INFORMATION TECHNOLOGY INFRASTRUCTURE DEVELOPMENT IN THE SOUTHERN AFRICA DEVELOPMENT COMMUNITY: A SURVEY ANALYSIS

by

Zibusiso Ncube

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

Capella University

February 2007

INFORMATION TECHNOLOGY INFRASTRUCTURE DEVELOPMENT IN THE SOUTHERN AFRICA DEVELOPMENT COMMUNITY: A SURVEY ANALYSIS

by

Zibusiso Ncube

has been approved

February 2007

APPROVED:

RAJ SINGH, Ph.D., Faculty Mentor and Chair

JOHN HANNON, Ph.D., Committee Member

GODWIN ONYEASO, Ph.D., Committee Member

ACCEPTED AND SIGNED:

RAJ SINGH, Ph.D.

Kurt Linberg, Ph.D.
Dean, School of Business and Technology

Abstract

The purpose of this research study was to concisely present a strategic plan for developing information technology (IT) infrastructure in the Southern Africa Development Community region. The main objective of this process was to check with the proper regulations for the development the researcher was working on, at the same time being flexible to the needs of the people in the community. The study employed a survey analysis methodology. The study dealt with specification and design of infrastructure, human/machine interface design analysis, software and hardware product quality evaluation, reliability management, product and service performance measurement, and project support activities. The results of this study indicated that once the infrastructure is constructed and the standards adopted, the development and delivery of information technology will be easily accessible in those countries within the region. The physical planning process is dynamic and cyclical, as are most other planning and development processes. This study found that flexibility in the region's information technology infrastructure development contributes significantly to the region's ability to gain competitive advantage in the market place. Therefore, continued investment in the region's infrastructure development should pay off for the regions organizations as they will be able to gain, and sustain competitive advantage over their rivals. Future studies should focus on regional development policies and what impact they have on the socio economic indicators and industrial structures in the region.

Dedication

I would like to dedicate this effort to my late wife Christine, my late parents, my relatives, and friends. To my sons, Ngqabutho and Nkanyiso who have been very patient with me in this endeavor.

Acknowledgments

First, I am grateful to the Lord who has been the guidance of my life. I am indebted to my family, relatives, and friends who contributed to this dissertation. Appreciation is extended to my mentor, Dr. Raj Singh, and committee members, Dr. John Hannon and Dr. Godwin Onyeaso, whose counsel, guidance, and support were very valuable throughout the dissertation process. I would thank Dr. Sheila Bonilla-Fournier and Dr. Jose Nieves, who initially served as my comprehensive examination committee. Also I would like to thank the Capella University faculty whose teachings addressed the principles of my success in this dissertation project.

At the University of Botswana I would like to thank Dr. Balulweni Grand and Dr. Dudu Janke, who introduced me to my interviewees in Botswana. I would like to thank Mr. Ben Khumalo and Mr. Nickson Sibanda who were linkers to my interviewees, and Mr. and Mrs. Bekithemba Dube who provided accommodation and transportation while in South Africa. In Malawi I would like to thank Mr. and Mrs. Banda who tirelessly accompanied me to different parts of the country introducing me to various people I interviewed. In Zimbabwe I would like to thank Colonel Reuben Mgqwayi who arranged my interviews. Also in Zimbabwe, to thank my family members, especially Mr. Jabulani Nkiwane and Mr. Dingilizwe Ncube who took turns transporting me to my interviewees.

I would like to extend a special thank you to the Concordia College staff, especially the library staff, Mrs. Minnie McMillan, Ms. Dorenda Brown, and Ms. Rebecca Jones, in providing reference documents for this dissertation. I also thank Dr. Doreen Moyo and Dr. Chris Adalikwu who tirelessly proof read my manuscript. I also thank Dr. Julius Jenkins, Dr. McNair Ramsey, Mrs. Phyllis Richardson, and Mrs. Haddie Shelton for their prayers and encouragement when I needed it the most.

Last but not the least, I would like to thank my fellow Capella University students, with whom I shared values of academics, especially John Watson and Robin Chisolm. Finally, many thanks to Dr. Solomon Nkiwane, Dr. Horst Richardson, Dr Michael Sidoway, Dr. Vincent Harding, and Dr. John Buuck for their encouragement to endure my ambitions to the end of my academic endeavor.

Table of Contents

List of Tables

List of Figures

CHAPTER 1. INTRODUCTION

Introduction to the Problem

Investing in the information technology (IT) infrastructure for the future is a responsibility for the Southern Africa Development Community (SADC). Current and future electronically based-business processes and transactions to the world are now the heart of almost every enterprise need for a robust information technology infrastructure capability. Information technology enables processes, transactions and services require substantial infrastructure capabilities to operate effectively and efficiently. Business present a unified face to the customer or knowing the customer's entire relationship with the enterprise at any service point, rely on bringing IT assets together from across the enterprise.

Background of the Study

While information systems (IS) management (Yahya, 1993) and implementation (Nidumolu & Goodman, 1996) in developing countries have received some attention in the literature, there are few reports of cases of information systems development processes (Madon, 1992). Most efforts are focused on problems of infrastructure (Odedra, Lawrie, Bennett, & Goodman, 1993; Moyo, 1996). The call for more case study research by Montealegre (1999) was again focused on implementation issues. Information systems research has traditionally focused on organizations in the US and Western Europe without considering how this could be applied and extended to developing countries (Dasgupta, Agawrwal, & Ioannidis, 1999). The actual implementation in developing countries has not been able to benefit from this kind of results, as the local factors pose significantly different circumstances. Several systems have been developed where only the context of region of origin has been taken into account. This has resulted in information systems solutions that are not sustainable, even if they meet the needs of organizations in developing countries.

With globalization and internationalization of labor markets, it is important that policy makers have more contextual knowledge of information systems development in the developing countries. In this regard, a locally-oriented information systems methodology has even been proposed (Korpela, 1994; Korpela, Soriyan, Olufokunbi, & Mursu, 2000), yet comprehensive knowledge of the IS development activities from a real-life example could broaden our understanding of the processes and methods.

New business initiatives often emerge unpredictably, making long-term IT infrastructure investments. Over investing in infrastructure or incompatibilities with business partners, enterprises with greater infrastructure investments are often shared across many applications, multiple business initiatives and often several business units. The demands of new business initiatives are immediate but building a tailored strategy enabling infrastructure often takes considerable time and expertise. Identifying these needs is not easy. While the components of infrastructure are commodities and are commonly available, the management processes used to implement the best mix of infrastructure capabilities to meet specific business strategy needs is a scarce resource. Even more desirable and scarce is a modular, service-based infrastructure tailored to an enterprise's strategy that is created via a series of incremental investments rather than a lump sum up front.

While each research project and each researcher has different ideas about the importance and application of a research project, most agree that there are three distinct purposes of gathering information. The first and perhaps most applicable to professional journals and academia is fundamental research. When a theory is developed and in turn the related hypothesis is tested to determine support for the theory, we are gathering fundamental knowledge about a particular topic area. The purpose of fundamental research is to gather information and advance a particular field of knowledge in order to better understand it and eventually apply what we learn.

Statement of the Problem

The information technology infrastructure in the Southern African Development Community (SADC) is not up to standard, which causes communication inaccessibility for those nations to and from the whole world. Technology is a main driving force for economic development and competitiveness. There is an urgent need to upgrade or develop technological capacities to promote economic growth in the SADC countries. Developed nations Research and Development (R&D) institutes should play a key role in technology development and be able to provide technology support services to meet the needs of the SADC nations. In the SADC nations, the R&D, universities, and industrial partnerships should be strengthened and networked with partners in developed countries. Capacity building, education and training in technology development and management should go side-by-side for policy makers, managers of R&D institutes and entrepreneurs. Strategic thinking is required to develop and manage technological change. The SADC countries need to rely on assistance from international organizations specialized in research development and technology management institutions. Multinational corporations can be important partners in technology transfer, upgrading and capacity building for research and development.

These needs will be based on the understanding and appreciation of the role technology inventions and technology management play today in the changing of global economic and competitive environment and rapid technological pace.

Management Questions

1. What should be done to improve technology infrastructure for the SADC nations?
2. What is needed to teach the population about technology in the SADC nations?
3. What type of equipment to be used for the type of infrastructure in the SADC nations?
4. Who will manage the infrastructure development in the SADC nations?

Research Question

Should the SADC nations invite developed nations to participate in information technology infrastructure development?

Investigative Questions:

1. Who will be involved in the development of the infrastructure?
2. What material will be needed for the project?
3. How will it take to complete the infrastructure development and how much will it cost?

Measurement Questions

1. Where should the infrastructure be concentrated, public facilities or private facilities?
2. Who will benefit most from the infrastructure development?
3. Who will participate for further infrastructure development once it is started?

Abbreviations

DRC. Democratic Republic of Congo

EC. Electronic Campus

GDP. Gross Domestic Product

ICT. Information and Communication Technology

IS. Information System

IT. Information Technology

NGOs. Non-Governmental Organizations

SADC. Southern Africa Development Community

SADCC. Southern African Development Coordination Conference

ITU. International Telecommunications Union

SSA. Sub-Saharan Africa

WTO. World Trade Organization

Definitions of IT Research and Development

Based on the evolution of IT, the research and development related to IT can be defined in at least four different ways, all which are illustrated in Figure 1 (Fossum, 2004).

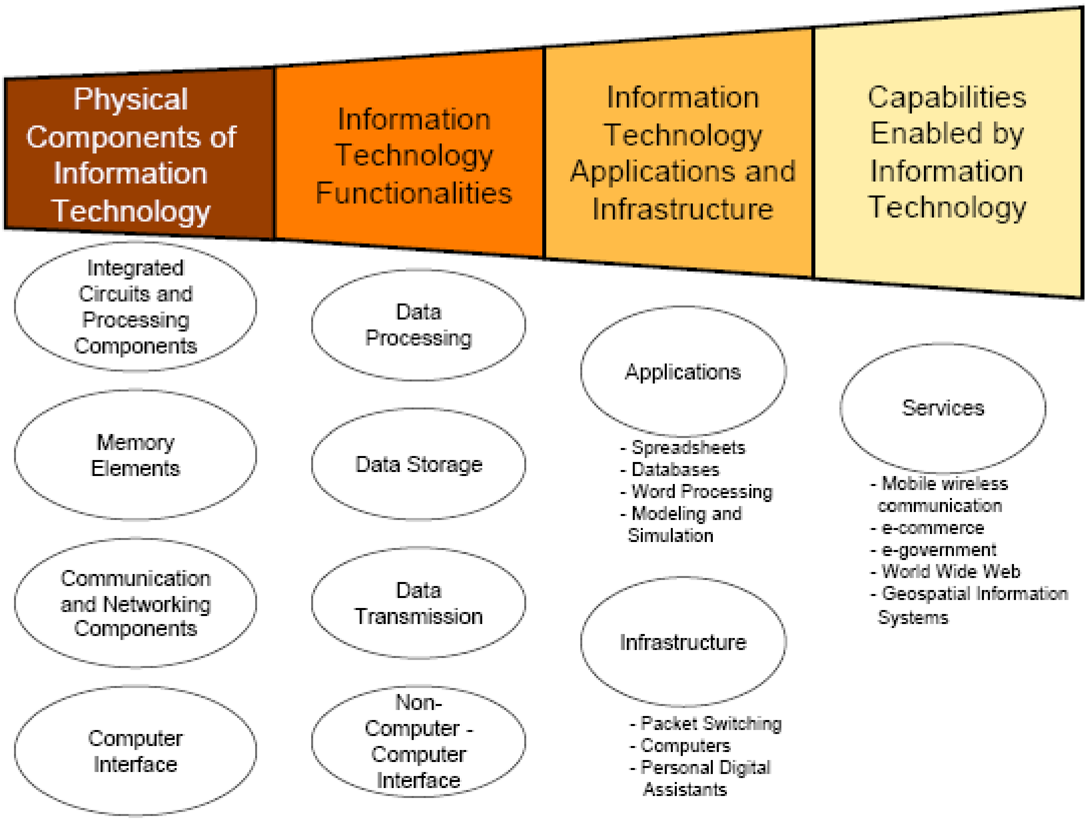

Figure 1. Four definitions of IT R&D.

From "Identifying Federally Funded Research and Development on Information Technology," By D. Fossum, 2004, *Rand Corporation, CT229-1*, p. 7. Copyright 2004 by the Rand Corporation. Adapted with permission of the Rand Corporation.

Depending on whether IT research and development is defined in terms of the physical components of IT, IT functionalities, IT applications and infrastructure, capabilities enabled by IT, or some combination thereof, one will get a different answer regarding how much is spent on IT research and development (Fossum, 2004).

Nature of the Study

First, the researcher developed a conceptual framework of information technology infrastructure through identification and discussion of its elemental components and the inter-relationships among them. Attention was given to the central role that standards apply in the development of information technology infrastructure. This conceptualization was essential to provide a basis for empirical work to investigate the multiple claims of infrastructure impacts.

One theme found in the various definitions of information technology infrastructure was that, it is a shared organizational resource or capability, typically coordinated by some form of central information systems within the organization (Rockart, 1988; McKay & Brockway, 1989; Weill, 1993). For example, a telecommunications network coordinated by a corporate Information System (IS) and shared by multiple business units would constitute a shared Information Technology capability.

Differences exist as to “whether” the infrastructure consists purely of physical IT assets (Gunton, 1989), intellectual IT assets (Weiss & Birnbaum, 1989), or both (Weill, 1993; McKay & Brockway, 1989; Sambamurthy & Zmud, 1992).

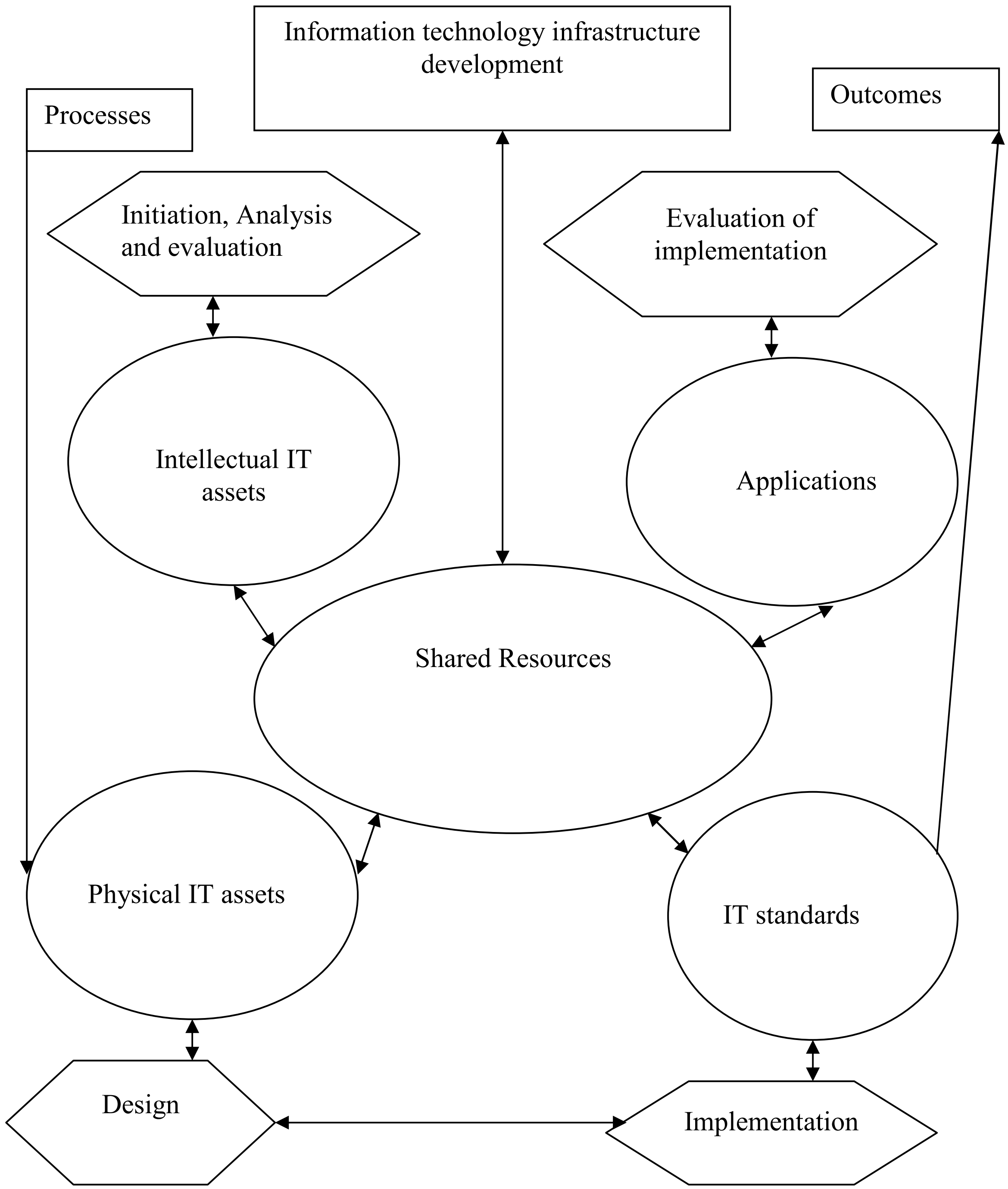

Figure 2. Infrastructure components inter-relationships

Organization of the Remainder of the Study

Chapter 2 reviews the relevant literature to support a theoretical foundation for the research. Chapter 3 describes the research methodology for the study. Chapter 4 discusses the results of the data analysis. Chapter 5 concludes the study and offers recommendations for future research.

