

With a sub total of US\$ 9,477.50 ten computers and the necessary furniture were calculated for one center. Multiply that amount by 26, the number centers in the country, and we will have US\$ 246,415.00 which is the total for buying ten computers and the necessary furniture for one center in all 26 regions of Tanzania. The following are estimates for operational costs on monthly basis for one center.

Telephone (0.43 x 60 x 30)	774.00 (Refer to Table 14)
Average rent	150.00
Power Supply	50.00
Personnel and Maintenance.....	<u>400.00</u>
Subtotal -----	1,374

Multiply the above sub total by 26 centers in the country and we get US\$ 71,448 as the total monthly operational cost for the information centers in the country. In other words, the Tanzanian government or any donor who wants to expose Tanzanians to information and communication can set an annual budget of **US\$ 857,376** as operational costs and **US\$ 246,415.00** as initial cost for one center in all 26 Tanzanian regions.

There are many advantages that will be realized by establishing these centers, like motivating Tanzanians to learn and use modern ICTs, They can be used for learning basic computer skills as well. Another advantage is that the centers will enable the government to gather public opinion more efficiently. Schools, health and research institutions can get more up to date information from these centers. The central government can hold meetings with regional representatives through NetMeeting and/or Videoconferencing from the centers, which in turn will save time and money used for traveling. People will be paying affordable amount that will make majority to be able to access information. The center's supervisors will set time for each person so that majority can have access to the computers. The income will be used for maintenance and expansion.

5.2 Subsidize PH Radio E-mail Program for Rural Areas

Where the centers mentioned cannot be used because of the lack of telephone lines, the government can subsidize PH Radio E-mail programs so that rural people can communicate through modern ICTs. If the mobile phone network reaches those areas, it can be used to connect computers to the Internet as shown in Figure 4. The problem of the PH Radio E-mail system is that it is limited to an e-mail program only while the other above mentioned alternatives allow users to access more Internet information; they are able read newspaper, education and health web pages as well as other information that are important to the community. BushMail (2002) reported that bushmail is e-mail to and from the African bush via radio waves and the Internet. Totally remote individual lodges and clients make use of their HF Radios. You, as a bush-person connect via your radio and new radio modem direct to one of our main "radio Internet" servers in Africa, which may in fact be thousands of kilometers away from your bush facility. So we recommend the PH Radio program for people who are far away in rural areas and cannot be reached by landline or mobile telephone.

5.3 Encourage ECommerce Enterprises in Rural Areas

We also recommend that the Tanzanian government should encourage more people and enterprises to run ecommerce from rural areas in order to bring even development in Tanzania. We have seen how the number of computers has increased in the country after exempting them from import duty, which in turn has increased the computer literacy rate in the country. We recommend the same to be done for ecommerce that will operate from rural areas so more people will be employed, the social services will be improved, less people migrate into the cities and idle resources will be used in a more effective way.

5.4 Use the Existing Infrastructure to Expand the Internet Network

There are many possible ways to expand the Internet network in Tanzania. For example, the railway cables that are used for railway communication have been used to expand the Internet network from Dar es Salaam to Morogoro. Tanzania Railway Corporation TRC (15 October, 2002) reported that the Internet connection between Dar es Salaam and Moragoro was by fiber optic cable 140Mbps and the type of transmission was Plesiochronous Digital Hierarchy (PDH), which covers a distance of 202 km.

The University of Dar es Salaam and the academic institutions in Morogoro like Sokoine University of Agriculture, the Institute of Development and Management (IDM) can use this Internet connection. These institutes and others can work together through videoconferencing and other online academic opportunities. Business enterprises, community development, government and nongovernmental organizations would all benefit from this network expansion.

