FRAMEWORK FOR THE DEVELOPMENT OF TELECOMMUNICATIONS WITHIN AN INTEROPERATOR ENVIRONMENT IN THE SADC

by

MARK ROLF FRICKE

Submitted in partial fulfillment of the
requirements for the degree

M. Eng. (Technology Management)

in the

FACULTY OF ENGINEERING

UNIVERSITY OF PRETORIA

PRETORIA

November 2004

DISSERTATION SUMMARY

FRAMEWORK FOR THE DEVELOPMENT OF TELECOMMUNICATIONS WITHIN AN INTEROPERATOR ENVIRONMENT IN THE SADC

by

Mark Rolf Fricke

Supervisor: Prof Krige Visser

Department: Department of Engineering and Technology Management

UNIVERSITY OF PRETORIA

Degree: M.Eng (Technology Management)

Telecommunications development in southern Africa is encouraged by economic opportunity, government-level support (such as the Southern African Development Corporation, or SADC) and market trends (de-monopolisation and market liberalisation). Various markets in the SADC region offer telecommunications operators solid growth potential and the advantages of geographic diversification.

Operators entering the new markets will generally do so in the mode of partnerships, alliances or Greenfield operations. However, the context in which they function, independent of the mode of entrance, will tend to be defined by the telecommunications and ICT industry; that is, within an interoperator environment. “Interoperator” is referred to in a broad sense, i.e. enterprise interaction between operators / service providers and across the value chain. The existence of interoperator relationships is thus taken as an assumption.

A carefully managed network rollout and technological evolution plan is required together with critical market and business considerations to succeed with expansion into SADC markets.

This paper presents a logical methodology for telecoms operators (mobile or fixed) to guide network development and formulate strategy particular to the SADC deployment area. A proposed development framework gives structure and organisation to the various aspects – business requirements, technology choices and market decisions – of a telecoms business in Southern Africa. The total model consists of 4 associated representations which fit logically in an enabling framework.

Central to the framework is a technology decision methodology, guiding the technological evolution toward a Next Generation Network (NGN) services core whilst preserving existing investment, smoothing interoperation of elements and legacy technologies and subordinating decisions to business needs. Alignment of services and products to the business plan and that of the customer needs is also addressed through the “considerations and applications” and “customer visibility circle” representations.

The regulatory environment, licence stipulations and interconnect agreements are important inputs to the framework. The output is the formulation of a high-level strategy roadmap, and evaluation and feedback methodology.

The realisation of a clear, defined roadmap through which telecommunications development in the SADC can be guided provides telecommunications operators with a high-level framework that structures, orders and orientates all necessary elements with long-term goals and business requirements.

ACKNOWLEDGEMENTS

I would like to thank the following people for their various contributions to this dissertation:

- Professor Krige Visser, my dissertation supervisor at the University of Pretoria
- Mr Clive Tarr from Vodacom
- Mr Kevin Burns from Telkom
- Dr Russell Achterberg from Telkom

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

TERMS AND ABBREVIATIONS

ADSL: Asymmetric Digital Subscriber Line.

ATM: Asynchronous Transfer Mode.

AToM: Any transport over MPLS.

CPE: Customer premises equipment.

DSCP: Diff Serv Code Point

DSL: Digital Subscriber Line. A technology for bringing high-bandwidth information to CPE or end terminals (e.g. homes and small businesses) over copper telephone lines.

EDGE: Enhanced Data GSM Environment. The EDGE standard is built on the GSM standard and uses time-division multiple access to make it faster than GSM alone

FR: Frame relay.

GSM: Globalé Sisteme de Mobile (Global System of Mobile [communications])

GPRS: General Packet Radio Service. A packet switching-based radio technology protocol.

ICT: Information and Communication Technology.

IP: Internet Protocol. This is an addressing structure. It can be understood to be the infrastructure on which the internet – a service enabled by the infrastructure – is carried.

ISP: Internet service provider.

ISDN: Integrated Services Digital Network.

MoU: Memoranda of Understanding.

MPLS: Multi-Protocol Label Switching. A protocol based on label switching, currently used mainly in the network core and edge for efficiency and speed.

MSC: Mobile switching centre.

NGN: Next Generation Networks. A concept for defining and deploying advanced networks which enable support of innovative services

OSS: Operation Support Systems

TRASA: Telecommunications Regulators Association of Southern Africa.

SADC: Southern African Development Community.

SATCC: Southern Africa Transport and Communications Commission.

SDH: Synchronous Digital Hierarchy

SNO: Second Network Operator.

SMME: Small, Micro and Medium Enterprise.

TDM: Time Division Multiplexing.

Telco: A telecommunications operator

TOS: Type of service

USA: Universal Service Access.

VOIP: Voice Over Internet Protocol.

VPN: Virtual Private Network.

Wi Fi: Wireless Fidelity. A high-frequency wireless local area network (usually standard 802.11b). Also known as wi fi.

WiMax: Or WiMAX. A so-called broadband wireless access technology. Standard 802.16

CHAPTER 1: INTRODUCTION

Economic development and growth requires a level of infrastructure which many countries in the world and especially Africa simply do not have. Some level of economic advancement and industrial progress is generally required to alleviate poor social conditions for any meaningful period in the modern world.

Where some basic infrastructure does exist and certain services do operate, the operation of such infrastructure is sometimes below a level necessary to enable sustainable socio-economic development. Telecommunications, energy and transport service levels are sometimes unreliable to the degree that social and economic investment is difficult to secure, especially from foreign sources, and carry-out effectively. A lack of basic infrastructure precludes any real foreign investment and severely hampers local development and investment.

The greater southern African region has not only recognised through bodies such as the SADC (Southern African Development Community) the need for organised, structured infrastructural development to improve socio-economic conditions, but also has the potential evidenced by government- and private-sector projects to achieve a level of cross-country development.

It is for this reason that this dissertation focuses on the SADC region, in a geographical, socio-economic and political sense.