CHAPTER 2. LITERATURE REVIEW

Computer technology and telecommunication are the core components of information technology today. Computers provide real-world examples that bring concepts to life, by illustrating the numerous places in which we interact every day and the integral role they play in our lives. Technologies of today and tomorrow include not just computers but a host of other technologies. Working together, these technologies help us see and visualize the world around and communicate the information to a wide variety of computing devices that then help analyze and understand the information.

The Southern Africa Development Community (SADC) nations being far behind in technology expansion are not likely to compete vigorously against developed nations for any capabilities. Development of the IT will only be achieved through intensive partnerships (WSIS, 2003). According to Gompert (1998) developing nations' political economies strengthens the relationship to have a strong partnership not enemies.

SADC Countries Overview

The Southern Africa Development Community (SADC) has been in existence since 1980, when it was formed as a free alliance of nine majority-ruled States in Southern Africa (Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, United Republic of Tanzania, Zambia and Zimbabwe) known as the Southern African Development Coordination Conference (SADCC), with the main aim of coordinating development projects in order to lessen economic dependence on the then South Africa. Today there are 14 member states including the Democratic Republic of Congo, Madagascar, Mauritius, Namibia, and South Africa (see figure 3) (SADC Country Analysis Brief, 2005).

The SADC vision is that of a common future, a future within a regional community that will ensure economic well-being, improvement of standards of living and quality of life, freedom and social justice and peace and security for the peoples of Southern Africa. This shared vision is anchored on the common values and principles and the historical and cultural affinities that exist between the peoples of Southern Africa.

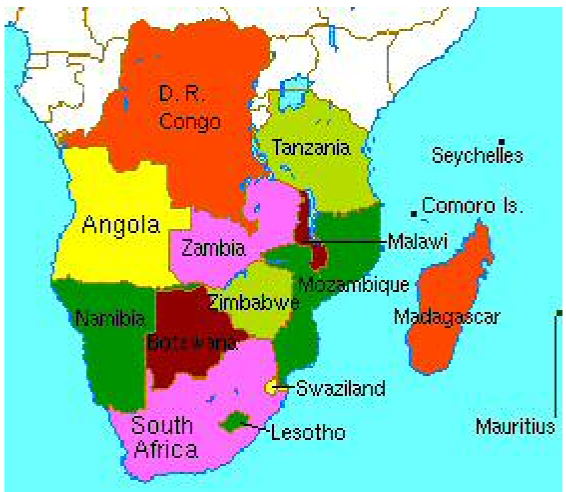

Figure 3. SADC region map.

Economic Overview

In 2004, the combined Gross Domestic Product (GDP) for Southern Africa was approximately $296.4 billion (see Table 1) (SADC Country Analysis Brief, 2005). Individual national economies are structurally diverse and at varying stages of development. South Africa, the region’s most developed economy, has a GDP of $213.1 billion, which is more than double the combined GDP of the other Southern African countries (SADC Country Analysis Brief, 2005). Challenges of post-war disarmament and reconstruction in Angola and DRC, and continuing internal strife in Zimbabwe have adversely affected economic performance in these states.

The Zimbabwe economy has experienced a sharp deterioration over the past five years, with real GDP contracting by about 30% during the period and inflation reaching 600% in 2003, before dropping to 124% in 2005. The economies of DRC and Angola have begun to experience GDP growth as peace agreements in both countries begin to take hold (SADC Country Analysis Brief, 2005).

Table 1. Economic and Demographic Indicators

Country	Gross Domestic Product (GDP), 2004E (Billions of U.S. $)	Real GDP Growth Rate, 2004 Estimate	Real GDP Growth Rate, 2005 Projection	Per Capita GDP, 2004E	Population 2004E (Millions)
Angola	$20	12.2%	14.4%	$1,381	14.8
Botswana	$9	5.4%	4.8%	$4,852	1.7
Comoros	$0.4	1.6%	2.8%	$579	0.6
DRC	$6.0	5.7%	6.0%	$110	54.8
Lesotho	$1.5	4.4%	4.8%	$682	2.1
Madagascar	$3.7	4.7%	5.5%	$211	17.4
Malawi	$2.8	3.6%	4.5%	$248	11.2
Mauritius	$6.3	4.1%	4.3%	$5174	1.2
Mozambique	$6.0	7.3%	6.1%	$305	19.2
Namibia	$5.0	4.4%	3.8%	$2,524	1.9
Seychelles	$0.7	-2.0%	0.5%	$8,348	0.1
South Africa	$213.1	3.7%	4.0%	$4,562	46.7
Swaziland	$2.0	2.1%	1.8%	$1,772	1.1
Tanzania	$11.0	5.7%	5.8%	$266	42.1
Zambia	$5.0	4.6%	4.8%	$489	10.7
Zimbabwe	$3.9	-4.3%	-1.4%	$296	13.2
Regional Total/Average	$296.4	4.0%	4.5%	$1,985	238.8

Note. From "The Southern African Development Community: Country Analysis Briefs, July 2005," by Energy Information Administration, *Global Insight*. Copyright 2005 by EIA.

Technology Considerations

Technology reform and growth are pre-requisites for economic development. The SADC is currently highly dependent on foreign debt in spite of being one of the resource-rich areas in the world. The number of telephones per capita is correspondingly very low. However, in order to maximize their national welfare, the SADC countries must modernize their technology infrastructure, at both the national and regional level.

The importance of technology, in many discussions of development, is contribution to economic growth, through the incremental and radical innovation of skills, machines and organizations (Rush, 1984). Information technology is not just a one single system because no single system can provide all the information needed. Even a simple tool as a network model requires skill to design, time to apply, and money to support the process that will eventually use it. But skill, time, and money are scarce resources that SADC nations can ill-afford.

Consequently, one must evaluate the costs as well as the benefits associated with implementation. In other words, one must do a formal analysis, using methods such as benefit-cost or cost-effectiveness analysis, to determine if the benefits received from implementation outweigh their costs (Khan, 2000).

Economic studies for information technology union (ITU) have revealed that the revenue per added line in Africa is an average of $4500 (SADC 1998). Hence, the well-documented fact demonstrating the direct correlation between telecommunications investments and GDP is undeniable (Mansell & When, 1998).

As for the needed IT-induced urgency, it can be established in many ways. For instance, Africa's traditional primary exporters have been increasingly displaced by new and more efficient producers from other regions. However, many of the technologies are so new that to realize their full potential requires models for technical implementation and institutional collaboration which have yet to be developed (Jensen, 1999). Africa's primary exports have also been losing markets because final products are continuously embodying more information and less material. Between 1980 and 1996 Africa's overall world trade share fell from approximately 6% to 1% (Bhalla 1996; IMF, 1998). The comparative advantage of African nations' trading of primary products-- more than 90% of their exports-- continues to erode against knowledge-based products. Evidence is accumulating which suggests that national economic leaders, government bureaucrats, civic organizers, corporate officials, and family heads (i.e., leaders of all societal institutions), particularly in underdeveloped countries, are being penalized due to failure to adopt IT (Mansell & When, 1998). Moreover, according to the present course of trends, unless IT is systematically adopted in the SADC countries, they will be unable to retain market share of traditional industries, let alone go upstream with the higher value-added production that is deemed absolutely necessary for human development (Mansell & When, 1998).

Factors Bearing on Technology

The major factors bearing on technology in the SADC region are those of cost and the lack of availability of telecommunications infrastructure. Computers are expensive – far too expensive for the vast majority of individuals in SADC regions (Mundy & Sultan, 2001).

However, there is also a need to accelerate the efforts to expand access, particularly in rural areas. The significant and perhaps growing division between rural and urban Information and Communication and Technologies (ICT) access in the SADC countries can only be remedied with innovative public-private partnerships that encourage increased investments by the private sector (Guislain, 2002).

In addition, *Internet* access falls well below the world benchmarks (see Table 2). Recent statistics show that less than 1% of people in the SADC can access the *Internet* due to some reason which can be seen in Table 2 (Guislain, 2002).

Table 2. Comparison of Internet Access in the SADC Countries

Country	ISPs	Users	Inter-Bandwidth (Kbps)	Call Cost (US$/hr)	Internet Density Population /User	Speed (Users/Inter. Kbps)
South Africa	75	900,000	600000	1.6	49	15
Zimbabwe	17	10,000	2000	4.00	1,192	5
Tanzania	14	2,500	1098	1.94	12,876	5
Mozambique	6	3,500	384	0.8	5,340	9
Namibia	6	2,000	1000	1.00	827	2
Botswana	6	1,000	640	0.60	1,551	2
Mauritius	6	1,000	896	1.00	1,154	1
Angola	5	1,750	192	6.00	6,838	9
Zambia	3	3,000	256	1.6	2,897	12
Malawi	3	2,000	128	1.56	5,189	16
Swaziland	3	900	64	0.95	1,036	14
Seychelles	1	1,000	128	--	76	8
Lesotho	1	200	10	--	10,920	21
DRC	1	200	64	--	246,040	3
Total/Average	147	929050	66860	1.7	149	8.2

Note. "Internet Density" is the ratio of population to users. "Users/Int Kbps" is the number of Internet users for every 1 Kilobit per seconds of the total International bandwidth. From “Connecting Sub-Saharan Africa: A World Bank Group Strategy for information and communication technology sector development” by P. Guislain, 2005, Herndon, VA: World Bank.

To access the *Internet*, it requires a computer with the appropriate software, a telephone line and relevant skills for one to be connected on to the *Internet* (Madakufamba, 1999). However, the cost of acquiring a computer, opening and running an account with a local service provider and the monthly telephone bills are beyond the reach of many SADC citizens

(Madakufamba, 1999). Available statistics show that there are only 14 million lines for the 700 million people in Africa (Madakufamba, 1999). According to Mike Jensen (1999), a South African-based *Internet* expert, there are between 800,000 to one million *Internet* users in the SADC or one user for every 4,000 people. Just over three percent of the total for the region is outside South Africa. With 10,000 users in Zimbabwe, the other 20,000 are shared among the remaining 12 member states (Madakufamba, 1999).

The World Bank Group (WBG) retains its focus on helping the SADC countries to address instances of market failure in telecommunications sector development, on creating demand for ICT through innovative applications, and on promoting the development of a regional market (Guislain, 2005).

Equipment is of little use, unless knowledge about how to operate, maintain and adapt such equipment to local conditions (Odedra-Straub, 1990). Even though the SADC countries can obtain the equipment, they still need to be serviced by trained personnel. Furthermore, the cost of maintaining tele-centers is being increased by theft of equipment (Mundy & Sultan, 2001). Connection fees and online charges are high in Africa, with telephone companies mostly being state monopolies (Mundy & Sultan, 2001; Murphy et al., 2002). Although these state monopolies provide telephone connections, the connections are slow and unreliable in urban areas. There are scarcely any of these in Africa's rural villages, most of which lack basics, such as electricity and roads (Mundy & Sultan, 2001). The average number of telephones in sub-Saharan Africa in 1992 was five per thousand people. In contrast, most industrialized countries have over one telephone for every two persons (Guislain, 2005).

Regional Telecommunication Today

African heads of state expressed their strong support for initiatives that will help create regional infrastructure in Sub-Sahara Africa and increase connectivity throughout the region; they recognize that regional integration of telecommunications makes private sector investment in infrastructure more attractive and leads to regional economic integration (Guislain, 2005).

A great majority of intra-African traffic is being routed through Europe and elsewhere via satellite links resulting in high transit charges and a significant financial drain. In response to this urgent need, NEPAD has highlighted international broadband connectivity as one of its six ICT priority projects (Guislain, 2005).

Networks

Beginning with postal services, then with the telegraphy, finally the telephone, telecommunication was targeted at enabling information exchange between major centers and markets, and served effectively in international trade. That was the model of the Post, Telephone, and Telegram Company (PTT), which originally evolved in Europe over a century and one half ago.

In developing their technology networks, the SADC countries should own their networks to eliminate international dependence rating costs and standardize a single accounting rate cost for all across African countries.

Technology Distributed Network Interfaces

There are two types of commonly used information technology networks: local area network (LAN) and the wide area network (WAN). LAN is a combination of hardware, software, and communication channels that connect two or more devices that are in a close physical proximity. LANs typically use only cable transmission medium, such as twisted-pair wire, coaxial cable, or fiber-optic cable (Jessup & Valacich, 2003). WAN; on the other hand, ties together large geographical areas by using microwave and satellite transmissions or telephone lines. The most famous wide area network is the *Internet*, which connects thousands of smaller networks and millions of users all around the world.

There are a number of other issues that relate to communications distributed interfaces that are more complex (Cartwright, et al., 1998). Examples are systems integrators which are well versed in hardware and software issues, because different information systems often use incompatible hardware and software. Often, overcoming incompatibility issues is one of the most difficult aspects of integration (OZ, 2002). Systems integration has become increasingly complex because IT professionals must integrate systems of different companies so that they can communicate and work well using telecommunications.

One of the most basic ways that telecommunication connects an individual to information systems is by connecting personal computers to servers or mainframe computers so that data can be downloaded or uploaded. For example, data file or document file from a database can be downloaded to a personal computer for an individual to use. Some communications software programs instruct the computer to connect to another computer on the network, download or send information, then disconnect from telecommunications line (Stair & Reynolds, 2006).

Telephone Services

The telephone service in the SADC region is concentrated in large cities, living rural areas almost unsaved. Even though concentrated in large cities the services are very poor, and account for other regions within the continent. With telephone access, an industrialized nation is accessible to almost every household and the service is granted to be perfect. For example, the US telephone service to every 1 household would equate to every 100 households in the SADC cities.

The telephone upgrade in the SADC does not attract investors. This is due to government's control of the phone. Investors tend to shy from investing in telephone systems in fear of revenue loss or high tariffs charged by the governments.

Wireless Services

Cell phones have become more prevalent to the SADC region. Connectivity has been established to the SADC but not as expected to support the majority. The cell phone systems depend on leased lines from private enterprises that operate transmission towers. Cellular phones are quite popular to those who can obtain and afford them. Demand for cellular phones has been exceedingly high. Similar to the telephone, cellular phones are congested within the city limits. Rural areas are left without the service of cell phones, since there are no towers to support their transmissions.

Cell phones are the ideal means of communicating in the rural areas, since people in the rural area are dispersed apart. Tower building projects in rural areas can be very convenient for rural people to connect with the world.

Constraints Affecting Technology Within the Region

It is obvious that demand for networking is exploding. Users want more applications over greater distances and delivered at higher speeds. At the same time, budgets are not growing by any means near the rate for the SADC region. Most network budgets are either stagnant or are growing only 5% to 10% per year (Panko, 2003). To meet exploding users' needs, it is important for network managers to be extremely cautious about the cost of whatever technologies they elect.

Panko (2003) explains that the only reason that network administrators have been able to keep up with exploding user needs is that technology costs are falling rapidly. However, hardware, software, and carrier services are only a fraction of the total cost of running a communication network. For instance, capital equipment purchases account for just under half of the average networking budget (Gaudin, 2001).

Another large cost element is labor. A third of the average budget is employee labor. A new complex networking technology system can be very expensive to plan and implement as well as produce high labor costs to operate on a day-to-day basis. Although hardware costs are falling rapidly, hourly labor costs actually tend to increase overtime. In addition, the users who need the system to do their functional work will also have labor costs to implement and use the technology systems.

Factors Bearing on Education and on Learning Content and Media

In Africa as a whole, the current estimates of the number of African *Internet* users is around 5-8 million, with about 1.5-2.5 million outside of North and South Africa. This is about 1 user for every 250-400 people, compared to a world average of about one user for every 15 people, compared to the average of about one in every 2 people in North America and European countries. The UNDP World Development Report figures for other developing regions in 2000 were: 1 in 30 for Latin America and the Caribbean, 1 in 250 for South Asia, 1 in 43 for East Asia, 1 in 166 for the Arab States (Africa Internet Infrastructure Information, 2002).

Internet-connectivity in the region is low partly because of low penetration of personal computers and low tele density (SADC Today, n.d.). Available statistics show that there is an average of two computers per hundred people in SADC, and only five people for every hundred have access to a telephone. *Internet* users are estimated at 930,000 in SADC or one user for every 204 inhabitants, compared to the world average of one user per 40 inhabitants (SADC Today, n.d.). With the exception of South Africa, all the other countries have *Internet* connectivity concentrated only in the capital city or the second largest urban centre. This has resulted in the exclusion of citizens in remote areas, and limited economic growth (SADC Today, n.d.).

Physical access is not the only or even the most important factor influencing technology education in Africa. Very few African countries can meet educationally sound and inclusive access to Information and Communication Technology (ICT) (Lelliot & Enslin, 2000). Although there are already distance education institutions operating in Africa, the success of these institutions differs from country to country.