There is also a need to motivate people in these areas to participate in this modern ICT liberation by becoming users of this system. TRC reported further that there is another connection through the same cables from Morogoro to Dodoma, which was built on Synchronous Digital Hierarchy (SDH) with the capacity of 155Mbps. We understand that there are railway cable networks that pass through different towns of Tanzania as shown in the Figure 23. Therefore we recommend that ISP, education institutions, government organizations and other enterprises work together in making use of the existing resources to expand modern ICTs in the region.

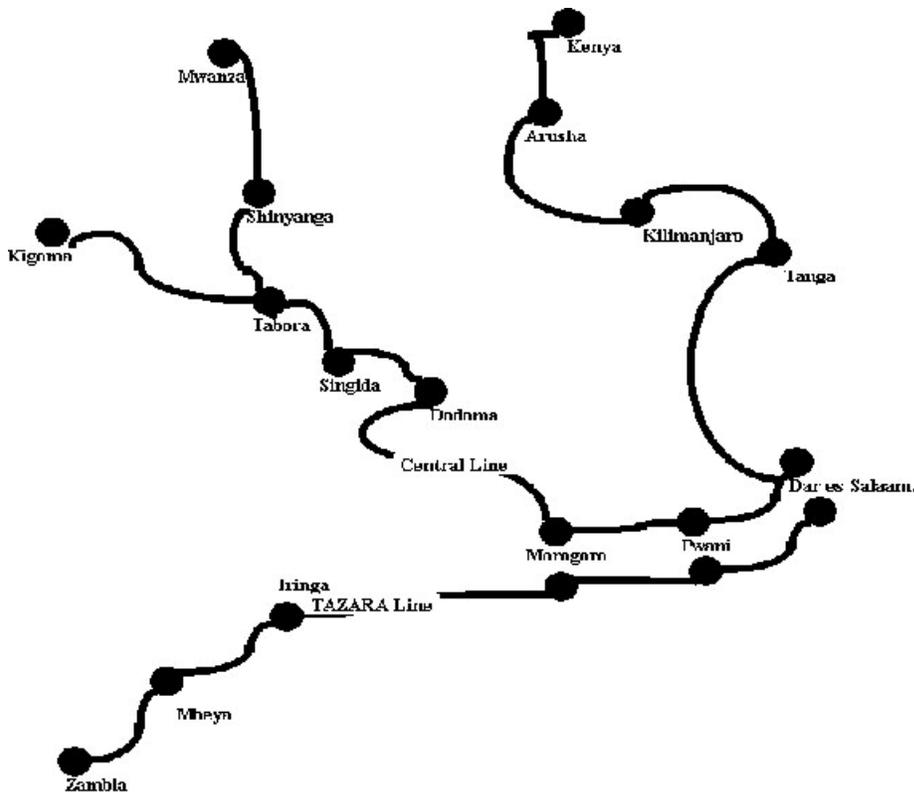


Figure 22 Tanzanian Railway cables

Like railway cables, the study can be conducted to evaluate if the existing electricity cables can be used to expand communication network in the country. Electricity cables connect most of Tanzanian big towns. Some communication companies in Germany are currently working on possibilities to use electricity cables to expand communication network. For example, German electronic giant Siemens is working on the possibilities of using existing electricity cables to deliver high-speed voice and data services. In the U.K communication companies are building a technology that will enable use of electricity lines for broadband telecommunications (Bob Adams 2002)

5.5 Establish Tanzania Universities Network (TUNET)

Building a network that will join universities and other institutions of higher learning in Tanzania will be another way of solving academic problems. Through this network, the academic institutions can share and maximize the utilization of teaching resources. For example, through video conferencing a professor from one institute can offer lectures to students in other institutions. The system will allow maximum collaboration between students from different institutions; for example, they can use chat, email and NetMeeting programs to discuss in academic courses. Professors and other teaching staff will be able to share their teaching materials; for example, they can download syllabi and lectures from other schools for reference. The next phase will be the recommendation to build the East Africa universities' network. Three countries; Kenya, Tanzania and Uganda have united to form the East African Community (EAC); therefore, university collaboration through networks can be formed as, part of this union.