Telecommunications

Telecommunications / ICT (Information and Communication Technology) in the largest sense is occupying an increasingly important role in society and to the economy. It is widely acknowledged to be a crucial driver of business growth and development, which in turn has the potential to influence other spheres – job creation, infrastructure, healthcare, education, etc. A necessary level of telecommunications and ICT infrastructure is an enabler for other businesses and an important precursor for foreign investment.

Telecommunications expansion into new markets

Telecoms corporations have expressed interest in conducting business in these (by comparison) under-developed African states. This has been sparked by trends such as the liberalisation of markets (traditional monopolies in the countries being ended), the growth prospects and perceived potential offered by emerging markets, and the so-called convergence of technology (enabled by the digitalisation of data).

Reasons for geographic expansion are commonly one or more of the following:

- Diversification of risks; be they geo-political, technological or otherwise.
- Higher growth prospects offered by foreign markets. The cellular industry, for example, is under pressure to maintain its high subscriber growth rate, and since a saturation point is logically going to be reached in home markets, emerging markets represent a way to achieve this.
- To leverage existing knowledge and expertise in new markets (thereby increasing the return on intellectual property) and the specific strengths of their position (number of customers, huge market capitalisation, large asset base, etc) for economic profit.
- The liberalised or free-market state which is evolving intensifies economic and industry activity, driving demand for communication and information services (Sarkar *et al*, 1999), which opens the market to various service providers and ICT players.
- Rapidly changing technology has created new, niche markets which incumbents often do not address. Space therefore exists for foreign firms (Sarkar *et al*, 1999).

Worldwide, the ITU reports the total revenues of the telecommunications industry in 2003 will be approximately US$ 1.37 trillion, which is the highest amount ever, with 1.2 billion fixed lines and 1.3 billion mobile phones. Players in mature markets have experienced traffic and subscriber growth, despite the pall hanging over the industry following the bursting of the "telecoms bubble". However, some practices in the late 1990s have resulted in fundamental problems with certain operators' businesses, which required immediate remedy. These include debt mismanagement, fraud, bankruptcy and vast unrestrained spending based on inaccurate traffic demand projections. The unnecessary spending (expanding core network capacity beyond what was required and purchasing the overly

expensive, "hyped-up" 3G licences) forced many firms into debt positions which were unrecoverable as data traffic forecasts proved insufficient to warrant and pay off the infrastructure. Increasing price competition in local markets resulted and, together with the telecom bubble bursting, forced firms to cut costs, restructure networks and organisations, and eliminate debt.

However, a strategy based on better positioning to meet demand (which is strong in certain spheres, such as broadband and mobile services) and a customer orientation approach to services has emerged. Companies that have focused on real global market needs, such as basic telecoms development in emerging markets, interconnecting dispersed sites (in the form of Virtual Private Networks, or VPNs), offering cellular access to various markets and IP-based value-added services have experienced success since 2001.

Expansion into new or foreign markets can be achieved through various entry modes, the most prominent in the case of large telecoms companies moving into emerging markets being direct entry through joint ventures, strategic alliances, Mergers and Acquisitions, (all of which are "co-operative" entry modes), purchasing a firm in the target market and establishing Greenfield operations (classified as "integrated" entry modes) (Kogut *et al*, 1988). Empirical studies show telecommunications companies expand abroad mainly through alliances and consortia (Sarkar *et al*, 1999).

Implications of entry mode choice

The choice of entry mode into a new market affects the risks, opportunities and profit potential of the enterprise. In joint ventures and alliances, the most prolific telecoms expansion vehicle, this entry choice has certain basic implications (expressed in brackets) to the following risks:

- The level of company control and decision-making (alliances mean the company has a high degree of control over foreign operations and control risk is reduced).
- Country risk, which is political and business risks / uncertainties (country risk is maximised when entry mode is Direct (Gronroos, 1999), though joint ventures can reduce the political aspect).
- Profit potential (entry modes have different profitability models, with complimentary joint venture operations providing the highest profit (Pan *et al*, 1999)).

- National culture of the target market (the level to which a firm understands differences and cultural behaviour affects operations, with a joint venture a better entry mode than Greenfield operations, for example, if a large cultural distance exists between the home and local market (Kogut *et al*, 1988)).

Joint ventures, alliances and Greenfield initiatives from operators who understand local culture are well-suited and often-selected telco entry modes into the SADC. Furthermore, the nature of service development often requires some form of cross-company interaction or partnership across the value chain (e.g. with broadcasting, content distribution, etc.) This dissertation therefore focuses on telecommunications development with the assumption of some form of soft or hard partnership, alliance or other operation selected as the entry mode by a foreign corporation. (Hence, the inclusion of the phrase "…within an interoperator environment" in the title.) Analysis of the entry mode choice and the subsequent effects and implications on operations *per se* is however beyond the scope of this dissertation.

Need for structured roadmap

Services companies – both telecoms and others such as utility companies – have experienced both success and failure in Africa, for various reasons. Obviously not all of these are particularly relevant to telecommunications businesses, as characteristics of the businesses are unique in each case. However, elements from these undertakings can be consolidated into strategy and methodology issues to gain some knowledge of the development of infrastructure in foreign markets.

However, despite the existence of this experience there are few processes or clearly defined frameworks (that address political, social and economic variables) through which launching a modern telecoms business venture in Southern Africa can be guided. Though "technology transfer" processes are well documented and business models exist, combining all these issues and applying them to a region with specific characteristics as in the SADC is still required.

Defining critical elements that require attention and making provision for arising business and technological issues in modern telecommunications (and Southern African

telecommunications specifically), is necessary. The economic and technological drivers of telecommunications growth, as well as the risks of such development, should be described, properly understood and clearly positioned within a business plan to maximise the potential benefits and minimise the risks. Acknowledged problems with traditional telecommunications operators' businesses have the potential to be eliminated in these new markets (e.g. by "leapfrogging" technology) and better practices implemented.

There is therefore need for a clearly defined telecommunications development process through which the various issues, risks and business drivers, as they are relevant to Southern African ICT business, are addressed.