Using ICT as a means of education will not be effective if there is no certain critical level of education, a condition that in most of Africa has not been met as yet (Lelliot & Enslin, 2000). The overall literacy rate generally remains low in many regions in Africa (Chale & Michaud, 1997). In the main stream education systems the school enrollment rates are low, school drop-out rates are high, and teacher-to-pupil ratios are discouraging (Gilpin, 2000). The ability of learners to do self-study based on prior learning at schools is therefore low. This complicates attempts by students at distance learning. The foundational background in languages acquired at schools is not always adequate for self-study in the major international languages (e.g., English, French) (Mundy & Sultan, 2001). Research shows that distance learning requires substantial selfdiscipline on the part of the student, and student isolation tends to be high, compared to conventional learning (Gilpin, 2000).

Invariably, the decision to develop the infrastructure in Africa is primarily a political one (Chale & Michaud, 1997). Since there is a huge shortage of skilled personnel and high staff turnover in IT, firms or related companies in Africa result in significant productivity losses. Ivala (1999) further noted that universities and technical colleges are often ill equipped to provide training on current technological developments. Darkwa and Mazibuko voice a similar opinion (Darkwa & Mazibuko, 2000).

People in Africa are often still afraid of computers and have difficulty in using the technology. For example, they may not be able to navigate around a screen using a mouse, neither to understand obscure commands and error messages (Mundy & Sultan 2001). Teachers are not always familiar with the technological environment and are thus not equipped to use ICT in education. In an opinion document, a former Minister of Education from Guinea states, "teachers who don't master computing skills will necessarily prevent pupils, more eager than they, from using technology. Resistance to change is hard to overcome" (Diallo, n.d., para 3).

Courses and training materials do not always reflect market needs (Ivala, 1999). To worsen the situation, much of the content and style of the materials produced in developed countries is unsuited to social and cultural traditions in less developed countries and may have the effect of excluding people who are already severely disadvantaged (Leilliot, 2000). The vast majority of *Internet* sites are irrelevant to local people. Most of the content on the *Internet* is probably generated by Europeans and Americans, with English being the most common language on the *Internet* (Darkwa & Mazibuko, 2000). People from developing countries, who do not, for example, have English as their home language and who have been inadequately schooled in that language, can hardly easily or adequately relate to computer technology or the *Internet*. This problem is compounded when students need to actually study in English in distance education.

Currently institutions of tertiary education in Africa cannot accommodate all secondary school graduates. According to Guislain (2005), a research conducted by the World Bank in Malawi states that of those completing their secondary education only 15% obtain places at the University of Malawi and University of Mzuzu. This is also the case in other African countries (Southern Africa Global Distance Educationet, 1999).

Payment for studies offered via the *Internet* by foreign institutions or for study materials to be acquired from abroad is often difficult in Africa due to lack of international currency or the cost of such currency (Odedra-Straub, 1990).

Technologies in Business and Industry

Businesses of all sizes use computing technology and telecommunication in every aspect of national commerce in developed countries. While technologies have had a major impact on a wide range of fields and disciplines, none has been more changed by the technology than business and industry. The *Internet* has been the backbone supporting these disciplines. New methods of taking advantage of efficiencies are becoming widely accepted as access to high-speed broadband *Internet* connections become commonplace (Plunkett Research, 2005).

Businesses and industry in SADC are getting to use the *Internet* to provide high quality goods and services and gain or sustain competitive advantage over rivals around the world. The disadvantage that compromises their competive advantage is due to non high speed *Internet* providers and outdated hardware and software.

Defenses Against Information Technology

The impact of threats in information technology systems highlights how much we rely on information to fulfill our day-to-day needs. Like any other thing in life, we often take information technology for granted until it is no longer there. This becomes a challenge for the SADC region to protect the information.

It is very important to safeguard information systems in order to prevent these disastrous events from occurring. Information technology security encompasses a variety of policies, procedures, and tools that help protect information systems against crime, abuse, systems failures, and disasters (Laudon, Traver, & Laudon, 1995). If these policies and procedures are properly executed, there maybe a lesser chance of information landing in the wrong place.

CHAPTER 3. METHODOLOGY

For a project to be completed successfully, the researcher plays an important role from the beginning of the research to the end. So it is the researcher's responsibility to guide it through. The researcher studies the problem which has been developed, and works to make discoveries which can be applied to the problem.

The researchers promote cooperation between themselves and their research participants fostering and improving information exchange and research quality (Kock & Lau, 2001). In order to fulfill this cooperation the researcher has a duty to unify other entities such as a planner, leader, facilitator, teacher, listener, observer, and reporter.

Development of Data Gathering Instruments

Evaluation and data collection reports most often identify the need for change and the problems or issues central to an organization. The information collected reflects issues and events people have found interesting and important (Boring, 1963). So, an organizational transformation relies on ideas and a vision of the future.

A great variety of diagnostic instruments are available for studying organizations. Questionnaires and other data gathering instruments make it possible to study a whole range of topics from productivity and efficiency considerations to behavioral factors such as morale, organizational flexibility, and job satisfaction.

The formulation of the questions to guide a research project can be relevant for scholarly and practical purposes. The information being theoretically interesting to a scholarly audience who would appreciate hearing more about it as well as of interest to a practitioner audience (Walton, 1985). Research is based on the assumption that research questions should respond to both areas of relevance.

Developing a research questionnaire is a bottom up process. This emerges from consultations with people in the field, from people who are involved with the issue, and from those who have an interest in learning more about it.

The process involves open-ended interviews, on-site observations, and other explorations. The process may seem long and unnecessary to some people, as it requires patience and careful editing of items so they recall the phrases and words used by the people being researched.

However, time spent at this stage should decrease the time one spends later on as well as improving the relevance of the questions. The complete process is ongoing and involves developing an understanding of the issues, criteria, and variables related to the problem.

Application of Research

There are no agreed-on answers to these questions. Although researchers differ on priorities and norms of their research subculture, their method involves a stage of study through which tentative theories are developed. Researchers then aim to gain knowledge and put it to practice. In this approach, the researcher may find a combination of quantitative and qualitative methods.

Quantitative Research

This research provides an in-depth critique of a quantitative research in business initiatives and cost reduction of current business processes in IT infrastructure. For example, Peter Weill, (2002) in his *IT Infrastructure for Strategic Agility* studied 180 electronically based-business initiatives in 89 top performing enterprises and identified the specific infrastructure capabilities needed for different types of business initiatives and how this capability was provided as an integrated IT infrastructure.

Qualitative Research

Qualitative research describes and classifies various cultural, racial and sociological groups by employing interpretive and naturalistic approaches. It is both observational and narrative, and relies less on the experimental elements normally associated with scientific research (reliability, validity and generalization). Connelly and Clandinin (1990) suggest that qualitative inquiry relies more on appearance, verisimilitude and transferability. On the other hand, Lincoln and Guba (1985) emphasize the importance of credibility, transferability, dependability and conformability in qualitative studies. Because the field of qualitative research is still evolving, the criteria and terminology for its evaluation are not yet agreed upon.

Traditionally, the period of observation for a qualitative observational study has been from six months to two years or more (Fetterman, 1989). Today, it is generally acceptable to study groups for less than six months, provided that the researcher triangulates the research methods. The more time spent in the field, the more likely the results will be viewed as credible by the academic community.

What is agreed upon is that qualitative observational research is a systematic inquiry into the nature or qualities of observable group behaviors in order to learn what it means to be a member of that group (Rockart, 1988; McKay & Brockway, 1989; Weill, 1993). The researcher's job, rather than to describe a stable entity, is to give continually updated accounts of observations on multiple levels of group interactions that occur on both a temporal and continuous basis simultaneously. Thus, this type of research attempts to identify and explain complex approaches within the IT infrastructure development. Typically, qualitative research methodologies are combined with each other in order to provide comparative results. A triangulation of methods (also called multiple methods), where three or more methodologies are used and the results compared against each other, is common and can provide a more complete understanding of the behavior of the study group (Lakoff & Johnson, 1980).

Qualitative study lends itself to thick narrative description, and it may be intense given the complexity of group interactions. It takes place on site, in the group's natural environment, and attempts to be non-manipulative of group behaviors. The purpose is to aim for objectivity, while it must take into account the views of the participants.

Research Methodology

The observations and insights in this research ware based on an analysis of data collected in four studies of the infrastructure needs of leading enterprises implementing different types of electronically-based business initiatives. The key research questions addressed in this research ware:

1. What is IT infrastructure and what services are involved? How do these services fit together in an integrated infrastructure?

2. What are the different types of electronically based-business initiatives?

3. What IT infrastructure capabilities are required for different types of electronically based-business initiatives?

4. How can enterprises make infrastructure investments today to enable the desired strategic agility in the future?

Often such questions are unique to the selected technique. Thus the findings linking infrastructure capability to different types of business initiatives are based on the top performing enterprises rather than all players in an industry (Cooper & Schindler, 2003). In all four studies, the researcher conducted detailed interviews and collected questionnaire data, visiting over 90% of the enterprises.

The remaining data collection was by phone and email. The data was analyzed using a combination of quantitative and qualitative techniques. The quantitative techniques ware applied to the extensive questionnaire and financial information collected; and all relationships described in this research from the quantitative analysis were statistically significant (i.e., were very unlikely to occur by chance). The qualitative techniques used detailed pattern analysis for the interview transcript data using a text analysis tool.

IT is a large investment with the average enterprise spending more than 4.2% of revenues annually (Gormolosk, Grigg, & Potter, 2001). Overall, IT investments now account for more than 50% of an enterprise's total capital budget (Broadbent, 1998). Typically about 55% of the enterprise IT budget is infrastructure. Infrastructure capability is difficult to create because it is a complex fusion of technology, processes and human assets (Barney, 1991). Once in place, competitors need long lead times to emulate it, so IT infrastructure can be a source of competitive advantage.

As is the case with other infrastructure investments in an enterprise; such as people, buildings, and plants, the IT infrastructure investment decision involves a tradeoff between profit levels with minimal future oriented-investment, and enabling benefits later from growth and flexibility.

Evaluation of the Methodology

A complex infrastructure requires a variety of services integrated together to create a unique capability for the enterprise. This guide attempts to acknowledge the broad categories of qualitative observational research. First, qualitative observational research is broken down into its most common approaches, including types of this research method, themes that guide researchers' study designs and other, secondary approaches. Next, a methods section introduces steps and methods used in qualitative observational research, employing multiple methods and computer software for this field of research. Then, a commentary section includes some of the advantages and disadvantages to qualitative observational research, a look at the ongoing qualitative vs. quantitative discussion and some of the ethical considerations of this form of research. The final issue that makes an evaluation of infrastructure development difficult is the lack of good information. It is tempting to say that the final project has a good standard, but the objective of the differential is to determine all the hypotheses that are consistent with the task presentation. As a result, there will always be some level of controversy and misunderstanding in the critiques. A common strategy to control these factors is to have the experts critique each other as well as the project. An alternative would be to have the reviewers individually critique a case then collectively agree on a final critique. The problem, of course, is that it would lengthen an already time consuming and somewhat tedious process.

Pilot Study for Validity and Reliability

A questionnaire is “valid” if it examines all the aspects and facets of the research question in a balanced way; that is, if it measures what it purposes to test. The researcher chose ten people from South Africa who work in IT fields. Represented in the group of participants were; supervisors, technicians and program writers. The participants were contacted ahead of time and a questionnaire was sent to them before face-to-face interview. A follow up with the face-to-face interview helped the researcher to find out whether the answers the participants gave in the questionnaire were in agreement with the responses they offered in a face-to-face interview. However, to avoid testing only for reliability, the researcher’s face-to-face questions were worded differently from those listed in the questionnaire.

Reliability is defined as an assessment of the repeatability and consistency of an instrument of measurement, in this case, the questionnaire. The researcher tested for the internal consistency of the questionnaire by asking a question in more than one way, after which the responses were compared.

CHAPTER 4. DATA COLLECTION AND ANALYSIS

This chapter presents results gathered from selected IT professionals from some of the SADC countries including; Botswana, Malawi, South Africa, Zambia, and Zimbabwe. To actually administer the survey, the researcher followed a rigorous approach to ensure that the study validly answered questions concerning infrastructure development in the SADC region. Based on studies that have shown no significant differences in means scores between paper and Web-Based surveys (Kantor, 1991; Rosenfield, Doherty, Kantor, & Greaves, 1989), the researcher administered the questionnaires using e-mail and physical distribution of the survey to the participants.

The population of this study was targeted to 50 IT professionals. Twenty-four (48%) of the targeted participants completed the survey. Twenty-six (54%) did not participate. The analysis was based on participants from Botswana (4), Malawi (5), South Africa (10), Zambia (2), and Zimbabwe (3). Keep in mind that the decisions in significance testing are based on information gathered from random sample within the region. On rare occasions, a sample may not be a representative of the population from which it was selected (Healey, 2005).

Participants' Selection

First, the researcher wrote an invitation letter to the participants describing his intention of the research and assuring the participants of their confidentiality in taking part in the research.

Secondly, the researcher wrote an informed consent letter to be signed by the participants assuring the participants' rights and protection.

Participants were identified to the researcher by contacting individuals in Botswana, Malawi, South Africa, Zambia, and Zimbabwe working in the technology field. The researcher then made initial contact with participants through email and telephone calls. Among the participants were college professors, college students, business and organizations IT managers and technicians.

Participants Demography

The participants were well educated, experienced in their jobs, and in the prime of their work years. Table 3 shows their gender. Of the twenty-four (24) participants, three (3) were female and twenty-one were male. Table 5 shows participants' level of education. Four (4) completed technical school, twelve (12) completed college/university, five (5) completed master's degree, and two (2) completed doctorate degree.

Table 3. Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	21	87.5	87.5	87.5
	Female	3	12.5	12.5	100.0
	Total	24	100.0	100.0	

Table 3 shows the difference between male and female participation in the technology field. As shown in Table 3, 87.5% male participated in the survey, while 12.5% female participated. The survey analysis and participation rates between males and females are indicators of how the males are dominating in technology issues. Age range of the participants was between 18 years and 60 years. The majority of the participants' age range was between 31 years and 35 years (see Table 4). Table 4, shows that 12.5% of participants were between the ages 18 to 25 years, another 12.5% between ages 26 to 30 years. The highest population 37.5% of the participants was between 31 and 35 years.

Table 4. Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-25 yrs	3	12.5	12.5	12.5
	26-30 yrs	3	12.5	12.5	25.0
	31-35 yrs	9	37.5	37.5	62.5
	36-40 yrs	5	20.8	20.8	83.3
	41-50 yrs	3	12.5	12.5	95.8
	51-60 yrs	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Table 5. Level of Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Completed Technical School	4	16.7	16.7	20.8
	Completed College/University	12	50.0	50.0	70.8
	Completed Graduate School (master's degree)	5	20.8	20.8	91.7
	Completed Graduate School (doctorate)	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

Table 6 shows information about the participants and their respective positions in their organizations. Participants were asked to check or write their specific title for the occupation that closely represents their positions in their organizations. The data revealed that the majority of the participants 50.0% (*n* = 12) indicated to be professional or technical. The data also revealed that 20.8% (*n* = 5) were in *upper management* and 16.7% (*n* = 4) were in *middle management*, 8.3% (*n* = 2) were *trainees*, and 4.2% (*n* = 1) did not respond. These findings suggest that final responsibility for information technology infrastructure development is finalized by IT professionals as suggested by many IT researchers (Conner, 1993; Brancheau, Janz, & Wetherebe, 1996; Broadbent et, 1996).

Table 6. Specific Title for the Occupation that Closely Represents Position in the Organization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Upper Management/ Executive	5	20.8	20.8	25.0
	Middle Management	4	16.7	16.7	41.7
	Professional/ Technical	12	50.0	50.0	91.7
	Trainee	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

Responses to highest degree earned show that the highest positions in the technology industry are held by those with the highest degrees 20.8% (*n* = 5) Upper Management/Executive, 16.7% (*n* = 4) Middle Management, 50.0% (*n* = 12), Professional/Technical, 8.3% (*n* = 2) Trainee (see Table 6).

Data Collection

Data related to information technology infrastructure development in the SADC region was obtained through different individuals and offices. Data for the region was collected from personnel related to information technology in both the public and private sectors, including directors, government officials, business owners, and institutes. Numerous documents, describing information technology in the development standards, the establishment and contributions of IT personnel were reviewed.

A survey (Appendix A), prepared by the researcher was used in gathering data for the study. A total of fifty surveys were prepared. Of this number, twenty-four (24) were completed and used for an analysis; the other twenty-six (26) were not completed.

Data Analysis

Data collected was generated by SPSS to produce a statistical analysis. The data was conveyed by a survey instrument representing current knowledge of information technology infrastructure products from the participant's knowledge. The researcher used the scaling method developed by Likert. Likert scaling is a method to measure people's attitudes (Nachmias & Nachmias, 1987). For this research process, the researcher compiled a series of items that expresses a wide range of attitudes from extremely positive to extremely negative. Each item calls to check one of five fixed-alternatives of *strongly agree, agree, neutral, disagree,* and s*trongly disagree.* Other expressions used were *very satisfied, satisfied, neutral, dissatisfied, very dissatisfied*. In this-five point continuum, weights of *1, 2, 3, 4, 5* or *5, 4, 3, 2, 1* were assigned, the direction of weighing being determined by the favorableness or not favorable of the item.

The *scale* was scored by assigning weights for response alternatives items in percentage. The weights were assigned as follows: *strongly agree - 5; agree - 4; neutral - 3; disagree – 2; strongly disagree – 1;* and *very satisfied – 5; satisfied – 4; neutral – 3; dissatisfied – 2; very* *dissatisfied – 1;* and *n/a* or *no response - 0*. For negative responses, the weights were in reverse order.