The Scandinavian countries have been operating in this way and it is a good example for East Africa to learn from. For example Finland has a network (FUNET) connecting all universities and some other colleges, and the national network is connected to other Scandinavian countries like Sweden, Denmark and Norway (Figure 26). Academic institutes should work together with Internet service providers and TRC to see how they can utilize the existing infrastructure like the railway cable network in order to build up this network. One of the reasons that make Internet connection expensive for universities and other academic institutions is that they do not work together to find solutions. Academic institutions could provide possible solutions for Internet problems to the government and ICT services providers for implementation.

Figures 24 and 25 are imaginary pictures for networks of Tanzanian and East African universities. 26 show the Finnish University Network, which is a model for these imaginary networks.

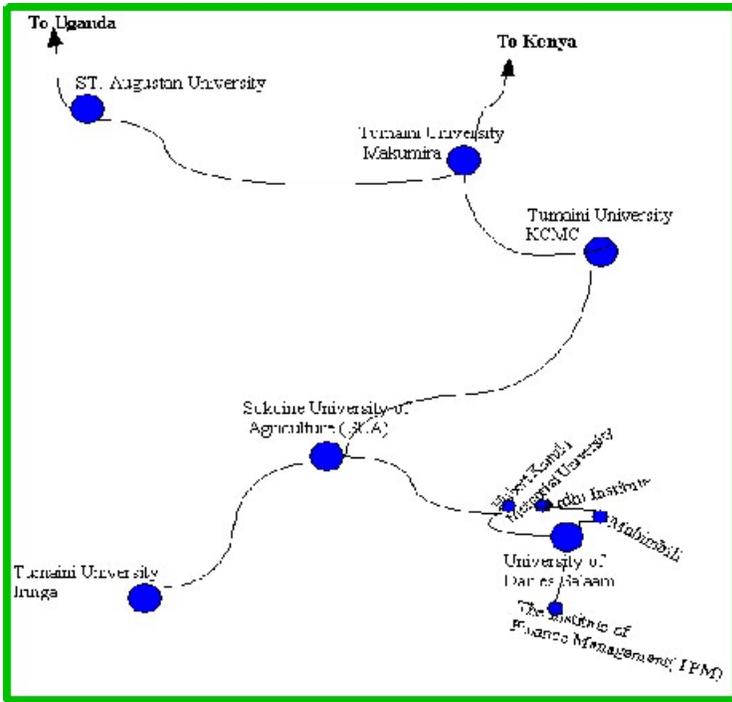


Figure 23 Imaginary Tanzanian Universities Internet Network

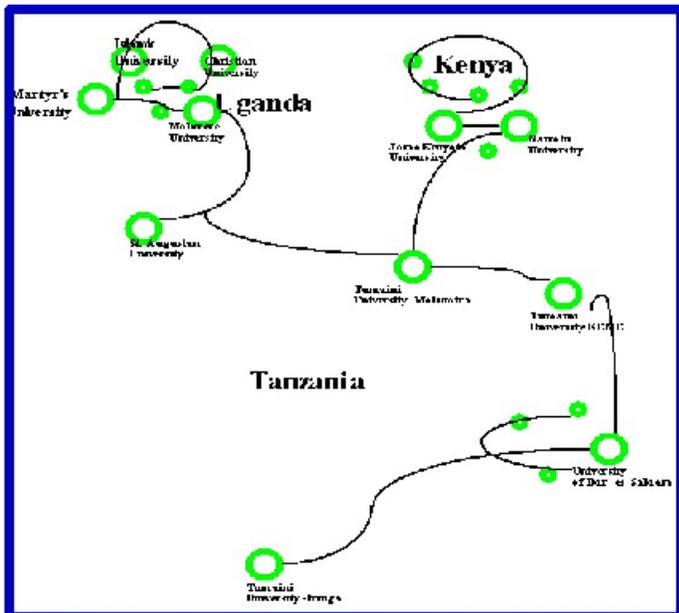


Figure 23 Imaginary East African Universities Internet Network

Figure 26 shows the Scandinavia universities network that we recommend for Tanzanian and East African universities to build in order to improve education standards in the region.