Hence, a model that takes into account the current and future needs, risks and overall structures of a successful strategy for a telecommunications undertaking in the SADC by a foreign corporation is required.

1.1 Research Statement

The goal of this research is to develop a clearly defined framework through which a strategy organising and structuring the various stages and processes involved a modern telecommunications network in a country or area in the SADC can be mapped.

The objectives are to prove that the framework is both valid and useful by:

1. comparing it with existing case studies and determining whether the framework successfully replicates and orders the necessary elements involved in new telecoms business in Southern Africa
2. determining whether the framework adds to or could have enhanced the actual strategy employed in the case study

The dissertation has as pre-existing assumptions that the telecommunications undertaking takes place from the perspective of a telco which engages in some level of interoperator interaction. This affects the development model by implying corporate positioning is important and business dependencies and risks exist. Development is generally achieved through an entry mode which is either "co-operative" or "integrated."

The development framework must be sufficiently generic to allow high-level application to both mobile and fixed access industry players of different sizes, but detailed enough to accurately describe and account for all network elements present in a high-level strategy.

Note that this dissertation does not purport to incorporate an in-depth analysis of telecommunications by itself. The constraints of application scope (approaching from a social, political and economic perspective the role of telecoms, both fixed and mobile), and nature of intent (providing a model for strategy development).

1.2 Research Design and Methodology

This dissertation draws from multiple sources to develop related lines of inquiry into the study body as it is described above. The research itself is primarily drawn from investigation through the following sources: interviews with relevant authorities; documentation (reports, policy documents, journals and textbooks), Internet research (from selected sources of particular quality) and statistics and records from recognised bodies such as the ITU (International Telecommunications Union).

The goal and objectives described in the above section are realised through the following methodology:

- Conduct research literature study and interviews with telecoms firms
- Identification and discussion of arising issues
- Development of conceptual framework and roadmap
- Test and verification of framework against case studies

The literature study in chapter 2 provides a summary of relevant issues in literature. It addresses the SADC; the importance of telecommunications; telecommunications policies and the regulatory framework; economic and technological factors; and general risks.

Chapter 3 discusses and analyses the issues raised in the literature study and provides additional related concepts and ideas which are examined. Conclusions regarding certain issues are reached.

Chapter 4 presents the conceptual framework which is the thrust of the research. It is a collection of various models which apply in concert through an enabling framework.

Chapter 5 describes the methodology used to test the model developed against a case study to determine its validity. Chapter 6 presents the results of the testing and chapter 7 the conclusions of the dissertation.

Recommendations for further research and related issues are presented in chapter 8. The bibliography and appendices are contained within chapters 9 and 10 respectively.

CHAPTER 2: LITERATURE REVIEW

Expansion of a telecoms business into Southern Africa is a complex field which incorporates government regulations, socio-economic and cultural elements, financial and technological capabilities, marketing issues and multi-operator relationships.

This research is by nature multi-disciplinary. Many disparate fields must receive attention in order to provide a comprehensive literature review of the subject matter.

A literature overview is therefore provided by addressing the following sections:

2.1 The SADC

An overview of the Southern African Development Community as an organisation and a geographic collection of member states is provided. The influence of this body on infrastructure and telecommunications development in the region is highlighted.

2.1.1 Overview

The Southern African Development Community consists of 14 member states: Angola, Botswana, DRC (Democratic Republic of Congo), Lesotho, Malawi, Mauritius,

Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

The original 9 states, which founded the organisation then known as the Southern African Development Co-ordinator Conference (SADCC) in 1980, did so in an effort to unite against colonialism and South Africa's Apartheid. Their objectives were twofold: to free their economies from dependence on South Africa and loosely integrate their national economies (McCormick, 2003).

Since the joining of the remaining 5 states, which took place between 1990 and 1997, and the evolution of the SADCC to the SADC in 1992, the SADC has seeked to strengthen its legal status and powers.

The SADC is to a large degree influenced by South Africa (McCormick, 2003), in political and socio-economic terms. It is the largest trading partner with many of the countries in the SADC. It has been suggested (Amin, 1997) that regional organisations should not be constructed by attaching peripheral countries or zones to dominant centres which serve as global or regional colonialists. Southern African states should therefore not be subjected to power wielded by South Africa. However, the size of South Africa's economy and its dominance in certain industries suggests South Africa does, and will continue to stand out as the most powerful country in the SADC.

It is relevant to understand this power bias within the organisation. South Africa's economy is more than 3 times the size of all the other SADC countries' economies combined. The SADC acknowledged this economic dominance before South Africa's admission (SADC, 1993), though the measures taken to counter this have not been sufficient to prevent further economic polarisation (McCormick, 2003). However, the SADC seeks to require that the more endowed states assist and compensate the weaker members to ensure that they benefit from the opportunities afforded by regional integration (McCormick, 2003; SADC, 1993).

This is important to note because South African telecommunication companies are currently applying or have licences to operate in other countries within the SADC. Their licences (if awarded) may be subject to certain service obligations, though this and the fact

that the licences are awarded to South African firms cannot be directly attributed to the SADC's influence.

The SADC treaty assumed the force of national laws upon ratification by the member states in 1993 (SADC, 1993). Under this legally binding arrangement, the member countries are to co-ordinate, harmonise and rationalise their policies for sustainable development. The primary role of the SADC is to facilitate integration, assist in mobilising resources, define priorities and maximise the impact of projects (McCormick, 2003).

Regional entities such as the SADC are necessary transitional steps to the construction of true economic globalisation (Amin, 1999). Regional economic integration requires corresponding political integration, and during this stage regional bodies such as the SADC assume increased importance.

It is therefore necessary to consider the potential influence of the SADC on telecommunications strategy in the next 10 to 15 years.

Mozambique has the duty of co-ordinating all telecommunications (and transport) projects, of which there number under half of the 400 SADC's current development projects. The Southern Africa Transport and Communications Commission (SATCC), based in Maputo, is the controlling body of these projects.