Analyzing the data consists of examining the database to address the research questions or hypotheses (Creswell & Plano Clark, 2007). Data analysis in qualitative field research is an on going process. As the research progresses, some hypotheses are discarded, others are refined, and still others are formulated. (Nachmias & Nachmias, 1987). The participants rated questions that pertained to IT development whether they were beneficial for the organization in different ways. The data obtained from the survey were tabulated and analyzed on the basis of percentages for each item assessed. The assessed items analyses are shown in Tables 7 to 45. The survey questionnaire solicited the items as presented in Appendix A.

1. Annual dollar range
2. Computer hardware
3. Networking
4. Wireless/Mobile
5. Telecommunications
6. Peripherals
7. Systems on site at the location
8. Operating systems on site at the location
9. How often technology equipment is used?
10. Would technology use be recommended to colleagues or contacts within the industry?
11. Technology equipment installation evaluation
12. Hardware/Software post installation

13. Hardware/Software product evaluation

14. Network types installed at the location

15. Hardware/software technical documentation

16. Occupation and title that closely represents position in the organization

17. Level of Education

18. Age and Gender

Item analysis of the survey is shown in Tables 7 to 45. These results indicate that information technology personnel perceived adequacy of materials and equipment and functions of technology as satisfactory on a majority of the items assessed. Breakdown analysis of each item included in the survey is indicated in corresponding Tables 8 to 46 as noted in items analysis of survey result.

Item Analysis of Survey Results

Response to the statement requiring annual dollar range for infrastructure products, services, or technologies reveal that most of the participants were reluctant to give out financial figures, 41.7% (*n* = 10) did not respond, 4.2% (*n* = 1) spent *100 million or higher,* 12.5% (*n* = 3) spent between *$10 million and $99,9 million*, 8.3% (*n* = 2) between *$1 million and $9,9 million*, another 8.3% (*n* = 2) spent between *$100,000 thousand and $999,99* thousand and those who spent *$100,000 or less* 25.0% (*n* = 6) (see Table 7).

Table 7. Annual Dollar Range

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	10	41.7	41.7	41.7
	100 Million or Higher	1	4.2	4.2	45.8
	10 Million to 99,9 Million	3	12.5	12.5	58.3
	1 Million to 9,9 Million	2	8.3	8.3	66.7
	100,000 to 999,99	2	8.3	8.3	75.0
	100,000 or less	6	25.0	25.0	100.0
	Total	24	100.0	100.0	

Results for each question on technology equipment installation evaluation are shown in Tables 8 to 15, questions represented as items 1 to 8 respectively. The overall response to all questions was above neutral with scores between 8.7% for neutral (Table 8 and 10) to as high as 65.2% satisfied (Table 11 and 12) respectively.

Table 8. With Your Experience of the Most Recent Technology Installation

	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Very Satisfied	10	41.7	41.7	41.7
	Satisfied	11	45.8	45.8	87.5
	Neutral	2	8.3	8.3	95.8
	Dissatisfied	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Item 1. Table 8 shows results of how satisfied the participants were with their most recent technology installations. 41.7% (n = 10) participants were *very satisfied*, 45.8% (n = 11) *satisfied*, 8.3% (n = 2) *neutral*, and 4.2% (n = 1) *dissatisfied*.

Table 9. With the Timeliness of Technology Installation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	3	12.5	12.5	12.5
	Very Satisfied	5	20.8	20.8	33.3
	Satisfied	10	41.7	41.7	75.0
	Neutral	5	20.8	20.8	95.8
	Dissatisfied	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Item 2. Table 9 shows how participants perceived timeliness of technology installations within their organizations. 12.5% did not respond, 20.8% *very satisfied*, 41.7% *satisfied*, 20.8% *neutral*, 4.2% *dissatisfied* with the timeliness of technology installations.

Table 10. Technology Installation Personnel are Sufficiently Knowledgeable and Professional

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	7	29.2	29.2	29.2
	Satisfied	14	58.3	58.3	87.5
	Neutral	2	8.3	8.3	95.8
	Dissatisfied	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Item 3. Table 10 shows how information technology personnel were knowledgeable and professional in technology installations. 29.2% were *very satisfied*, 58.3% *satisfied,* 8.3% *neutral*, 4.2% *dissatisfied* with technology installation personnel being sufficiently knowledgeable and professional.

Table 11. Technology Understands the Service Needs of the Company/Institute

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	7	29.2	29.2	29.2
	Satisfied	15	62.5	62.5	91.7
	Neutral	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

Item 4. Table 11 shows how participants felt about adequacy of technology meeting the service needs of an organization. 29.2% *very satisfied*, 62.5% *satisfied*, 8.3% *neutral* with technology understands the service needs of an organization.

Table 12. Overall With Technology Installation Service

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Very Satisfied	5	20.8	20.8	25.0
	Satisfied	15	62.5	62.5	87.5
	Neutral	2	8.3	8.3	95.8
	Dissatisfied	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Item 5. Table 12 shows how participants were satisfied with the overall technology installation service. 4.2% did not respond, 20.8% *very satisfied*, 62.5% *satisfied*, 8.3% *neutral*, and 4.2% *dissatisfied* with overall technology installation service.

Table 13. Overall With Amount of Technology Communication

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	7	29.2	29.2	29.2
	Satisfied	8	33.3	33.3	62.5
	Neutral	7	29.2	29.2	91.7
	Dissatisfied	1	4.2	4.2	95.8
	Very Dissatisfied	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Item 6. Table 13 shows how participants were satisfied with overall amount of technology communication used. 29.2% *very satisfied*, 33.3% *satisfied*, 29.2% *neutral,* 4.2% *dissatisfied,* and 4.2% *very dissatisfied* with overall amount of technology communication in use.

Table 14. Overall With Value of Technology Services With the Price Paid

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Satisfied	3	12.5	12.5	16.7
	Very Satisfied	12	50.0	50.0	66.7
	Neutral	7	29.2	29.2	95.8
	Dissatisfied	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Item 7. Table 14 shows how participants assessed overall value of technology services with the price paid for. 4.2% did not respond, 12.5% *satisfied*, 50.0% *very satisfied*, 29.2% *neutral*, 4.2% *dissatisfied*.

Table 15. Overall How Satisfied With Hardware/Software Installed?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Very Satisfied	10	41.7	41.7	45.8
	Satisfied	8	33.3	33.3	79.2
	Neutral	3	12.5	12.5	91.7
	Dissatisfied	1	4.2	4.2	95.8
	Very Dissatisfied	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Item 8. Table 15 shows how participants were satisfied with hardware/Software Installation. 4.2% did not respond, 41.7% *very satisfied*, 33.3% *satisfied*, 12.5% *neutral*, 4.2% *dissatisfied*, and 4.2% *very dissatisfied* with overall satisfaction with hardware/software installation.

Participants were asked their opinion on hardware/software post installation satisfaction. The responses for items 9 to item 15 are shown with their corresponding Tables 16 to 22. The researcher noted after a review of the individual items that the lowest scores were in the *strongly disagree* and *disagree* category of individual questions and the highest scores were *agreed* and *neutral* categories. This aligned with the research that noted differences in the way that professionals in different positions think and communicate.

Table 16. Site Preparation Requirements were Four (4) Weeks before Delivery

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Strongly Agree	5	20.8	20.8	25.0
	Agree	7	29.2	29.2	54.2
	Neutral	7	29.2	29.2	83.3
	Disagree	4	16.7	16.7	100.0
	Total	24	100.0	100.0	

Item 9. Table 16 responses show if site preparation requirements were ready four (4) weeks before delivery. 4.2% did not respond, 20.8% *strongly agreed*, 29.2% *agreed*, 29.2% were *neutral*, 16.7% *disagreed* that site preparation requirements were ready four (4) weeks before delivery.

Table 17. The Site was Ready for Installation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	8	33.3	33.3	33.3
	Agree	8	33.3	33.3	66.7
	Neutral	8	33.3	33.3	100.0
	Total	24	100.0	100.0	

Item 10. Table 17 responses show if the site was ready for installation. 33.3% *strongly agreed*, 33.3% *agreed*, and 33.3% *neutral* for the site readiness for installation.

Table 18. Hardware was Delivered as Scheduled

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	2	8.3	8.3	8.3
	Strongly Agee	1	4.2	4.2	12.5
	Agree	7	29.2	29.2	41.7
	Neutral	9	37.5	37.5	79.2
	Disagree	4	16.7	16.7	95.8
	Strongly Disagree	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Item 11. Table 18 shows if hardware was delivered as scheduled. The question which required if hardware was delivered as scheduled was the only question that participants rated at both lowest and highest possible scores. 8.3% *did not respond*, 4.2% *strongly agreed*, 29.2% *agreed*, 37.5% were *neutral,* 16.7% *disagreed*, and 4.2% *strongly disagreed* that hardware was delivered as scheduled.

Table 19. The Order was Delivered Complete (i.e. no components or peripheral devices missing).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	2	8.3	8.3	8.3
	Strongly Agree	4	16.7	16.7	25.0
	Agree	5	20.8	20.8	45.8
	Neutral	7	29.2	29.2	75.0
	Disagree	6	25.0	25.0	100.0
	Total	24	100.0	100.0	

Item 12. Table 19 shows if the order was delivered complete (i.e. no components or peripheral devices missing). 8.3% did not respond, 16.7% *strongly agreed*, 20.8% *agreed*, 29.2% were *neutral*, and 25.0% *disagreed* that the order was delivered complete.

Table 20. Installation was Scheduled at My Convenience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	4	16.7	16.7	16.7
	Agree	9	37.5	37.5	54.2
	Neutral	8	33.3	33.3	87.5
	Disagree	2	8.3	8.3	95.8
	Strongly Disagree	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Item 13. Table 20 shows if installation was scheduled at participants' convenience. 16.7% *strongly agreed*, 37.5% *agreed*, 33.3% neutral, 8.3% *disagreed,* and 4.2% *strongly disagreed* that the installation was scheduled at their convenience.

Table 21. Electrical Connections Included the Correct Plugs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	2	8.3	8.3	8.3
	Strongly Agree	7	29.2	29.2	37.5
	Agree	7	29.2	29.2	66.7
	Neutral	5	20.8	20.8	87.5
	Disagree	3	12.5	12.5	100.0
	Total	24	100.0	100.0	

Item 14. Table 21 shows participants' responses for electrical connections if they included correct plugs. 8.3% did not respond, 29.2% *strongly agreed*, 29.2% *agreed*, 20.8% were *neutral*, and 12.5% *disagreed* that the electrical connections included the correct plugs.

Table 22. The Preparation Instructions were Easy to Understand

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	7	29.2	29.2	29.2
	Agree	9	37.5	37.5	66.7
	Neutral	6	25.0	25.0	91.7
	Disagree	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

Item 15. Table 22 shows participants' responses, if preparation instructions were easy to understand for installation. 29.2% *strongly agreed*, 37.5% *agreed*, 25.0% were *neutral*, 8.3% *disagreed* that the preparation instructions were easy to understand.

Tables, 23 to 31 are hardware/software product installation. Included are questions which relate to the impotents of product characteristics in selection of new hardware. These questions are labeled as items 16 to 24. The results of the questions from items 17 to 24 averagely were consistently at or above 60% rating on *extremely important* among participants. The majority of the participants 54.2% *strongly disagreed* with item 16 question on easy of installations.

Table 23. Easy of Installation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	1	4.2	4.2	4.2
	Neutral	5	20.8	20.8	25.0
	Disagree	5	20.8	20.8	45.8
	Strongly Disagree	13	54.2	54.2	100.0
	Total	24	100.0	100.0	

Item 16. Table 23 shows responses of how ease installation was. Most of the participants indicated that installation was not easy. 54.2% of respondents *strongly disagreed*, 20.8% *disagreed*, and also 20.8% *were neutral*, while 4.2% *agreed.*

Table 24. Quality of Documentation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Neutral	3	12.5	12.5	16.7
	Somewhat Important	5	20.8	20.8	37.5
	Extremely Important	15	62.5	62.5	100.0
	Total	24	100.0	100.0	

Item 17. Table 24 shows participants' response on quality of documentation. 4.2% did not respond, 12.5% were *neutral*, 20.8% *somewhat important*, and 62.5% said quality of documentation was *extremely important*.

Table 25. Compatibility With Other Standards

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	4	16.7	16.7	16.7
	Somewhat Important	4	16.7	16.7	33.3
	Extremely Important	16	66.7	66.7	100.0
	Total	24	100.0	100.0	

Item 18. Table 25 shows that 66.7% of the participants agreed that compatibility with other standards was *very important* and 16.7% indicated that it was *somewhat important* and while the other 16.7% were *neutral*.

Table 26. Software Drive Support

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	2	8.3	8.3	8.3
	Somewhat Important	4	16.7	16.7	25.0
	Extremely Important	18	75.0	75.0	100.0
	Total	24	100.0	100.0	

Item 19. Table 26 shows Software Driver Support. 75.0% of the participants agreed that software driver support was *extremely important*, while 16.7% said *somewhat important* and the other 8.3% were *neutral*.

Table 27. Accessibility of Product Support

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Neutral	3	12.5	12.5	16.7
	Somewhat Important	4	16.7	16.7	33.3
	Extremely Important	16	66.7	66.7	100.0
	Total	24	100.0	100.0	

Item 20. Table 27 shows that 66.7% of the participants agreed that accessibility of product support was *extremely important*, while 16.7% said *somewhat important*, 12.5% were *neutral* and 4.2% did not respond.

Table 28. Quality of Product Support

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Neutral	3	12.5	12.5	16.7
	Somewhat Important	4	16.7	16.7	33.3
	Extremely Important	16	66.7	66.7	100.0
	Total	24	100.0	100.0	

Item 21: Table 28 shows that 66.7% of the participants agreed that quality of product support was *extremely important*, while 6.7% said *somewhat important*, 12.5% were *neutral* and 4.2% did not respond.

Table 29. Value relative to cost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Neutral	4	16.7	16.7	20.8
	Somewhat Important	5	20.8	20.8	41.7
	Extremely Important	14	58.3	58.3	100.0
	Total	24	100.0	100.0	

Item 22. Table 29 shows that 58.3% of the participants agreed that value relative to cost was *extremely important*, while 20.8% said *somewhat important*, 16.7% were *neutral* and 4.2% did not respond.

Table 30. Overall Reliability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Neutral	2	8.3	8.3	12.5
	Somewhat Important	2	8.3	8.3	20.8
	Extremely Important	19	79.2	79.2	100.0
	Total	24	100.0	100.0	

Item 23. Table 30 shows that 79.2% of the participants agreed that overall reliability was *extremely important*, while 8.3% said *somewhat important*, and another 8.3% were *neutral* and 4.2% did not respond.

Table 31. Overall Performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Neutral	1	4.2	4.2	8.3
	Somewhat Important	3	12.5	12.5	20.8
	Extremely Important	19	79.2	79.2	100.0
	Total	24	100.0	100.0	

Item 24. Table 31 shows the overall performance for the hardware/software installation. 4.2% did not respond, 79.2% said overall performance was *extremely important*, 12.5% *somewhat important*, and 4.2% were *neutral*.

Tables 32 to 40 contains questions requesting participants to rate the network installed at their site. The criterion from *very poor* to *excellent* was used to measure the network as illustrated on items 25 to 33 in the corresponding Tables 32 to 40.

Table 32. Ease of Installation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Fair	4	16.7	16.7	20.8
	Good	9	37.5	37.5	58.3
	Very Good	8	33.3	33.3	91.7
	Excellent	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

Item 25. Table 32 shows the ease of network installation. 4.2% did not respond, 16.7% of participants said easy of installation was *fair*, the majority 37.5% admitted to be *good*, 33.3% said *very good* and only few 8.3% found the easy of installation *excellent*.

Table 33. Quality of Documentation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Poor	3	12.5	12.5	12.5
	Fair	1	4.2	4.2	16.7
	Good	8	33.3	33.3	50.0
	Very Good	9	37.5	37.5	87.5
	Extremely Good	3	12.5	12.5	100.0
	Total	24	100.0	100.0	

Item 26. Table 33 shows the quality of documentation. 12.5% of the participants rated quality of documentation as *very poor*. 4.2% as *fair*, 33.3% as good, 37.5% as *very good* and 12.5% *extremely good*.

Table 34. Compatibility With Other Standards Hardware/Software

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Fair	5	20.8	20.8	20.8
	Good	4	16.7	16.7	37.5
	Very Good	10	41.7	41.7	79.2
	Excellent	5	20.8	20.8	100.0
	Total	24	100.0	100.0	

Item 27. Table 34 shows compatibility with other standard hardware/software. 20.8% of the participants rated compatibility with other standard hardware/software as *fair*, 16.7% as *good*, 41.7% as *very good* and 20.8% *extremely good*.

Table 35. Hardware/Software Driver Support

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Very Poor	1	4.2	4.2	8.3
	Fair	3	12.5	12.5	20.8
	Good	4	16.7	16.7	37.5
	Very Good	13	54.2	54.2	91.7
	Excellent	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

Item 28. Table 35 shows Hardware/Software Driver Support. 4.2% of the participants did not respond and the other 4.2% participants acknowledged the hardware/software driver support as *very poor*. 12.5% of the participants rated hardware/software driver support as *fair*, 16.7% as *good*, 54.2% as *very good* and 8.3% as *extremely good*.