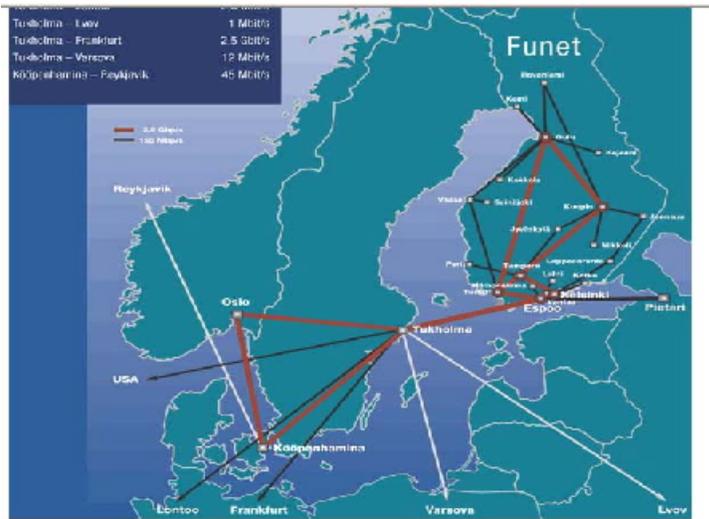


Figure 25 FUNET Network (http://www.csc.fi/kuvat/funetkartat/FUNET2002_suomi.gif)

If the Internet network is expanded as recommended above, the Tanzanian universities network will get established, which will solve many academic problems in the region such as outdated academic sources. The problem remains with current associated costs for Internet connection in Tanzanian and East African universities Table 6:

5.6 Collaboration between Schools and Small and Medium Size Enterprises

Many schools can contribute to teaching information and communication technology courses to the neighborhood. Enterprises can use students from nearby schools to work for them especially when dealing with modern technology systems. Students can be hired at cheap prices to work or to teach personnel how to use new devices like computers and software. Most enterprises in America and Europe employ students during summer holidays or when they write their master's theses. The students have new skills in using new systems, and they are also cheap to employ. The Hartford Courant (2002) reported that thirty students from Bergamann Entrepreneurial Studies Program were working on the site with the merchants; the student can prepare reports to identify the resources and assets needed to expand their business. Merchants have expressed the need for more training in customer service, computer use, and business plan preparation and marketing. The students will not only help them to direct them to those resources, but in the case of computer literacy, they will provide the training. The newspaper reported further that many small business owners were happy with the program of collaboration between the university and their businesses. They quoted Lisa Farrell, the owner of Full Blooms Inc.

“There are a lot of small-business owners that are not equipped when it comes to using certain programs on the computers. I, myself, need to learn more. And I’m grateful this program is available.”

Students can also get credits for working in different projects from enterprises that are connected with the university. For example I have been working on Tanzania virtual project where I got paid and get credit as well. The project is under University of Joensuu and makes teaching material for Tanzanian schools.

Tanzanian small and medium enterprises have to start to make use of universities, colleges and other academic institutions that are located in their neighborhood. This collaboration has advantages for business owners, academic institutions and students. As we have seen above, the business owners learn from students, while on the other hand students get experience and they may also get future employment. The universities will get support from other enterprises, a good reputation and recognition.