2.1.2 State of telecommunications in the SADC

Telecommunications capabilities and network proficiencies differ widely between the SADC member countries.

The general standards of service, reliability and density are not only different between countries; they are, on the whole, insufficient. This severely hampers the probability of achieving the SADC's goals: at an SADC telecommunications sectoral meeting in Harare in 1997, inadequate telecommunications within the region was rated as the foremost non-tariff barrier to trade and economic development (SADC, 1998).

Despite the widespread anticipation of new technologies, the "information revolution" and the prospects for building a connected society across the world and in Southern Africa, much more needs to be done (Kekana, 2002). The true benefits of an electronic community can only be achieved once that community is completely connected.

In developing countries (all SADC member states are classified as "developing countries", South Africa included), the problems faced by the telecommunications sector, according to the World Bank, include (IBRD, 1998):

- Large unsatisfied demand for basic services and non-availability of modern services needed for business and commerce
- Poor quality of service
- Shortage of adequately trained manpower to provide and maintain services
- Lack of financial resources
- Poor financial performance

Several factors are noted to contribute to this poor performance (McCormack, 2003): institutional inefficiency, inadequate human resources, maintenance problems (derived from differing technology and operating standards), standardisation and different maintenance procedures. The previous high costs of connectivity and the state of monopoly that existed in most countries also contributed significantly.

A teledensity of 25-30 dels per 100 persons is, according to the SATCC, required to support the socio-economic activities of a nation that has "transformed into a new economy." The SADC had in 2000 a regional average of 3.4 direct exchange lines (dels) per 100 inhabitants.

The Global Competitiveness Report, published annually by the World Economic Forum, assesses the competitive strengths and weaknesses of national economies. The Report includes two complementary competitiveness indexes: the Growth Competitiveness Index (GCI), which looks at "the set of institutions and economic policies supportive of high rates of economic growth in the medium to long term (over the coming five to eight years)." The second is the Microeconomic Competitiveness Index (MICI), which assesses

"the set of institutions, market structures, and economic policies supportive of high current levels of prosperity."

For the purposes of this dissertation, the competitiveness report simply gauges the general state of governance and economic probability of achieving long-term goals, as compared with other countries in the world. It should be regarded as contextual knowledge when considering the SADC's aims and objectives.

Unfortunately, not all countries from the SADC are addressed, but those that are appear in Table 1, below:

Country	Growth Competitiveness Index	Microeconomic Competitiveness Index
Botswana	Ranks 41. The technology environment is restraining the economy's competitive potential, with Botswana ranking 61 overall in this area. Public institutions, however, are perceived to be a relative strength, with a rank of 31.	Ranks 57. The quality of the national business environment ranks slightly higher (at 51) than the country's company operations and strategy (at 64).
Mauritius	Ranks 35. The country's technology environment is a weaker component of competitiveness (ranking 45) compared with Mauritius' public institutions (ranking 35).	Ranks 49. This overall score is affected by a slightly lower score for the quality of the country's business environment (ranking 50) than for company operations and strategy (ranking 42).
Namibia	Ranks 53. A relative competitive strength for the country is public institutions, where the country ranks 41. A fairly competitive technology environment (at 59) is driven by the ability of the country to absorb technology from abroad.	Ranks 51 overall, with a rank of 58 in company operations and strategy and a rank of 49 in the quality of the national business environment.
South Africa	Ranks 32. This relatively good competitiveness ranking is boosted by the country's macroeconomic environment (ranking 30). South Africa's technology environment is hindering the country's overall competitiveness ranking slightly, ranking 38.	Ranks 29 overall, ranking 31 on company operations and strategy and 33 on the quality of the national business environment.
Zimbabwe	Ranks 79. The country's macroeconomic environment is considered the least competitive of the 80 economies ranked in the report. Zimbabwe's technology environment ranks 75 and public institutions ranks 68.	Ranks 70. Company operations and strategy (ranked 68) is a relative strength compared to the quality of the country's business environment (ranked 70).

Table 1: Competitiveness report results

Source: World Economic Forum, 2003

2.1.3 Mobile and fixed access networks

It is necessary to consider the general operating condition and use of fixed-line and mobile communications networks currently utilised in the SADC.

Many applicants for a telephone line have had to wait between 6 months and 10 years for the installation of a fixed-line in the past. (Wilson *et al*, 2003; Kekana, 2002). The operators were inefficient and slow to install additional lines (especially to rural users) where revenue would not be as much as urban areas and costs were high. (Although some licences oblige operators to provide for these users, many lines are disconnected following non-payment after a few months, such as in South Africa.)

Unprecedented growth in the cellular and mobile sector is increasing the telecommunication penetration rate (ITU, 2003). The advent of cellular technology has revolutionised telecommunications in Africa. Mobile technology is easier and cheaper to install in rural and urban areas, with the result that the number of cellular subscribers in a country exceeds that of the fixed access network (ITU, 2003; Afullo, 1999) in most countries.

The following statistics provide an idea of the proliferation of cellular technology in Africa as a whole (ITU, 2003):

- 61% of total telephone subscribers in Africa are cellular mobile subscribers. (Mobile penetration in Africa exceeded fixed-line penetration in 2001 with 53% of subscribers)
- The compound annual growth rate of cellular subscriptions between 1995 and 2002 is 75.8%

Table 2 contains details of SADC member states' fixed telephone lines, cellular subscribers and Internet particulars.

Statistics of particular interest:

- CAGR of fixed access is approximately 7%; while the CAGR of cellular subscribers is approximately 97%. (The CAGR was calculated using only the figures of countries where there were cellular providers in 1995).
- On average, there are 6.4 main telephone lines per 100 inhabitants in the SADC; while there are 11.45 cellular subscribers per 100 inhabitants (known as teledensity).

Even taking into account that cellular technology in 1995 was almost brand new to Africa, and that the CAGR should therefore logically be a large percentage given mobile communications' popularity and utility, the growth rate is nonetheless impressive.