Table 36. Accessibility of Support

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very poor	1	4.2	4.2	4.2
	Poor	4	16.7	16.7	20.8
	Fair	6	25.0	25.0	45.8
	Good	10	41.7	41.7	87.5
	Very Good	3	12.5	12.5	100.0
	Total	24	100.0	100.0	

Item 29. Table 36 shows Accessibility of Support. 4.2% of the participants rated accessibility of support as *very poor*, 16.7% as *poor*, 25.0% as fair, 41.7% as *good*, and 12.5% as *very good*.

Table 37. Quality of Support

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Poor	1	4.2	4.2	4.2
	Fair	6	25.0	25.0	29.2
	Good	5	20.8	20.8	50.0
	Very Good	9	37.5	37.5	87.5
	Excellent	3	12.5	12.5	100.0
	Total	24	100.0	100.0	

Item 30. Table 37 shows quality of support. 4.2% of the participants rated quality of support as *very poor*, 25.0% as *fair*, 20.8% as *good*, 37.5% as *very good*, and 12.5% as *excellent*.

Table 38. Value Relative to Cost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Poor	1	4.2	4.2	4.2
	Fair	7	29.2	29.2	33.3
	Good	5	20.8	20.8	54.2
	Very Good	9	37.5	37.5	91.7
	Excellent	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

Item 31. Table 38 shows Value Relative to Cost. 4.2% of the participants rated value relative to cost as *very poor*, 29.2% as *fair*, 20.8% as *good*, 37.5% as *very good*, and 8.3% as *excellent.*

Table 39. Overall Reliability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Poor	2	8.3	8.3	8.3
	Fair	4	16.7	16.7	25.0
	Good	6	25.0	25.0	50.0
	Very Good	8	33.3	33.3	83.3
	Excellent	4	16.7	16.7	100.0
	Total	24	100.0	100.0	

Item 32. Table 39 shows overall reliability. The results of the questions which address the overall reliability were consistently at or above 16.7% rating among participants with only one of the ratings below the 16.7% rating. The ratings are displayed as show in Table 36. 8.3% of the participants rate overall reliability as *very poor*, 16.7% *fair*, 25.0% *good*, 33.3% *very good* and 16.7% *excellent*.

Table 40. Overall Performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Fair	5	20.8	20.8	20.8
	Good	7	29.2	29.2	50.0
	Very Good	8	33.3	33.3	83.3
	Excellent	4	16.7	16.7	100.0
	Total	24	100.0	100.0	

Item 33. Table 40 shows that 33.3% of the participants agreed that overall performance was *very good*, while 29.2% said *good*, and 20.8% *fair* and 16.7% said *excellent*.

In Tables, 41 to 45 the participants were asked their opinion on hardware/software documentation quality and satisfaction. The responses were to choose from *very satisfaction* to *dissatisfaction* or not applicable as show in items 34 to 38 for the respective tables from Table 41 through 45.

Table 41. With the Appropriateness of Documentation to Your Needs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	5	20.8	20.8	20.8
	Satisfied	14	58.3	58.3	79.2
	Neutral	4	16.7	16.7	95.8
	Dissatisfied	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Item 34. Table 41 shows participants' responses to their appropriateness of documentation needs. 20.8% of the participants were *very satisfied* with the appropriateness of documentation to their needs, 58.3% were *satisfied*, 16.7% were *neutral* and only 4.2% were *dissatisfied*.

Table 42. With the Quality of the Documentation Delivered With the System

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	5	20.8	20.8	20.8
	Satisfied	14	58.3	58.3	79.2
	Neutral	4	16.7	16.7	95.8
	Dissatisfied	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Item 35. Table 42 shows participants' responses with the quality of the documentation delivered with their system. 20.8% of the participants were *very satisfied* with the quality of the

documentation delivered with their system, 58.3% were *satisfied*, 16.7% were *neutral* and only 4.2% were *dissatisfied*.

Table 43. With the Accuracy of the Documentation Delivered

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Very Satisfied	4	16.7	16.7	20.8
	Satisfied	11	45.8	45.8	66.7
	Neutral	5	20.8	20.8	87.5
	Dissatisfied	3	12.5	12.5	100.0
	Total	24	100.0	100.0	

Item 36. Table 43 shows participants' responses with the accuracy of the documentation delivered. 4.2% of the participants did not respond. 16.7% of the participants were *very satisfied* with the accuracy of the documentation delivered, 45.8% were *satisfied*, 20.8% were *neutral* and 12.5% were *dissatisfied*.

Table 44. With the Usability of the Documentation Provided

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Did not respond	1	4.2	4.2	4.2
	Very Satisfied	4	16.7	16.7	20.8
	Satisfied	10	41.7	41.7	62.5
	Neutral	5	20.8	20.8	83.3
	Dissatisfied	4	16.7	16.7	100.0
	Total	24	100.0	100.0	

Item 37. Table 44 shows participants' responses with the usability of the documentation provided. 4.2% of the participants did not respond. 16.7% of the participants were *very satisfied* with the usability of the documentation provided, 41.7% were *satisfied*, 20.8% were *neutral* and 16.7% were *dissatisfied*.

Table 45. Overall With the Documentation Provided

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	4	16.7	16.7	16.7
	Satisfied	12	50.0	50.0	66.7
	Neutral	6	25.0	25.0	91.7
	Dissatisfied	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

Item 38. Table 45 shows the participants' responses on their opinion on hardware/software documentation quality and satisfaction with overall documentation provided. Responses indicate that 16.7% were *very satisfied*, 50.0% were *satisfied*, 25.0% were *neutral* and 8.3% *dissatisfied* with overall documentation provided.

Exploratory Factor Analysis of Item Dimensions

An exploratory principle component factor analysis was conducted on the five main items (Computer Hardware, Networking, Wireless Mobile, Telecommunications, and Peripherals) to assess construct validity. As an initial check prior to the factor analysis, the distribution of the responses of each of the items was examined. The mean for all items responses was 3.782, with standard deviation of .979. These results suggest that the item responses were somewhat positively skewed, with a majority of the responses falling in the top three categories of the *Likert scale*.

An exploratory factor analysis resulted in five-factor solution which explained 75.631% variance (see Table 48) of the systemic covariance. All five empirically derived factors had *eigenvalues* less than one. The descriptive statistics for the five factors are shown in Table 46.

Table 46. Correlation Matrix for the Five Major Items

		Computer Hardware	Networking	Wireless Mobile	Telecommunications	Peripherals
Correlation	Computer Hardware	1.000	.835	.867	.910	.656
	Networking	.835	1.000	.721	.756	.461
	Wireless Mobile	.867	.721	1.000	.948	.574
	Telecommunications	.910	.756	.948	1.000	.581
	Peripherals	.656	.461	.574	.581	1.000
Sig. (1-tailed)	Computer Hardware		.000	.000	.000	.000
	Networking	.000		.000	.000	.012
	Wireless Mobile	.000	.000		.000	.002
	Telecommunications	.000	.000	.000		.001
	Peripherals	.000	.012	.002	.001	

Table 47. Communalities

	Initial	Extraction
Computer Hardware	.900	.945
Networking	.712	.652
Wireless Mobile	.900	.863
Telecommunications	.931	.914
Peripherals	.460	.407

Extraction Method: Alpha Factoring.

Table 48. Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.962	79.245	79.245	3.782	75.631	75.631
2	.584	11.684	90.929			
3	.322	6.435	97.364			
4	8.913E-02	1.783	99.146			
5	4.268E-02	.854	100.000			

Extraction Method: Alpha Factoring.

Figure 4 shows the weights of the five items most considered by the participants as important for information technology infrastructure development to be in place. The participants ranked computer hardware being the *extremely important*, the backbone for the development as indicated by the *eigenvalue scale*.

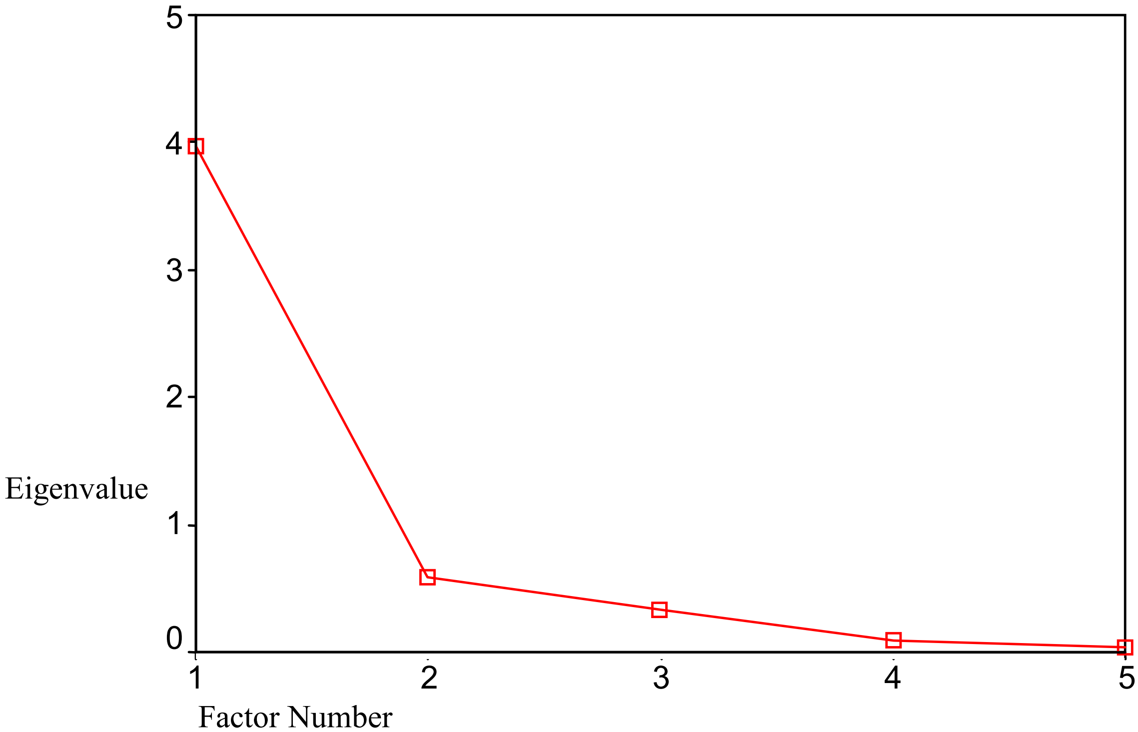

Figure 4. Screen plot for the five major items

Table 49. Factor Score Coefficient Matrix

	Factor
	1
Computer Hardware	.594
Networking	-.009
Wireless Mobile	.199
Telecommunications	.231
Peripherals	.005

Extraction Method: Alpha Factoring.

Table 50. Factor Score Covariance Matrix

Factor	1
1	.979

Extraction Method: Alpha Factoring.

Hypothesis

The research hypothesis can be stated in several ways (Healey, 2005). One form would simply assert that the population from which the sample was selected did not have a certain characteristics or, in terms of the study, had a mean that was not equal to a specific value. Testing the hypotheses of independence in a two-way contingency table, the appropriate degrees of freedom are $(r - 1)(c - 1)$, where r is the number of rows and c is the number of columns in the table.

The results of the hypothesis testing are provided in Tables 51 to 58. The results $t(9) = 26.682$, $p<0.01$, indicate that the power coefficient of total project effort is significant in the planning phase effort equation. Hence, the null hypothesis H_1 is rejected and the alternate hypothesis H_2 is accepted. This asserts that there is no difference between the distributions of items. If one group is a treatment and the other a control, for example, this hypothesis asserts that there is no treatment effect. In order to conclude that there is a treatment effect, the null hypothesis must be rejected (Rice, 2007).

The two-sided test would thus reject at the level $\alpha = .979$ (see Table 50). If there were no difference in the two conditions, differences as large as or larger than that observed would occur only with probability less than .01—that is ρ-value is less than .01. There is little doubt that there is a difference between the two methods.

To see which discrepancies are large, it is helpful to examine the contributions to the chi-square statistics cell by cell as show in Tables 51 to 55.

The Chi-Square Test of Homogeneity

The chi-square statistics is 32.81 with 5 degrees of freedom, giving a ρ-value less than .001. The chi-square is 2.79 does not fall into the critical region, which, for alpha = 0.05, *df* = 22 begins at chi-square (critical) of 4.30. Therefore, we fail to reject the null. The observed frequencies are not significantly different from the frequencies we would expect to find if the variables were independent and only random chances were operating (Healey, 2005). Based on these results, we can conclude that the IT infrastructure development is not depended on the data collected.

Table 51. Chi-Square Tests for Hardware

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.000(a)	22	.347
Likelihood Ratio	18.085	22	.701
Linear-by-Linear Association	.012	1	.914
N of Valid Cases	24		

46 cells (100.0%) have expected count less than 5. The minimum expected count is .13.

The value of chi-square (obtained) is 24,000, the degrees of freedom are 22, and the exact significance of the chi-square is .347. This is well above the standard indicator of a significant result (*alpha* = .05), so we may conclude that there is no statistically significant at beyond .001 level for the hardware.

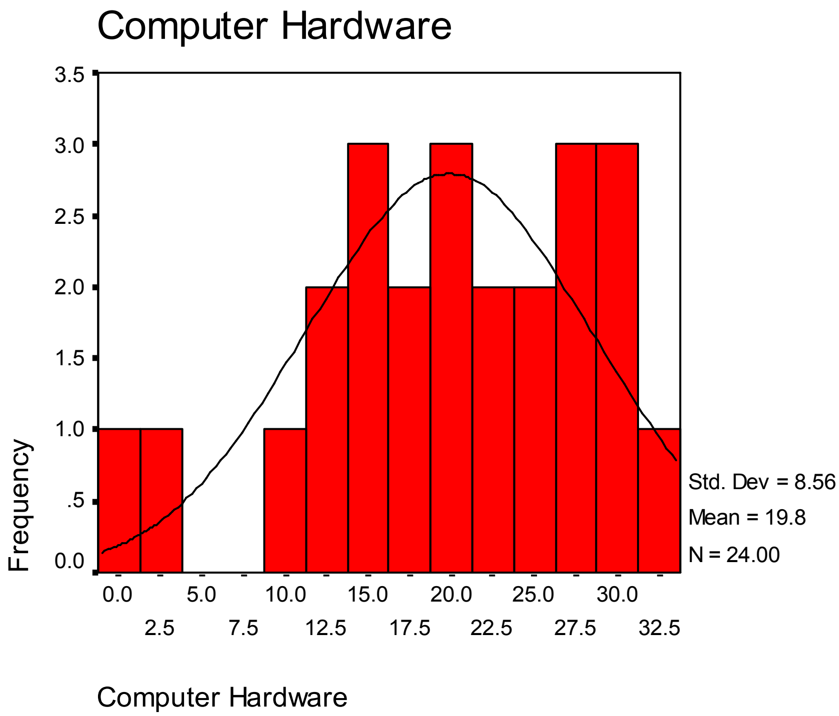

Figure 5. Computer hardware histogram

Table 52. Chi-Square Tests for Networking

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.143(a)	20	.644
Likelihood Ratio	13.586	20	.851
Linear-by-Linear Association	.109	1	.741
N of Valid Cases	24		

a 42 cells (100.0%) have expected count less than 5. The minimum expected count is .13.

The value of chi-square (obtained) is 17,143, the degrees of freedom are 20, and the exact significance of the chi-square is .644. This is well above the standard indicator of a significant result (*alpha* = .05), so we may conclude that there is no statistically significant at beyond .001 level for the networking.

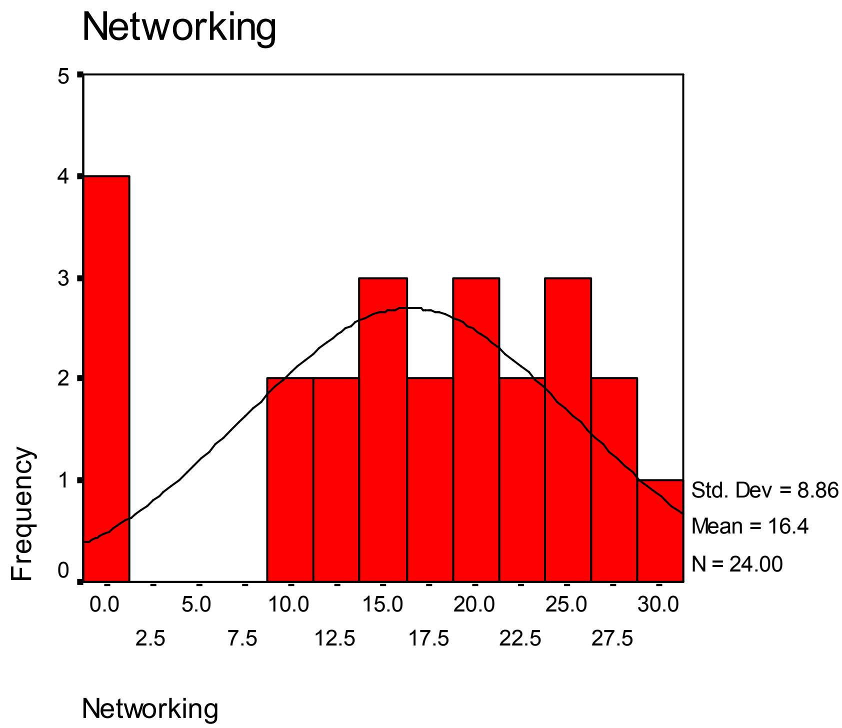

Figure 6. Networking histogram

Table 53. Chi-Square Tests for Wireless Mobile

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.000(a)	22	.347
Likelihood Ratio	18.085	22	.701
Linear-by-Linear Association	1.037	1	.309
N of Valid Cases	24		

a 46 cells (100.0%) have expected count less than 5. The minimum expected count is .13.