5.7 Advertisement of free Information and Communication Technology

There are some free Internet connection services that are not well advertised so that the Tanzanian society can take advantage of them. For example, Mobitel Telephone Company provides Internet connection free of charge. MobiNet (2002) reported, "Mobitel has launched MobiNet, Tanzania's first free Internet connection service. This new chapter of the information age in Tanzania makes the internet available to everybody free of setup fees, connection charges, or monthly subscriptions." The problem is that this information does not reach many people who still pay US\$ 50 per month as subscription fee to other Internet providers. If you want to get this free Internet connection service visit their web page for more information at <http://www.mobitel.co.tz/products/mobinet.html>, but the necessary information to get connected like telephone number to dial is 255 0811 884444, user name is mobinet and password is mobinet. There is also free or open-end software like Linux which is a free operating system, Open and Start office that has the same packages like Microsoft Office but it is free. Software are expensive and are added to the price of computers. We recommend to computers sellers that they install these free software to lower the prices of computers in Tanzania.

6 Conclusion

The thesis has covered different topics on opportunities that modern ICTs offer SMEs and regional development in Tanzania. We have answered the research questions; what information and communication technologies are available in Tanzania? How can modern ICTs improve the performance of Tanzanian SMEs? What is the role of ICTs in other development sectors? What factors are hindering modern ICTs development in Tanzania? And what is the relationship between modern ICTs, SMEs and regional development?

Modern ICTs have played a key role in the development of developed countries. Developing countries will have a long way to development if they leave modern ICTs behind. Modern ICTs will improve the performance of SMEs in the region, reduce operational costs and increase profit margins. Modern ICTs minimize operational costs like communication and information processing expenses. This applies both to government and non-governmental organizations.

Modern ICTs add opportunities in the society so that marginalized groups like women can get social services like education and health and participate in the decision making processes. Modern technologies can play a key role in controlling diseases like HIV/AIDS that kills hundreds of people daily. There are many positive changes that ICTs can bring in Tanzanian communities that can be hard or expensive to achieve otherwise.

ICTs have are very important for SME growth and expansion. They can contribute much to poverty eradication. The increase/expansion of SMEs in the country is a good indicator for development. First people get employment and second the government gets taxes. The government needs to encourage both foreign and domestic investors to start and run SMEs in Tanzania. The most effective way of doing this is through modern ICTs, like publishing investment policies on the web pages and uploads on the Internet.

Poverty, poor ICT infrastructure and the lack of ICT skills among the majority are major factors that hinder development of ICTs in Tanzania. The poor ICT infrastructures are among the major reasons for slow expansion of small and medium size enterprises.

Both poor ICT infrastructure and slow expansion of small and medium size enterprises make the development process rather slow and difficult. There is a connection between the presence of information and communication technologies, expansion of small and medium size enterprises and regional development. There is a need for scholars to conduct studies on the causes and solutions for Africa isolation in the field of information and communication Technology.

This study has caused me to think of doing more studies on how cultural difference has contributed to low development of ICT in developing countries. The second one is how modern ICT can be used to improve market of developing countries under globalization.

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Executive Director, EAHP Enterprise / PACT, PO Box 76 011, Dar es salaam, TANZANIA, Tel. +255-22-2150966 Fax +255-22-2150987 Mobile: +255-744-852053 webmaster@ourtanzania.com

European Director, East African Home Pages (Deutschland) KG, P.O Box 300 326, 50773 Köln, GERMANY, Tel. +49-221-9139535 Fax +49-221- 2711016 Mobile: +49-151-12141503 marketing@ourtanzania.com

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- Board of External Trade, Dar es salaam
- Horizons Media Network, Nairobi, Kenya
- Uganda Home Pages Ltd., Kampala, Uganda
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- ♦ Publishing news from Tanzania on the website www.ourtanzania.com. This is a summary of news from Swahili language newspapers (Uhuru, Majira, Mtanzania, Mwananchi and others).
- ♦ Commercializing the website by selling cartoons, pictures and features to the international and local markets.
- ♦ Starting various other IT-related activities. These include importing computers into Tanzania, developing the Tanzanian Internet infrastructure (with a special emphasis on Wireless Internet Access), and other media topics (working with journalists, film makers etc.)

Activities and Deliverables.

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