Although call costs using cell phones are generally higher than fixed-line and the technology is relatively new, it is testimony to the presence of great demand for telecommunications that the proliferation of mobile technology has reached such levels in so short a time.

A barrier to entry, however, remains in that cellular handset costs in Africa are inflated above costs of handsets in Europe (Wilson *et al*, 2003). This is questioned by other sources, however, and CPE (customer premises equipment) and handset costs are generally decreasing.

From table 2 it is clear that once South Africa's (relatively) high number of users have been discounted from the total, there are 1 065 400 Internet users in all the SADC states combined. The population in 2002 was 205.66 million. About 0.5% use Internet. The hypothesized reasons for this are shortage of fixed-lines, a shortage of computers and equipment, and computer illiteracy (Wilson *et al*, 2003).

Though unprecedented growth in the cellular sector is increasing the penetration rate and teledensity (McCormick, 2003) in the SADC, the number of access points is not yet enough to support the socio-economic activities of a region to transform into a new economy.

	Main telephone lines				Cellular mobile subscribers				Internet			
	(k)			Per	(k)			per	Total	Hosts per	Users 2002	Users per
	1995	2002	CAGR	100 inhab.	1995	2002	CAGR	100 inhab.	hosts 2002	10000 inhab.	(k)	10000 inhab.
Angola	52.7	85	7.1	0.61	2	130	81.6	0.93	8	0.01	41	29.42
Botswana *	59.7	142.6	15.6	8.48		415		24.13	1273	7.57	50	297.47
DRC *	36	20	-9.3	0.04	8.5	150	61.4	0.29	134	0.03	6	1.14
Lesotho	17.8	34	9.7	1.57		92		4.25	60	0.28	5	23.15
Malawi	34.2	73.1	11.4	0.7	0.4	86	116.8	0.82	22	0.2	27	25.87
Mauritius	148.2	327.2	12	27.3	11.7	350	62.4	28.91	3462	28.6	180	1487
Mozambique *	59.8	89.5	6.9	0.51		152.7		0.86	16	0.01	30	16.99
Namibia *	78.5	117.4	6.9	6.43	3.5	150	71.1	8	4632	25.36	45	246.33
Seychelles *	13.1	21.4	8.5	26.11	0.1	44.1	209.7	53.87	262	31.99	9	1098.9
South Africa	4002.2	4895	2.9	10.77	535	12081	56.1	26.58	238462	53.51	3100	682.01
Swaziland	21.1	35.1	7.5	3.4		63		6.1	1142	11.2	20	193.8
Tanzania *	90.3	148.5	8.6	0.44	3.5	427	122.7	1.27	1478	0.44	100	29.77
Zambia	76.8	88.5	2	0.83	1.5	139.1	90.2	1.3	1095	1.03	52.4	49.01
Zimbabwe	152.5	287.9	9.5	2.47		353		3.03	3494	3.04	500	429.75
Total SADC	4842.9	6365.2	7.09	6.40	566.2	14632.9	96.89	11.45	255540	11.66	4165.4	329.33

Key:

*: 2001 figures are used in place of unavailable 2002 figures
CAGR: Compound annual growth rate, expressed as %

Table 2: SADC telecommunications penetration

Source: International Telecommunications Union, 2003

2.1.4 Universal access

Many of the touted benefits if ICT, such as in the fields of telemedicine and education, are specifically targeted at improving the situation in poorer and rural areas, who currently have very little access and so have a low probability of realising these ICT-driven developments. If all parts of society are to benefit from ICT, then some sort of universal access to telecoms services is required.

By universal access one does not necessarily mean a telephone line for every person. Universal access – right of entry to and use of telecommunications and services – can be defined as a telephone line every 20 km (as done in Burkina Faso), or within a travelling distance of 30 min (as proposed in South Africa) or as a telephone in every locality of more than 500 people (as in Ghana). (Henten *et al*, 2003).

Obligations on telecom operators' licences, universal service funds and other incentives and requirements have, to some extent, addressed this need. However, this has not always been sufficient to ensure long-term service. Experiences in South Africa, where service was rolled-out in rural areas and then had to be disconnected since payments were not made and lines were often stolen, indicate that it can be very hard to motivate (and justify forcing) operators to deliver services if rural areas remain unprofitable (Henton *et al*, 2003).

Again, however, access does in some way need to be provided to all parts of society to realise the full benefits of telecommunications.

2.2 The Strategic Importance of Telecommunications

According to the International Bank for Reconstruction and Development, telecommunication has been identified as the essential ingredient economic development of any country (IBRD, 1998). It is one of the keys to sustainable economic development in Southern Africa (Pieterse *et al*, 2002).

The transportation and telecommunications sectors are at the heart of a competitive Southern Africa (McCormack, 2003), and telecommunications is both the core and the infrastructure of the information economy (Afullo, 1999). Information has been accepted as the fundamental factor of production and growth. In the year 2000, approximately 70% of all employment in countries in the OECD (Organisation for Economic Co-operation and Development) was information related.

The telecommunications sector is a critical enabler of socio-economic goals and a major determinant of the ability to compete in the international economy. The communications network is arguably the most fundamental infrastructure with an all-encompassing effect of the performance of an economy (McCormack, 2003).

Advances in communication technologies have enabled many countries to improve the lives of its citizens (through improved health, education and public service systems) and economies (Kekana, 2002). But ICT proliferation and an information society alone are not solutions to all problems. They represent opportunities to help eradicate problems (Kekana, 2002).

Telecommunications infrastructure serves as a platform and a catalyst for other industries (McCormack, 2003). It is an especially important consideration for foreign firms wishing to enter the country and a prerequisite for foreign direct investment. (Wilson *et al*, 2003). Through well-channelled FDI, growth of local industries, employment creation and the elimination of contemporary problems in developing countries, ICT and telecommunications help to meet the social and economic challenges currently faced in Africa.

Information and communication technologies can help reduce the costs of escalating needs (e.g. education and healthcare) and improve public service. Inexpensive, reliable and ready access to communication and information are no longer a luxury of the few, but a necessity for the many (Wilson *et al*, 2003).