The value of chi-square (obtained) is 24,000, the degrees of freedom are 22, and the exact significance of the chi-square is .347. This is well above the standard indicator of a significant result (*alpha* = .05), so we may conclude that there is no statistically significant at beyond .001 level for the wireless mobile.

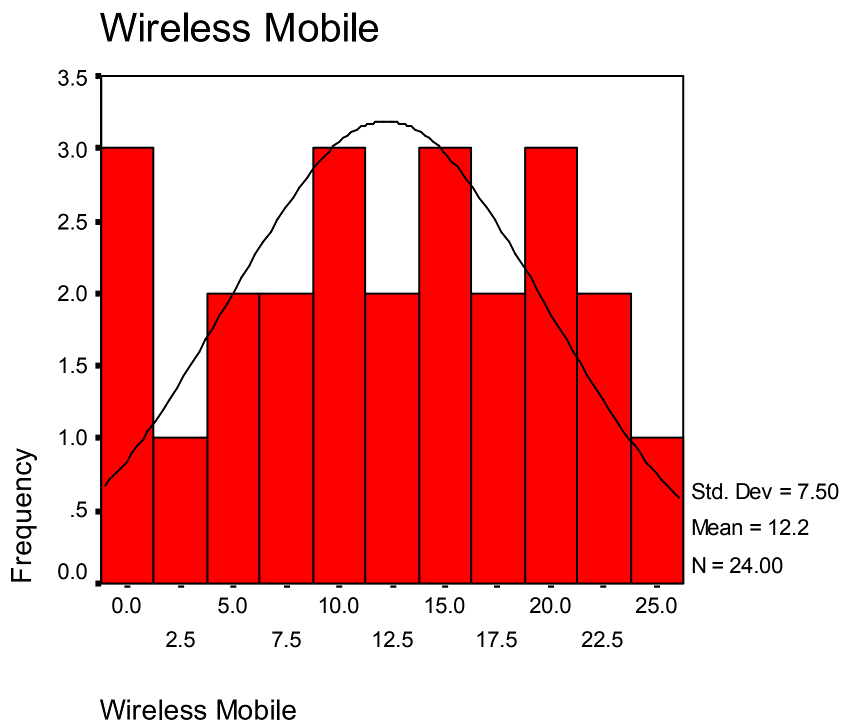

Figure 7. Wireless Mobile histogram

Table 54. Chi-Square Tests for Telecommunication

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.000(a)	22	.347
Likelihood Ratio	18.085	22	.701
Linear-by-Linear Association	.061	1	.805
N of Valid Cases	24		

a 46 cells (100.0%) have expected count less than 5. The minimum expected count is .13.

The value of chi-square (obtained) is 24,000, the degrees of freedom are 22, and the exact significance of the chi-square is .347. This is well above the standard indicator of a significant result (*alpha* = .05), so we may conclude that there is no statistically significant at beyond .001 level for the telecommunication.

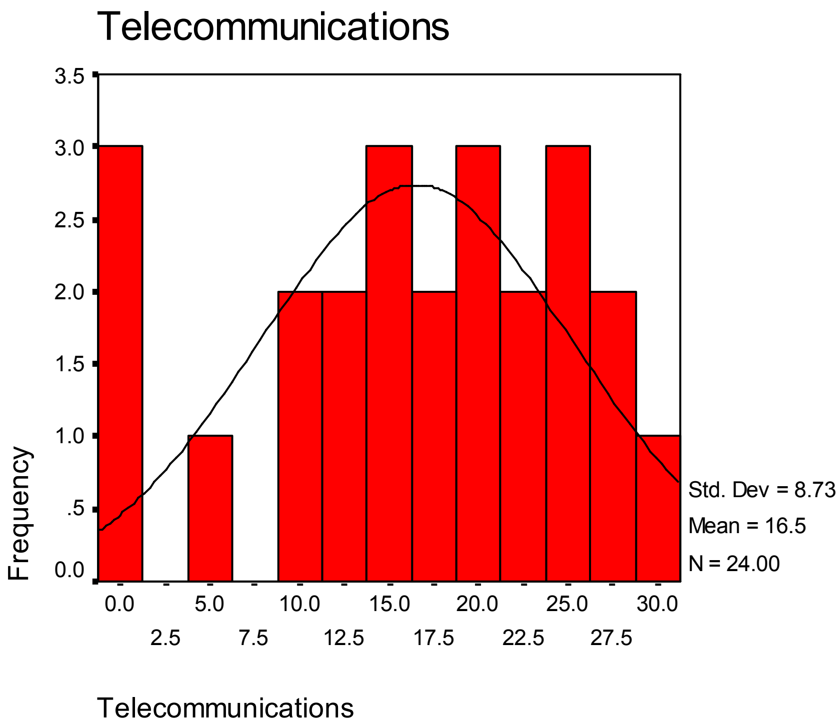

Figure 8. Telecommunications histogram

Table 55. Chi-Square Tests for Peripherals

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	24.000(a)	23	.404
Likelihood Ratio	18.085	23	.753
Linear-by-Linear Association	.087	1	.768
N of Valid Cases	24		

a 48 cells (100.0%) have expected count less than 5. The minimum expected count is .13.

The value of chi-square (obtained) is 24,000, the degrees of freedom are 24, and the exact significance of the chi-square is .404. This is well above the standard indicator of a significant result (*alpha* = .05), so we may conclude that there is no statistically significant at beyond .001 level for the peripherals.

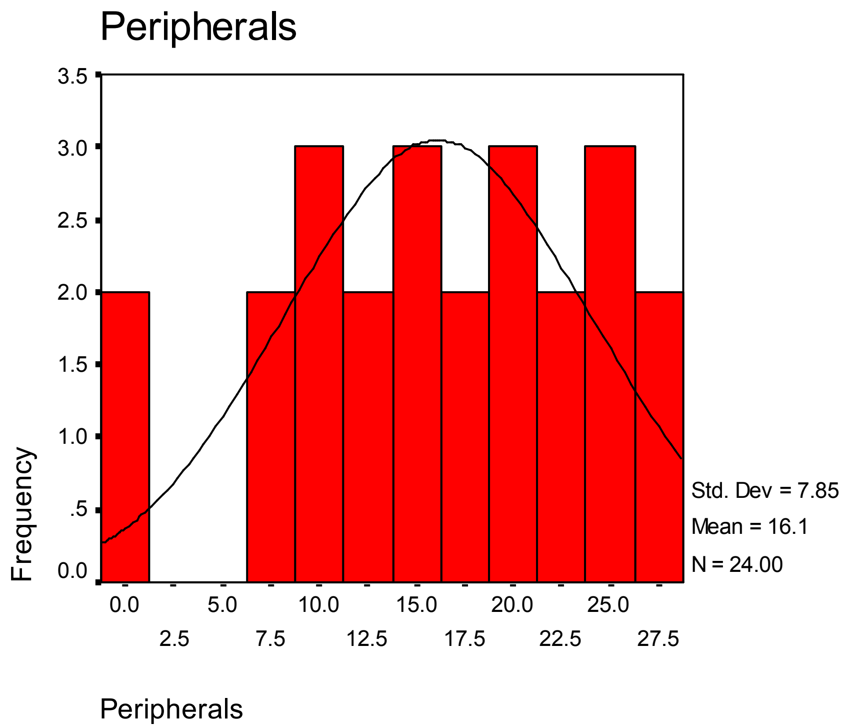

Figure 9. Peripherals histogram

Comparing the values with the chi square distribution with 3 degrees of freedom, we have a ρ-value of slightly less than .9 Pearson's chi-square statistic is .604, which is quite close the value from the likelihood ratio test (Rice, 2007). Interpreting the ρ-value as meaning that, even if the model were correct, discrepancies this large or larger would be expected to occur on the basis of chance about 90% of the time. There is thus no reason to reject the hypothesis that the counts come from a multinomial distribution with the prescribe probabilities. We would tend to doubt this hypothesis for only small *ρ*-value (Rice, 2007).

The ρ-value can also be interpreted to mean that on the basis of chance we would expect agreement, this close or closer about 10% of the time. There is some validity to the suggestions that the data agree with the model too well; if the ρ-value had been .999, for example, we would definitely be suspicious (Rice, 2007).

Analysis of variance (ANOVA)

Table 56 shows the scores of the items. Each item has a mean percentage from participant's responses. The question to be answered is: Are the differences among the means significantly different, at .05 level. To answer the question will calculate the ratio of between-group variance, to the within-group variance, (see Table 57). The between-group and within-group sum to the total variance. Formula for the total variance:

$$S = \sum (x - \bar{x})^2/N\text{-}1$$

Where *x* represents the raw scores of interval-level observations, $\bar{x}$ is the mean of the distribution of raw scores, and *N* is the number of observations. So to find the variance in a distribution: (1) subtract each observation from the mean of the set observations; (2) square the difference; (3) sum the squared difference (sum of squares); (4) divide that sum by the sample size, minus 1. Formula for sum of the square is:

$$S = \sum x^2 - (\sum x^2)^2/N\text{-}1$$

Table 58 shows the results of the sum of squares, between-groups variances and within-group variances.

Table 56. Test of Homogeneity of Variances (*df* = degrees of freedom)

	Levene Statistic	*df1*	*df2*	Sig.
Computer Hardware	4.734	1	22	.041
Networking	2.563	1	22	.124
Wireless Mobile	.132	1	22	.720
Telecommunications	3.478	1	22	.076
Peripherals	4.195	1	22	.053
Which of the following systems are on site at this location	2.075	1	22	.164
Which of the following operating systems are on site at this location	1.772	1	22	.197
Would you recommend technology use to contacts within your industry?	8.465	1	22	.008
With your experience of the most recent technology installation?	.322	1	22	.576
Technology installation personnel are sufficiently knowledgeable and professional?	.001	1	22	.979
Technology understands the service needs of my company/institute	.024	1	22	.878
Overall with technology installation service?	.619	1	22	.440
Overall with amount of technology communication?	1.345	1	22	.259
Overall with the value of technology services with the price paid?	3.830	1	22	.063
Overall how satisfied are you with hardware/software installation?	.877	1	22	.359
Site preparation requirements were four (4) weeks before delivery	2.668	1	22	.117
The site was ready for installation	.887	1	22	.357
Hardware was delivered as scheduled	.314	1	22	.581
The order was delivered complete (i.e. no components or peripheral devices missing)	.647	1	22	.430
Installation was scheduled at my convenience	1.551	1	22	.226
Electrical connections included the correct plugs	.490	1	22	.491
The preparation instructions were easy to understand	1.058	1	22	.315
Easy of installation	8.408	1	22	.008
Quality of documentation	22.549	1	22	.000
Compatibility with other standards	1.214	1	22	.282
Software drive support	.070	1	22	.794
Accessibility of product support	.806	1	22	.379
Quality of product support	.806	1	22	.379
Value relative to cost	1.001	1	22	.328

Table 56. (continued). Test of Homogeneity of Variances (*df* = degrees of freedom)

	Levene Statistic	*df1*	*df2*	Sig.
Overall Reliability	.366	1	22	.551
Overall Performance	.210	1	22	.651
Which of the following network types/applications are installed at your worksite	3.882	1	22	.062
Ease of Installation	.070	1	22	.794
Quality of documentation	.331	1	22	.571
Compatibility with other standards Hardware/Software	.545	1	22	.468
Hardware/Software driver support	.524	1	22	.477
Accessibility of support	.423	1	22	.522
Quality of support	.773	1	22	.389
Value relative to coast	.561	1	22	.462
Overall reliability	.763	1	22	.392
Overall Performance	.454	1	22	.507
With the appropriateness of documentation to your needs?	.063	1	22	.804
With the quality of the documentation delivered with your system?	.063	1	22	.804
With the usability of the documentation provided?	.003	1	22	.954
Overall with the documentation provided?	6.297	1	22	.020
Check or write your specific title for the occupation that closely represent to your position in the organization.	3.667	1	22	.069

Using SPSS package, means for all items are calculated as shown in Table 57. NOVA is applied to calculate *F* ratio (test statistics). The null hypothesis for the study simply state that the means of the item are equal (Caldwell, 2007). It is stated symbolical as follows:

$$H_0: u_1 = u_2 = u_3 = u_4 \ldots$$

In terms of the *F* ratio, there has to be more variation between the items than within the items for the *F* ratio to be significant. The *F* ratio (test statistics) is an expression of the ratio of the variation between groups to the variation within groups; the larger the *F* ratio, the more likely it is to be significant (see Table 57). In calculating the *F* ratio as a test of the null hypothesis, and arriving at a conclusion. If the calculated F ratio (test statistics) meets or exceeds the critical value, we will reject the null hypothesis. The F ratio is the estimate of the between-groups variance divided by the estimate of the within-groups variance. In other words, the F ratio will be an expression as follows:

$$F \text{ ratio} = SS_W/SS_B$$

Where SS_W = Within-Groups Sum of Squares and SS_B = Between-Groups Sum of Squares

Calculating the Within-Groups Sum of Squares (SS_W)

The calculation of the within-groups sum of squares focuses on the mean of each item in the study. The mean level for each item is found in Table 58 along with deviations. The sum of the deviations from the mean is always 0. Then will sum the squared deviations in each item to obtain the sum of squares for each item we have to square. This portion of the ANOVA calculation is illustrated in Table 57. For example the result of the within-groups sum of squares calculation for Computer Hardware is 1682.476. (SS_W = 1682.476).

Calculating the Between-Groups Sum of Squares (SS_B)

To calculate the between-groups sum of squares follows the procedure similar to calculating the within-groups sum of squares. The difference with this part of the ANOVA procedure requires that we calculate the squared deviation of each mean from the total means and sum those squared deviations across the items. This portion of the ANOVA calculation is illustrated in Table 57. For example the result of the between-groups sum of squares calculation for Computer Hardware is .857. (SS_B = .857).

Table 57. ANOVA (F = ratio)

		Sum of Squares	df	Mean Square	F	Sig.
Computer Hardware	Between Groups	.857	1	.857	.011	.917
	Within Groups	1682.476	22	76.476		
	Total	1683.333	23			
Networking	Between Groups	8.595	1	8.595	.105	.749
	Within Groups	1797.238	22	81.693		
	Total	1805.833	23			
Wireless Mobile	Between Groups	58.339	1	58.339	1.039	.319
	Within Groups	1235.619	22	56.165		
	Total	1293.958	23			
Telecommunications	Between Groups	4.667	1	4.667	.059	.811
	Within Groups	1749.333	22	79.515		
	Total	1754.000	23			
Peripherals	Between Groups	5.357	1	5.357	.084	.775
	Within Groups	1410.476	22	64.113		
	Total	1415.833	23			
Which of the following systems are on site at this location?	Between Groups	9.524	1	9.524	.146	.706
	Within Groups	1438.476	22	65.385		
	Total	1448.000	23			
Which of the following operating systems are on site at this location?	Between Groups	160.095	1	160.095	2.851	.105
	Within Groups	1235.238	22	56.147		
	Total	1395.333	23	.000		
How often do you use technology equipment (Circle one)	Between Groups	.000	1		.	.
	Within Groups	.000	22	.000		
	Total	.000	23			

Table 57. (continued). ANOVA (*F* = ratio)

		Sum of Squares	*df*	Mean Square	*F*	Sig.
Would you recommend technology use to contacts within your industry?	Between Groups	.857	1	.857	2.912	.102
	Within Groups	6.476	22	.294		
	Total	7.333	23			
With your experience of the most recent technology installation?	Between Groups	.595	1	.595	.942	.342
	Within Groups	13.905	22	.632		
	Total	14.500	23			
With the timeliness of technology installation?	Between Groups	2.381	1	2.381	2.282	.145
	Within Groups	22.952	22	1.043		
	Total	25.333	23			
Technology installation personnel are sufficiently knowledgeable and professional?	Between Groups	1.006	1	1.006	1.905	.181
	Within Groups	11.619	22	.528		
	Total	12.625	23			
Technology understands the service needs of my company/institute	Between Groups	.720	1	.720	2.189	.153
	Within Groups	7.238	22	.329		
	Total	7.958	23			
Overall with technology installation service?	Between Groups	2.625	1	2.625	4.813	.039
	Within Groups	12.000	22	.545		
	Total	14.625	23			
Overall with amount of technology communication?	Between Groups	2.625	1	2.625	2.475	.130
	Within Groups	23.333	22	1.061		
	Total	25.958	23			
Overall with the value of technology services with the price paid?	Between Groups	2.381	1	2.381	3.503	.075
	Within Groups	14.952	22	.680		
	Total	17.333	23			

Table 57. (continued). ANOVA (*F* = ratio)