The SADC seems aware that a reliable and comprehensive telecoms network is a requisite component of both sustainable development and regional integration (McCormack, 2003). The number of projects undertaken in this arena also testifies to this.

2.3 Telecommunication Policies and the Regulatory framework

The aim of this section is to provide an overview of the policy measures and structural reforms that are currently being implemented in the SADC member states by the separate governments, and what the objectives of these reforms are.

Also briefly discussed are various perspectives on the policy reforms and the methodologies used to achieve them.

2.3.1 Policy and policy reform

Government has a vital role to play in ensuring sustainable economic growth, and to allow telecommunications to play its part in national development (Pieterse *et al*, 2002). It generally seeks to achieve this through various legal and regulatory structures designed to enable, monitor and organise and oversee activities, and create bodies to promote development in desired directions. Creating a framework and formalised strategy through which government can realise telecommunications development is not to be underestimated (Hossain, 2003), especially in emerging markets.

Four key policy balances have been identified as important elements to enable a better understanding of the diffusion of the "information revolution" (Wilson *et al*, 2003) which the SADC organisation is trying to effect:

- public and private initiatives
- monopoly and competition markets
- domestic and foreign ownership or control
- centralised and de-centralised administrative controls

A necessary condition for an explanation of the diffusion of telecommunications is a policy framework that incorporates a combination of the above four balances (Wilson *et al*, 2003). Policy reform in the SADC should therefore be considered with this balance as a background.

General Policy Objectives

The general objectives of SADC telecommunications policies are to provide affordable, efficient and high quality telecommunications services "for all", and to create partnerships and an environment for sustainable information-communications development (McCormick, 2003).

A reform protocol entitled the *SADC Protocol on Transport, Communications and Meteorology*, which was adopted by heads of state in 1996, has the following objectives (Article 10.1):

- Ensure adequate and high quality and efficient services responsive to the diverse needs of commerce and industry in support of regional, social and economic growth
- Achieve regional universal service growth with regard to telecommunications services and regional universal access to advanced information services
- Enhance service interconnectivity in the region and globally

(SATCC-TU, 1998)

It aims to achieve this through a number of channels: organisations facilitating development, reform of government legislation and telecoms sectors, promulgating new telecommunications policies, and putting in place independent telecommunication regulators (Støvring, 2003).

These channels have been criticised by the private sector as too slow and often hamstrung by their own imposed limitations, but it has been noted that an irregular telecoms expansion, as opposed to a formalised plan, is expensive and ineffective, and the cost will be passed to the customers (Hossain, 2003).

Policy reform to basic telecommunications, through privatisation of national telecommunications assets and the introduction of competition has been found to lead to "significant improvements in performance" (Fink *et al*, 2003). Performance in this case is indicated by "number of main lines rolled out" and "labour productivity" in the telecoms firms.

The involvement of an independent regulator together with a comprehensive reform programme shows the largest gains in performance: 8% higher level of telephone "main lines" installed and 21% higher level of labour productivity in the telecoms firms as compared with years of partial or no reform.

The research also indicates that the order in which reform events occur ("privatisation", "competition introduction", etc) is significant in realising higher levels of teledensity (Fink *et al*, 2003).

The graph below indicates the situation graphically:

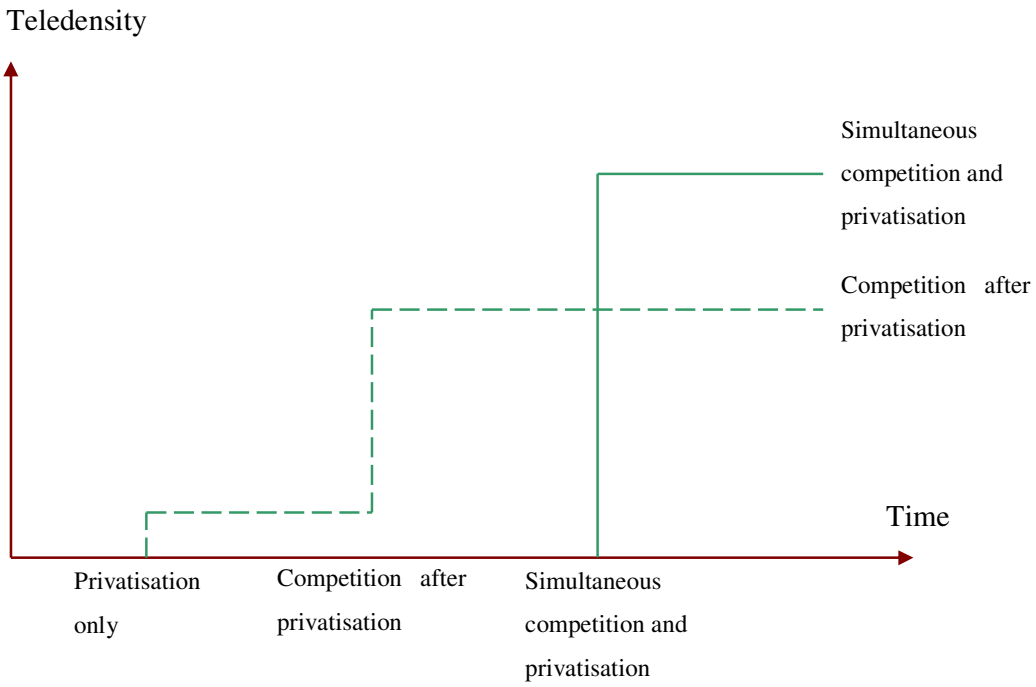

Figure 1: Sequences of policy reform and their impact on teledensity levels.
Source: Fink *et al*, 2003.

However, despite the above, a "managed liberalisation" approach will probably be adopted by the various states, if not already adopted, in order to prevent erosion of their public and private assets (Kekana, 2002).

There are benefits to limiting the size of the market during the liberalisation stage, namely that a large number of small operators would not significantly challenge the position held by the incumbent monopoly (and thereby contesting the dominant position held); and that it would be difficult for the regulator to properly monitor all activities in an uncontrolled marketplace (Kekana, 2002). An oligopolistic market is however unlikely to provide much price competition, and costs will remain relatively high under this managed liberalisation approach.

The Southern Africa Transport and Communications Commission (SATCC), the SADC ministry whose responsibility includes telecommunications and ICT, is currently trying to effect across the SADC a more liberal and competitive telecoms sector which allows for a greater role for private sector corporations. It seems to have most success when the channel used is government peer pressure.

However, not all of the countries in the SADC have completely liberalised the telecommunications sector, especially with regard to the market served by incumbent fixed access operators. This is a key determinant of telecommunications growth and development and until the sectors have been liberalised, progress will be inhibited.

Further impediments to development, which still remain in some SADC states, are antiquated policies and legislation. These are slowly being revised, mainly through the influence of revenue potential by selling licences, recognising the role of ICT and pressure from the SADC. It is imperative that reform and liberalisation of telecoms sectors take place to facilitate a competitive regional economy (McCormack, 2003).

The other major bodies through which the SADC aims to effect change and structure development in the right direction are TRASA (Telecommunications Regulators Association of Southern Africa) and SATA (Southern African Telecommunications Association). The major objective of SATA is to "encourage technological and business co-operation amongst members; facilitate beneficial access to innovative technologies...; and encourage co-operation...in training and human resource development" (SATA, 1999). Membership in the body consists only of the public telecommunications service providers of each SADC member state.

2.3.2 Enabling universal access in a liberalised marketplace

Reform in the telecommunications sector in the SADC can therefore be considered “in progress”. However, the major concern of governments during this stage is also the best way to enable universal access in a liberalised environment. (Understanding this need may reveal future policy trends to telecoms operators, and is therefore necessary.)

A theory of a monopoly organisation is that it allows for cross-subsidisation of extensions into poorer, rural areas, thereby enabling access to all (Henten, 2003). But the telecom monopolies have failed to deliver this access over the past 20 years.

There have been a number of proposals on how to achieve an increase in connectivity, and some of those already employed have met with success. They are (Barendse, 2003):

- Licence obligations: These conditions are intended to oblige operators to extend their network according to specified parameters, with the aim of increasing penetration.
- Establishing a regulator: A regulatory agency sets the terms and conditions of the licences granted; makes rules and regulations which govern the sector; and monitor and control activities, all in the public interest. It is this body which directs and enforces the intricacies of increasing penetration and teledensity.
- Creation of Universal Service Agency: This agency has the responsibility of facilitating the achievement of affordable universal service.
- Rolling out telecentres and public phone shops: Telecentres are projects undertaken in under-provisioned areas designed to empower communities through access to telecoms and ICT. They can offer a range of services and facilities. “Phoneshops” are small centres located in rural or under-services areas where mobile operators, through satisfying licence obligation rollouts, have franchised entrepreneurs to operate a subsidised phone shop on their behalf. Typically, the venture itself is the responsibility of the mobile operator while the shop owner employs staff and manages the shop, taking about a third of the profits on calls. Because the facility is subsidised, calls from the customer’s perspective are relatively cheap.
- Issuing licences in under-serviced areas: In this initiative, SMMEs (Small, micro and medium enterprises) and co-operatives in geographic areas where less than 5% of the population has access to telecoms facilities are awarded licences to operate, using their own or leased infrastructure.

Governments have generally employed various combinations of the above concepts, some meeting with success (such as initiatives like Vodacom SA’s Phoneshops). Phone shops harness the community’s needs and the entrepreneurial nature of some of its members to satisfy licence obligations, to a level of success.

2.3.3 Regulation

The SADC formed the Telecommunications Regulators Association of Southern Africa in an effort to bridge the gap between the formulation of regional legislation and policies and effective execution of the telecommunications at national level, (McCormack, 2003). As current network operators lose their monopoly and independent regulatory agencies are created, TRASA was considered important to facilitate regional telecommunications reform and enhance general service provision. Principle objectives include increasing communications and co-ordination between the region's telecommunications regulatory agencies, and encouraging investment in the telecoms sector by supporting the founding of a common enabling environment, especially with regard to regulation for the SADC region (McCormack, 2003). TRASA also aims to standardise equipment and operating standards – identified as an inhibitor of cross-border networks – and develop the personnel resources to provide cost-effective services throughout the region (Gullish, 1999).

Regulation is an integral part of any telecommunications reform programme, due to the imperfect nature of competition in market segments and the existence of market failures. It is also, as in the case of the SADC, used for the pursuit of social objectives (Makhaya *et al*, 2003).

The regulatory body has as one of its tasks to regulate interconnection agreements, and generally this includes structuring the access of current infrastructure to the new entrants. The complexity of regulation will therefore increase with liberalisation (Helm *et al*, 1998; Barnes, 1998).

Perception of the credibility and effectiveness of the regulatory institution in developing countries is noted to have a considerable influence on foreign investment and ensuring performance guarantees. The capabilities of the regulatory institution are closely related to the amount of discretion that it is allowed to exercise, given that this discretion should be accompanied by transparency and accountability (Makhaya *et al*, 2003). However, it has been argued that the limitation of discretion is often the most appropriate route in developing countries, as it allows the credibility of the reform programme to be

established. This obviously limits the flexibility of the body to adapt to changes (Joskow, 1998). However, credibility is of primary concern to investors and market players.

It has been argued that the opportunity for judicial review of regulatory decisions and processes, and for other measures limiting the discretion of the authority may aid in building confidence in the privatisation process (Levy *et al*, 1994), as in Chile.

Uganda, whose regulatory authority also has less discretion, resolved only to effect control over tariffs, service obligations and default interconnection terms into licences and contracts (Wellenius, 1997). A legalistic approach may, however, can benefit the incumbent by allowing it to utilise the legal system to resolve issues and thereby unduly delay the process, since disputes resolved in this manner take time and are often unreliable (Spiller *et al*, 1997). This can be observed in the cases of Chile, South Africa and New Zealand.