		Sum of Squares	*df*	Mean Square	*F*	Sig.
Overall how satisfied are you with hardware/software installation?	Between Groups	.857	1	.857	.662	.425
	Within Groups	28.476		1.294		
	Total	29.333	23			
Site preparation requirements were four (4) weeks before delivery	Between Groups	.000	1	.000	.000	1.000
	Within Groups	29.333	22	1.333		
	Total	29.333	23			
The site was ready for installation	Between Groups	1.524	1	1.524	2.316	.142
	Within Groups	14.476	22	.658		
	Total	16.000	23			
Hardware was delivered as scheduled	Between Groups	3.149	1	3.149	2.273	.146
	Within Groups	30.476	22	1.385		
	Total	33.625	23			
The order was delivered complete (i.e. no components or peripheral devices missing)	Between Groups	7.292	1	7.292	5.231	.032
	Within Groups	30.667	22	1.394		
	Total	37.958	23			
Installation was scheduled at my convenience	Between Groups	.054	1	.054	.049	.826
	Within Groups	23.905	22	1.087		
	Total	23.958	23			
Electrical connections included the correct plugs	Between Groups	3.429	1	3.429	2.640	.118
	Within Groups	28.571	22	1.299		
	Total	32.000	23			
The preparation instructions were easy to understand	Between Groups	.149	1	.149	.160	.693
	Within Groups	20.476	22	.931		
	Total	20.625	23			

Table 57. (continued). ANOVA (F = ratio)

		Sum of Squares	*df*	Mean Square	*F*	Sig.
Easy of installation	Between Groups	1.929	1	1.929	2.285	.145
	Within Groups	18.571	22	.844		
	Total	20.500	23			
Quality of documentation	Between Groups	6.095	1	6.095	5.313	.031
	Within Groups	25.238	22	1.147		
	Total	31.333	23			
Compatibility with other standards	Between Groups	.095	1	.095	.151	.702
	Within Groups	13.905	22	.632		
	Total	14.000	23			
Software drive support	Between Groups	.000	1	.000	.000	1.000
	Within Groups	9.333	22	.424		
	Total	9.333	23			
Accessibility of product support	Between Groups	.292	1	.292	.205	.655
	Within Groups	31.333	22	1.424		
	Total	31.625	23			
Quality of product support	Between Groups	.292	1	.292	.205	.655
	Within Groups	31.333	22	1.424		
	Total	31.625	23			
Value relative to cost	Between Groups	.595	1	.595	.410	.528
	Within Groups	31.905	22	1.450		
	Total	32.500	23			
Overall Reliability	Between Groups	.054	1	.054	.039	.844
	Within Groups	29.905	22	1.359		
	Total	29.958	23			

Table 57. (continued). ANOVA (*F* = ratio)

		Sum of Squares	*df*	Mean Square	*F*	Sig.
Overall Performance	Between Groups	.024	1	.024	.019	.892
	Within Groups	27.810	22	1.264		
	Total	27.833	23			
Which of the following network types/applications are installed at your worksite	Between Groups	1.167	1	1.167	.016	.901
	Within Groups	1621.333	22	73.697		
	Total	1622.500	23			
Ease of Installation	Between Groups	2.149	1	2.149	1.832	.190
	Within Groups	25.810	22	1.173		
	Total	27.958	23			
Quality of documentation	Between Groups	1.524	1	1.524	1.125	.300
	Within Groups	29.810	22	1.355		
	Total	31.333	23			
Compatibility with other standards Hardware/Software	Between Groups	.482	1	.482	.422	.523
	Within Groups	25.143	22	1.143		
	Total	25.625	23			
Hardware/Software driver support	Between Groups	1.339	1	1.339	.913	.350
	Within Groups	32.286	22	1.468		
	Total	33.625	23			
Accessibility of support	Between Groups	1.167	1	1.167	1.041	.319
	Within Groups	24.667	22	1.121		
	Total	25.833	23			
Quality of support	Between Groups	1.720	1	1.720	1.389	.251
	Within Groups	27.238	22	1.238		
	Total	28.958	23			

Table 57. (continued). ANOVA (*F* = ratio)

		Sum of Squares	*df*	Mean Square	*F*	Sig.
Value relative to coast	Between Groups	2.381	1	2.381	2.099	.161
	Within Groups	24.952	22	1.134		
	Total	27.333	23			
Overall reliability	Between Groups	1.524	1	1.524	1.054	.316
	Within Groups	31.810	22	1.446		
	Total	33.333	23			
Overall performance	Between Groups	1.006	1	1.006	.964	.337
	Within Groups	22.952	22	1.043		
	Total	23.958	23			
With the appropriateness of documentation to your needs?	Between Groups	.482	1	.482	.850	.367
	Within Groups	12.476	22	.567		
	Total	12.958	23			
With the quality of the documentation delivered with your system?	Between Groups	.482	1	.482	.850	.367
	Within Groups	12.476	22	.576		
	Total	12.958	23			
With the accuracy of the documentation delivered?	Between Groups	1.006	1	1.006	.964	.337
	Within Groups	22.952	22	1.043		
	Total	23.958	23			
With the usability of the documentation provided?	Between Groups	3.149	1	3.149	2.910	.102
	Within Groups	23.810	22	1.082		
	Total	26.958	23			
Overall with the documentation provided?	Between Groups	.214	1	.214	.289	.596
	Within Groups	16.286	22	.740		
	Total	16.500	23			

Table 57. (continued). ANOVA (*F* = ratio)

		Sum of Squares	*df*	Mean Square	*F*	Sig.
Check or write your specific title for the occupation that closely represent to your position in the organization.	Between Groups	1.006	1	1.006	.293	.594
	Within Groups	75.619	22	3.437		
	Total	76.625	23			

In Table 57, the degrees of freedom associated with the between-group estimate of variance are 1, and the degrees of freedom associated with the within-groups estimate of variance is 22. In interpreting the null hypotheses, as stated before, when the calculated *F* ratio meets or exceeds the critical value, we have significant results, and we can reject the null hypothesis. If, on the other hand, our calculated test static falls below the critical value, we will fail to reject the null hypothesis.

Since the degrees of freedom associated with the between-group estimate of variance are 1, and the degrees of freedom associated with the within-groups estimate of variance is 22 we can locate the critical value (.05 Level of Significance) as 4.30. Stating the hypothesis for all items, we find that the calculated *F* ratio falls below the value (4.30) we then fail to reject the null hypothesis, except for items;

Overall with technology installation service, which has *F* = 4.813

1. Order was delivered complete (i.e. no components or peripheral devices missing), which has *F* = 5.231
2. Quality of documentation which has *F* = 5.313

We then can reject the null hypothesis since these items calculated *F* ratio exceeds the critical value 4.30.

As part of the overall assessment of the questionnaire the researcher asked the participants what recommendations they would offer to improve hardware/software installations in their organizations. Varying responses were derived from participants as follows:

1. Adapt to changes in technology (buy new equipment and software) to easily link with other organizations and institutions.
2. Should have facilities for converting to local languages and should have visual displays and contact details in case any particular problems occur.
3 Strictly adhere to the date the installer promises to do so.
   (b). Proper and complete installation equipment and software.
   (c). Being available when required for installation.
4. Installers should be knowledgeable.
5. Great deal of research and consultation should be more thorough so that there are fewer malfunctions at the site.
6. Consultation and research must be done up front and thoroughly. Know the needs of the region's information technology and to what extent does it need expanding. Research in technology installation should involve all parties, for example, management and staff.
7. Installation fine, but can be improved by running modern advanced software.
8. To buy new hardware and software.
9. Buying to much technology becomes absolute quickly.
10. Train in house personnel for prompt support.
11. Use of simple language and easy explanations.

12. All hardware peripherals should be plug and play compatible for easy installation.

Need to provide more quality documentation on product and improvement, reliability and support.

Statistical Summary of Individual Items

Participants answered each of the items on a *5-point Likert scale*. In attempting to determine if any significant difference existed between the items. Mean scores were computed for all items assessed on the survey. The results of these comparisons are shown in Table 58. These results indicate rather small differences between the perceptions obtained from the participants.

Table 58. Descriptive Statistics of Individual Items

Items	N	Mean	Std. Deviation
Computer Hardware	24	19.83	8.555
Networking	24	16.42	8.861
Wireless Mobile	24	12.21	7.501
Telecommunications	24	16.50	8.733
Peripherals	24	16.08	7.846
Which of the following systems are on site at this location	24	16.00	7.935
Which of the following operating systems are on site at this location	24	26.17	7.789
How often do you use technology equipment (Circle one)	24	1.00	.000
Would you recommend technology use to contacts within your industry?	24	1.17	.565

Table 58. (continued). Descriptive Statistics of Individual Items

Items	N	Mean	Std. Deviation
With your experience of the most recent technology installation?	24	1.75	.794
With the timeliness of technology installation?	24	1.83	1.049
Technology installation personnel are sufficiently knowledgeable and professional?	24	1.87	.741
Technology understands the service needs of my company/institute	24	1.79	.588
Overall with technology installation service?	24	1.87	.797
Overall with the value of technology services with the price paid?	24	2.17	.868
Overall how satisfied are you with hardware/software installation?	24	1.83	1.129
Site preparation requirements were four (4) weeks before delivery	24	2.33	1.129
The site was ready for installation	24	2.00	.834
Hardware was delivered as scheduled	24	2.63	1.209
The order was delivered complete (i.e. no components or peripheral devices missing)	24	2.46	1.285
Installation was scheduled at my convenience	24	2.46	1.021
Electrical connections included the correct plugs	24	2.00	1.180
The preparation instructions were easy to understand	24	2.13	.947
Easy of installation	24	4.25	.944
Quality of documentation	24	4.33	1.167

Table 58. (continued). Descriptive Statistics of Individual Items

Items	N	Mean	Std. Deviation
Compatibility with other standards	24	4.50	.780
Software drive support	24	4.67	.637
Quality of product support	24	4.37	1.173
Value relative to cost	24	4.25	1.189
Overall Reliability	24	4.54	1.141
Overall Performance	24	4.58	1.100
Which of the following network types/applications are installed at your worksite	24	16.75	8.399
Ease of Installation	24	3.21	1.103
Quality of documentation	24	3.33	1.167
Compatibility with other standards	24	3.63	1.056
Hardware/Software driver support	24	3.37	1.209
Accessibility of support	24	3.42	1.060
Quality of support	24	3.29	1.122
Value relative to coast	24	3.17	1.090
Overall reliability	24	3.33	1.204
Overall Performance	24	3.46	1.021
With the appropriateness of documentation to your needs?	24	2.04	.751
With the quality of the documentation delivered with your system?	24	2.04	.751
With the accuracy of the documentation delivered?	24	2.21	1.021
With the usability of the documentation provided?	24	2.29	1.083
Overall with the Documentation Provided?	24	2.25	.847
Check or write your specific title for the occupation that closely represent to your position in the organization.	24	3.13	1.825
Valid N (listwise)	24		

Using the mean and standard deviation (*SD*) of each item from Table 58. The mean scores are not identical, implying that there is no coordination in the way IT infrastructure development is handled. However, there are differences in the standard deviations of each item. The relatively low standard deviations indicate that these items are homogeneous as far as IT infrastructure development satisfaction is concerned. In the Networking item, the dissipation (*SD* = 8.861) is greater than other items, suggesting that the degree of satisfaction reflected by the mean is not common to all the IT infrastructure development tools in the study.

Summary

This analysis attempts to acknowledge the broad categories of information technology infrastructure development research. Based on these results, the researcher can redesign activities, policies, and techniques in order to improve data gathering. The research is less rigid in that there is rarely ever a control group, the procedures are not necessarily standardized, the outcome is often subjective and the intent is not to compete. On the other hand, the research can be a highly effective way to improve situations within the information technology infrastructure development in the SADC.

The final issue that makes an evaluation of IT infrastructure development difficult is the lack of good information. The evaluation alludes to the final project as a good standard, but the objective of the differential is to determine the hypotheses that are consistent with the task presentation. As a result, there will always be some level of controversy and misunderstanding in the critiques.

The findings have very important implications for the practice of IS management. Hopefully, they may be useful in helping practitioners and researchers alike to find ways to increase infrastructure development components, and in so doing, to provide a basis for further development of a more complete construct for composite infrastructure development.

CHAPTER 5. RESULTS, RECOMMENDATIONS, AND CONCLUSION

The purpose of this study was to enhance the understanding of information technology infrastructure development in the SADC region and establish a foundation for future studies. The researcher first identified the domain concepts of information technology. This task was accomplished by content analysis of the information technology literature in the region.

Maintaining an integrated approach in information technology infrastructure development was essential to ensure that the overall goals were achieved for empowering communities, improving people's quality of life, and creating more equal, open societies in the region. This applies to policies and policy making. The key challenge is to consider the longer-term use and the role of information technology in society while making policies intended to support infrastructure development. Often, in a developing country, the focus is on the infrastructure development dimension of policy, while neglecting dimensions that relate to the development of human resource capacity, production, exchange and dissemination of information content.

Information technology is the combined set of technological and organizational components that provide the platform to address the region's organization information needs. Information technology infrastructure provides to address both current and future needs of the region's information distribution to support the organizations.

Findings

Analysis of the data gathered from the instrument had two major purposes. First, as the study has involved the research effort to gather information on infrastructure characteristics relating to its development, an important task of analysis was to search for generalized information about the construct. Secondly, once the best measures of infrastructure development were defined, the analysis sorts to test the model of its strategic value.

The survey questions used in the study are presented in the questionnaire in Appendix A. The following sections describe the factor analysis results of the data in the infrastructure technology group. From communications perspective, the researcher, for instance, did not show a differentiated pattern of communication among the participants. Greater attention should be paid to the aspects of group composition, and user participation in infrastructure standards. It may be interpreted as partially supportive of the idea that non-IT participants may not have impact on standard development process. Better process and coordination mechanisms may be necessary to facilitate more participation from stakeholders and communities at large. Just like in any traditional standards development organizations, the group dynamics are also affected by social influence namely normative and informational influence, even when the process is open to a wide business community.

Furthermore, it should be pointed out that the SADC is a vast geographic region made up of countries that were colonized by different world powers. The economies of Anglophone countries historically were relatively disconnected from those of the Francophone countries within the region, and some countries, such as Mozambique and Angola, do not belong to either the Anglophone or the Francophone block (Musa, Meso, & Mabarika, 2005). Surveying technology adoption practices across the different blocks may provide a further understanding of the ways technology adoptions and diffusions vary across the region.

The researcher propose that additional studies employing more qualitative approaches such as field study or case-study methods be conducted in the region as ways of obtaining a deeper understanding of the factors that influence technology adoption and diffusion, investment decisions, and even government policies.

Limitations

This study has several limitations to be considered. The primary obstacle to the information technology infrastructure development in the SADC region is the political infeasibility due to the leg time required for an observed impact. Secondly, funding sources are not available. Thirdly, the interpretation of the examining factor can not be regarded as final, but, rather as a direction for future research. Fourthly, the study used self-report data with no control or incentive to assure the participation of the selected participants. Fifthly, majority of the participants were not in upper level information technology management in which they could not disclose total amounts spent per year in procuring equipment. Sixthly, participants were reluctant in responding to the survey. Seventhly, the data set used to test the validity came from only 5 of the 14 countries; this perspective may not have produced the most accurate information representative of the actual status of the region.

Measurement Limitations

The research methodology employed in this study used a survey instrument as a data-gathering tool and interviews. While this no doubt limited measurement problems in the questionnaire, it clearly could not eliminate the possibility that some participants may have been confronted with questions that were misinterpreted. To some extent this was mitigated by the option of not responding to particular questions. Indeed, with few exceptions, responses typically encouraged further research while citing few difficulties with the survey instrument. Furthermore, if organizational participants do not understand the relevance of the study, there is little to motivate them providing access and information to an investigator (Van De Ven, 1992).

Recommendations

This research provides insights into the factors that comprise the construct of information technology infrastructure development, thus contributing to the literature for future researchers. As infrastructure is the backbone of information dispatching, two avenues of research may be followed. First, the study must be replicated with a different sample to increase the reliability and validity of its conclusion. Secondly, another study should be conducted to further refine the items associated with infrastructure development.

The dissertation maintains that in order to generate meaningful results and rational policy recommendations, it is essential to conduct an in-depth examination of the regions' technology infrastructure resources and their advancement within a socioeconomic, political, and cultural context unique to each nation. This produces any analysis that permits investigating the actual technology infrastructure development level, determining obstacles and opportunities, and identifying policy directions, while realizing that the conclusions are unlikely to be valid and applicable to other countries.

The SADC nations need to develop a cultural appropriate strategy if the need for information technology is to have a positive impact on their overall socio-economic development. As part of budgetary process, the SADC governments should allocate funds specifically toward information technology infrastructure development. The long-term impact on the countries' social development is over looked. Left unchecked, the technology market place will pose a hard-to-reverse negative role on the SADC. This will make it hard for the SADC nations to decide their long term preferences for social and economic development.

Conclusion

It is difficulty to draw a conclusion on complex issues such as the impact of regional development policies and technological disparities. This dissertation has opened the door for further research into relationships between countries within the region. Future studies would reveal a better understanding of the workings of the regional development policies and what impact they have on the socio economic indicators and industrial structures in the region.

To achieve a better understanding of the levels of information technology infrastructure development impact in the SADC region, it would be beneficial to make a comparison among the countries within the region. This means using a control method to measure and analyze the impact level of policies for technology development. This study found that flexibility in the region's information technology infrastructure development contributes significantly to the region's ability to gain competitive advantage in the market place. Therefore, continued investment in the region's infrastructure development should pay off for the regions organizations as they will be able to gain, and sustain competitive advantage over their rivals.

Building information technology infrastructure is beneficial to economic development. By continuing to refine policies directed toward information technology infrastructure development and education, sustainable economics growth is certain to follow. Perhaps the most important aspect of information technology infrastructure development is expanding the level of coordination and communication between the public and private sectors as well as promotion of private sector industry within the region.

REFERENCES

Africa Internet Infrastructure Information. (July, 2002). *The African Internet–A status report*. Retrieved from http://www3.sn.apc.org/africa/afstat.htm

Barney, J. (1991). Enterprise resources and sustained competitive advantage. *Journal of Management 17*(1), 99–120.

Bhalla, A.S. (1996). *Facing the technological challenge.* New York: St. Martins.

Brancheau, J. C., Janz, B. D., & Wetherbe, J. C. (1996). Key issues in information systems management. 1994-95 SIM Delphi results. *MIS Quarterly, 20*(2), 225-242.

Broadbent, M. (1998). *Leveraging the new infrastructure: How market leaders capitalize on information technology.* Boston: Harvard Business School Press.

Broadbent, M., & Subramani, M. (1997). Management by Maxim: How business and IT managers can create IT infrastructures. *Sloan Management Review*, *38*(3), 77–92.

Broadbent, M., Weill, P., O'Brien, T., & Neo, B. S. (1996). Firm context and patterns of IT infrastructure capability. *Proceedings of the Seventeenth International Conference on Information Systems,* 174-194.

Caldwell, S. (2007). *Statistics unplugged*. (2nd ed.). Belmont, CA: Thomson Wadsworth.

Cartwright, W., Crampton, J., Gartner, G., Miller, S., Mitchell, K., Siekierska, E., et al. (n.d.). Geospatial information visualization user interface issues. *New Media research 28*(1). Retrieved on May 23, 2005 from http://kartoweb.itc.nl/icavis/agenda/PDF/Cartwright.pdf

Chale, M., & Michaud, P. (1997). *Distance learning for change in Africa. The Acacia initiative - Studies and Outputs, International Development Research Centre*. Retrieved March 28, 2003, from http://www.idrc.ca/acacia/03230/04-dlear/dlear4.html.

Connelly, F. M., & Clandinin, D. J. (1990). Stories of experience and narrative inquiry. *Educational Researcher, 19*(5), 2-14.

Conner, D. R. (1993). *Managing at the speed of change*. New York: Villard Books.

Cooper, R. D., & Schindler, S. P. (2003). *Business research methods* (8th ed.). New York: McGraw-Hill.

Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research.* Thousands Oaks, CA: Sage.

Cronbach, L. J. (1971). Coefficient alpha and the internal structure of tests. *Psychometrika, 16,* 297-334.

Darkwa, O., & Mazibuko, F. (2000). Creating virtual learning communities in Africa: Challenges and prospects. *First Monday, 5*(5). Retrieved March 22, 2006, from http://firstmonday.org/issues/issue5_5/darkwa/index.html

Diallo, A. B. (n.d.). Technology, Africa and learning. *Opinion article 3, UNESCO – Division of Basic Education.* Retrieved March 22, 2006, from http://www.unesco.org/education/educprog/lwf/doc/portfolio/opinion3.htm

Fetterman, D. M. (1989). *Ethnography: Step by step.* Newbury Park, CA: Sage.

Fossum, D. (2004, July 7). *Identifying federally funded research and development on information technology: Testimony presented to the House Committee on Government Reform.* Retrieved on February 12, 2006 from http://www.rand.org/pubs/testimonies/CT229-1/index.html

Gaudin, S. (January 29, 2001). Spending on the rise. *Network World Fusion*.

Gormolosk, B. G., Grigg, T., & Potter, K. (2001). IT Spending and Staffing. *Survey results*, R-14-4158.

Guislain, P. (2005). *Connecting Sub-Saharan Africa: A World Bank Group Strategy for information and communication technology sector development*. Herndon, VA: World Bank, p. 2. Retrieved on March 12, 2006 from http://site.ebrary.com/lib/capella/Doc?id=10079937&ppg=18

Gunton, T. (1989). Infrastructure: *Building a framework for corporate information handling.* New York: Prentice-Hall.

Healey, J. F. (2005). *Statistics: A tool for social research*. (7th ed.). Belmont, CA: Thomson Wadsworth.

Ivala, E. (1999). The Internet and distance education. *1st NADEOSA Conference*. Retrieved March 29, 2006 from http://www.saide.org.za/nadeosa/conference1999/ivala.htm

Jensen, M. (1999). *Internet: A preserve of urban elite: View on information and technology.* Retrieved on Feb 23, 2006, from http://www.sardc.net/editorial/sadctoday/2-5-01-1999/v2-5-01-1999-12.htm

Jessup, L. M., & Valacich, J. S. (2003). *Information systems today* (2nd ed,). Upper Saddle River, NJ: Prentice Hall.

Kerlinger, F. (1973). *Foundations of behavioral research*. New York: Rinehart and Winston.

Khan, A. (2000). *Cost and optimization in government*. Quorum Books.

Lakoff, G., & Johnson, M. (1980). *The metaphors we live by*. Chicago: The University of Chicago Press.

Laudon, K. C., Traver, C. G., & Laudon, J. P. (1995). *Information technology concepts and issues*. Ferncroft Village Danvers, MA: Boyd & Fraser.

Lelliot, A., & Enslin, P. (2000). Online education in Africa – Promises and pitfalls. Journal of Philosophy of Education Special Issue: Enquiries at the interface: *Philosophical problems of online education, 34.* Retrieved on March 27, 2006, from http://generalupdate.rau.ac.za/infosci/conf/Wednesday/Lelliot.htm

Lincoln, Y.S., & Guba, E.G. (1985). *Naturalistic inquiry.* Beverly Hills, CA: Sage.

Madakufamba, M. (1999). *Smart partnerships needed to improve information technology.* Retrieved on March 25, 2006, from http://www.sardc.net/editorial/sadctoday/v2-5-01-1999/v2-5-01-1999-1.htm

Madon, S. (1992). Computer-based information systems for decentralized rural development administration. *Journal of Information Technology, 7*, 20-29.

McKay, D. T., & Brockway, D. W. (1989). *Building IT Infrastructure for the 1990s*. *Stage by Stage*. New York: Norton & Company.

Mansell, R., & When, U. (1998). *Knowledge Societies: Information technology for sustainable development.* New York: Oxford University Press.

Moyo, L. M. (1996). Information technology strategies for Africa's survival in the twenty first century: IT all pervasive. *Information technology for development, 7*(1), 17-29.

Montealegre, R. (1999). A case for more case study research in the implementation of information technology in less-developed countries. *Information technology for development, 8*(4), 199-208.

Mundy, P., & Sultan, J. (2001*). Information revolution: How information and communications management is changing the lives of rural people*. Wageningen, The Netherlands: CTA.

Murphy, P., Anzalone, S., Bosch, A., & Moulton, J. (2002). *Enhancing learning opportunities in Africa: Distance education and information and communication technologies for learning. African Region Human Development* (Working Paper Series 24051). Africa Region. Washing D.C.: The World Bank.

Nachmias, D., & Nachmias, C. (1987). *Research methods in the social sciences* (3rd ed.). New York: St Martin's Press.

Nidumolu, S., & Goodman, S. (1996). Information technology for local administration support: The governorates project in Egypt. *MIS Quarterly, 20*(2), 197-225.

Nunnally, J. (1967). *Psychometric theory*. New York: McGraw-Hill.

Odedra, M., Lawrie, M., Bennett, M., & Goodman, S. (1993*).* International perspectives: Sub-Saharan Africa: A technological desert. *Communications of the ACM, 6*(2), 2529.

Odedra-Straub, M. (1990). Information technology transfer to developing countries: Is it really taking place? In J. Berleur & J. Drumm (Eds.), *Information technology assessment*. North-Holland. Retrieved on January 16, 2006 from http://www.straub-odedra.de/Seiten/publications.htm

Oz, E. (2002). *Management Information Systems* (3rd ed,). Boston: Course Technology.

Panko, R. R. (2003). *Business data networks and telecommunications* (4th ed.). Upper Saddle River. NJ: Prentice Hall.

Philip F. M., Peter, M., Victor, W. M. (2005). Toward sustainable adoption of technologies for human development in Sub-Saharan Africa: Precursors, diagnostics, and prescriptions. *Communications of the Association for Information Systems, 15,* 592-608.

Plunkett Research. (2005). *Plunkett's E-Commerce and Internet business almanac*. Retrieved on February 19, 2006 from http://www.plunkettresearch.com/technology/ecommerce trends.htm#i

Rice, J. A. (2007). *Mathematical statistics and data analysis* (3rd ed.). Belmont, CA: Thomson Brooks/Cole.

Rockart, J. F. (1988). The line takes the leadership-IS management in a wired society. *Sloan Management Review, 29*(4), 57-64.

Rush, H. J., Ghosh, P. K., & Morrison, D. E. (1984). *Appropriate technology in third world development.* Westport, CT: Greenwood Press.

SADC Today (n.d.). *Information technology to propel SADC into next millennium.* Retrieved on March 25, 2006, from http://www.sardc.net/Editorial/sadctoday/v2-6-04-1999/v2-6-04-1999-1.htm

Sambamurthy, V., & Zmud, R. W. (1992). *Managing IT for success: The empowering business relationship.* Morristown, NJ: Financial Executives Research Foundation.

Stair, M. R., & Reynolds, W. G. (2006). *Principles of information systems* (6th ed.). Boston: Thompson Learning.

Southern African Development Community Country Analysis Brief (2005). *The Southern African Development Community.* Retrieved on March 23, 2006 from http://www.eia.doe.gov/cabs/sadc.html

Southern Africa Global Distance Educationet. (1999). *An overview of distance education initiatives and the use of technology in Malawi.* Retrieved on February 22, 2003 from http://www.saide.org.za/worldbank/countries/malawi/mal overview.htm

Van De Ven, A. H. (1992). Suggestions for studying strategy process: A research note. *Strategic Management Journal, 13,* 169-188.

Weill, P. (1993). *The role and value of IT infrastructure: Some empirical observations.* R. D. Cambridge, MA: Massachusetts Institute of Technology.

Weill, P (2002). *IT infrastructure for strategic agility.* Cambridge, MA: Massachusetts Institute of Technology.

Weiss, A., & Birnbaum, P. (1989). Technological infrastructure and the implementation of technical strategies. *Management Science 35*(8), 1015-1027.

World Summit on the Information Society (WSIS). (February 5, 2003). *Delineating roles for partners in the development of the information society: A collaborative approach*. Beirut.

Yahya, A. (1993, April 13). *On the problems of information technology management in developing nations. Proceedings of the conference of the ACM special interest group on computer personnel research.* ACM SIGCPR *93*, 349-355. St. Louis, MO.

APPENDIX A: INTERVIEW QUESTIONS

Technology Infrastructure Products

1. Which of the following infrastructure products, services, and technologies do your organization or institute currently use or plan to approve, recommend, purchase, or influence the purchase of? Circle all that applies for each category and write the range of annual dollar value involved from the range below:

Annual Dollar Range

a. $100 Million or higher
b. $10 Million to $99,9 Million
c. $1 Million to $9,9 Million
d. $100,000 to $999,99
e. $100,000 or less

A. Computer Hardware

____________Mainframes
____________Windows Servers
____________Application Servers
____________Web/Commerce Servers
____________PCs/Workstations/Desktops
____________Laptops/Notebook
____________Other, Please specify___________
____________Unix Servers
____________Linux Servers
____________Database Servers

B. Networking

____________LANs (Local Area Network)
____________WANs (Wide Area Network)
____________Virtual Private Network
____________Remote Access/WI-Fi/Wi-Max
____________Networking/Communications Software
____________Switches, Routers, Hubs
____________Security/Firewalls
____________Network/Systems Management
____________Other, Please specify_______________________________________

C. Wireless/Mobile

____________Handheld PCs/PDAs/Pocket PCs
____________Wireless LANs
____________Wireless WANs
____________Fixed Access/point to point/MANs
____________Wireless/PCs/Cellular
____________Other, Please specify____

D. Telecommunications

____________LANs (Local Area Network)
____________WANs (Wide Area Network)
____________Telecom Services (Voice and Data Service)
____________VOIP (Voice Over IP)
____________Call Center /PBX
____________T-1/T-3/Fiber
____________Broadband/DSL
____________Web Conferencing/Teleconferencing
____________Other, Telecommunications, please specify____________________________

E. Peripherals

____________Printers
____________Monitors/Flat Panel Displays
____________Projectors/Visual Displays
____________Copiers/Document Imaging
____________UPS (Power Protection)
____________Other, Please specify_______________________________________

2. Which of the following systems are on site at this location? (Check all that apply)

__________Mainframe/Large Scale Computers
____________Min/Midrange Computers
____________PC Servers
____________Workstations
____________PCs including Portables
____________Handhelds/Wireless Devices
____________Other, Please specify____

3. Which of the following operating systems are on site at this location? (Check all that apply)

____________Windows Server 2003
____________Windows Vista
____________Windows 2000
____________Window NT
____________Windows 98
____________Windows CE
____________Windows XP

__________UNIX
__________Linux
__________MVS/ESA/VM
__________OS 400
__________NetWare
__________Sun OS/Solaris
__________Mac OS (Macintosh)

____________Other, Please specify____

4. How often do you use technology equipment (Circle one).
   a. Daily
   b. Once/week or more
   c. 2-3 times a month
   d. Once a month
   e. Every 2-3 months
   f. 2-3 times a year
   g. Never

5. Would you recommend technology use to colleagues or contacts within your industry?
(Circle one) Yes No Not sure

Product Surveys – Technology Equipment Installation Evaluation

Installation service evaluation… quality of service, how well needs are met, feedback

1. Please check an option, which best represents your opinion, for each of the following questions, how satisfied are you?

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
With your experience of the most recent technology installation?					
With the timeliness of technology Installation?					
Technology installation personnel are sufficiently knowledgeable and professional?					
Technology understands the service needs of my company/institute?					
Overall with technology installation service?					

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Overall with amount of technology communication?					
Overall, with the value of technology services with the price paid?					
Overall, how satisfied are you with hardware/Software Installation?					

Hardware/Software – Hardware/Software Post Installation Satisfaction

Post purchase installation, evaluation, feedback.
1. Please check an option, which best represents your opinion, for each of the following statements.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Site preparation requirements were four (4) weeks before delivery.					
The site was ready for installation.					
Hardware was delivered as scheduled.					
The order was delivered complete (i.e. no components or peripheral devices missing).					
Installation was scheduled at my convenience.					
Electrical connections included the correct plugs					
The preparation instructions were easy to understand.					

Hardware/Software – Hardware/Software Product Evaluation

Hardware/Software use, attribute importance and evaluation.

1. How important are the following product characteristics to you in the selection of new hardware products?

	Not Important	Somewhat Unimportant	Neutral	Somewhat Important	Extremely Important
Ease of Installation					
Quality of Documentation					
Compatibility with Other Standard					
Software Driver Support					
Accessibility of Product Support					
Quality of Product Support					
Value Relative to Cost					
Overall Reliability					
Overall Performance					

2. Which of the following network types/applications are installed at your worksite or organization/institute? (Circle all that apply)

a. LAN
b. WAN
c. WIRELESS
d. VOIP
e. Voice Mail
f. Telecommuting
g. Videoconferencing
h. Other, Please Specify____

3. Please rate the network installed at your site on the criteria below.

(Specify type of network: ____)

	Very Poor	Fair	Good	Very Good	Excellent
Ease of Installation					
Quality of Documentation					
Compatibility with Other					
Standard Hardware/Software					
Hardware/Software Driver Support					
Accessibility of Support					
Quality of Support					
Value Relative to Cost					
Overall Reliability					
Overall Performance					

Hardware/Software - Technical Documentation

Quality and satisfaction with technical documentation.

1. How satisfied are you?

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied	N/A
With the appropriateness of documentation to your needs?						
With the quality of the documentation delivered with your system?						
With the accuracy of the documentation delivered?						
With the usability of the documentation provided?						
Overall with the documentation provided?						

What recommendations would you offer to improve hardware/software installation in organizations/institutes?

____

____

____

____

____

____

Check or write your specific title for the occupation that closely represents your position in the organization.

Occupation	Specific Title
Upper Management/Executive	
Middle Management	
Sales/Marketing	
Professional/Technical	
Clerical/Service Worker	
Tradesman/Machine Operator/Laborer	
Trainee	

Level of Education: (Circle the highest level completed)

a. Completed primary school

b. Completed high school

c. Completed technical school

d. Completed college/university

e. Completed graduate school (master's degree)

f. Completed graduate school (doctorate)

Age and Gender (circle M for male and F for female)

18-25 yrs M F

26-30 yrs M F

31-35 yrs M F

36-40 yrs M F

40-50 yrs M F

51-60 yrs M F

61-70 yrs M F

71-80 yrs M F

81-90 yrs M F

Please be assured that information provided will be kept confidential.

Thank you, for participating in this survey.