The credibility of regulatory bodies relative to the political and other forces governing their operations is significant (Samarajiva, 2002), especially in developing nations with a history of wide-ranging political influence and perceived meddling. But certain cases have shown that regulation does not necessarily have to be completely independent of political influence to be "free of disruptive influence" (Levy, 1994). Chile's telecommunications regulatory agency falls under the Ministry of Telecommunications and Transport and has succeeded in nurturing competition and developing a respected rural universal access project.

In the case of South Africa, merging the South African Telecommunications Regulatory Authority (SATRA) with the broadcasting regulator formed the Independent Communications Authority of South Africa (ICASA). It was hoped the "converged regulator" would result in an economy of regulation and suit the situation of constrained resources and convergence of technology. However, the agency has struggled with certain issues over the last few years, specifically with regards to awarding the third cellular licence and the licence for the second network operator (SNO). Many disputes regarding Telkom, the incumbent operator, have not been resolved and have gone to court.

The creation of legitimate, independent regulatory authorities in each of the member states remains important, despite organisations such as TRASA, which could perhaps operate as a Pan-Southern African Regulatory Association. Member countries that hope to attract service providers to the local environment must do so by offering a well-structured setting that minimises fears as to changing regulations.

Regulatory bodies are initially among the more important considerations for a telecoms venture. The perceived state and independence of the regulator, together with licence conditions the regulator imposes, are critical to an operator's business strategy and the initial business decisions. Regulation essentially defines a framework for interoperation.

2.3.4 Summary

With the rise of cellular technology and advancement of standards (IP) and services offered on these standards, the problem in the SADC is not really connectivity or technology but infrastructure and regulation.

The role and influence of SADC authorities and regulatory bodies in telecoms development and long-term success is therefore mixed: independent, credible and effective regulators are critical to attract investment, monitor operations and facilitate development; while the various bodies fostering managed liberalisation and providing a framework in which collaboration is facilitated are becoming less important. Focus should be on creating space for the possibility of economic gain for operators whilst enforcing the increase of teledensity and universal access to best achieve the SADC's aims.

A clear, stable, independent and effective regulatory environment that could ensure operations under certain conditions and strive towards universal network access is critical to achieve telecommunications development success.

2.4 Technological Factors

This section discusses the technological drivers of telecommunications growth which impact on the strategies for telecoms development.

2.4.1 Convergence

One of the more influential trends in ICT is the convergence of technology. Technological convergence is not new, however the digitalisation of signals has made possible convergence to a significant degree that the term is generally perceived as a modern trend.

The electronic signals that enable communication between data-transmitters and data-receivers are in fact streams or packages of binary language (digital code). Both the content and the protocol governing transmission of information is digital.

The steady evolution of communications and information technologies through the digitalisation of signals has made possible the converging or union of previously disparate technologies, hence the term, "technological convergence".

The European Commission (1997) defines technological convergence as:

> *"The ability of different network platforms to carry essentially similar kinds of services, or, the coming together of consumer devices such as the telephone, television and personal computer."*

By convergence is commonly meant that any type of terminal can now access any type of data, which in turn can be transmitted through any kind of pipe (Borés *et al*, 2001.)

This has created an environment in which not only transmission (delivery) of information, but also the content itself has been greatly influenced. Essentially, industries which have previously remained separate have the potential to be united, and firms will increasingly have to compete for the same customers who are using functionally similar information-receiving devices. (Torngren, 1998.)

Separate and distinct domains such as television and computers have the potential (and are to an extent tending toward) a unified market. This can be seen in the application of the Internet philosophy to the current TV markets (Borés *et al*, 2001; Owen, 1999). The telecommunications industry, traditionally concerned solely with voice transmission over fixed access networks, has been transformed into an industry that involves data and voice transmission of varying data size, and through different mediums. Even the content itself has become part of telecommunications business. Thus, convergence has wide ranging implications for both supply and demand of information (Borés *et al*, 2001).

The Internet has been responsible for much of the information explosion. The IP protocol (a set of protocols which allow routing and transmitting of any kind of data, whether voice, image or text) has given information delivery platform independence. Users have access to any type of information using any terminal, and that information transmitted is independent.

According to Borés *et al*, 2001, the landscape of transmission activities has been transformed.

In the SADC, convergence is best observed by the number and variety of services and applications, aimed at both business and the consumer, and offered primarily to the personal user through the Internet and mobile phones. It has facilitated the explosion and extended use of cellular technology in areas where services and applications are offered through mobile handsets. (One reason cell phones are so popular is that they are tending towards becoming PDAs, or Personal Digital Assistants).

Of particular importance to the SADC is the potential offered by fixed-mobile network integration, where a GSM (Global System of Mobile) local loop can be employed to service concentrated rural areas and link with the more costly fixed infrastructure (Kekana, 2002).

Technological convergence has also affected not only the markets and industries but the regulatory agencies that govern them – South Africa has a converged regulator which governs the broadcasting and telecoms sectors (Barendse, 2003).

The implications of convergence are therefore central to telecommunications development and the achievement of a level of ICT capability.

2.4.2 Costs of transmission

Another force driving telecommunications growth is the decreasing costs of voice and data transmission, according to Borés *et al*, 2001. The reduction in costs of infrastructures through establishing economies of scale, the general improvement in compression techniques, use of protocols such as MPLS (Multi-protocol Label Switching) which enable faster packet routing and efficient transfer, and decreasing network cost (cost-per-bit) through improving network equipment have resulted in an increased cost efficiency of data delivery.

This potentially enables operators to offer services previously infeasible for low-income customers, at prices that are now more reasonable for the customer and economically viable for the operator. This is one of the factors that influenced governments to begin changing the monopolistic structure of Public Telecommunications Operators (PTOs) in the 1980s and 1990. (Bores *et al*, 2001).

However, it must be made clear that although cost of transmission has decreased, the cost of providing rural customers a service which previously did not exist (i.e. to provision and establish infrastructure) remains high. The actual rolling out of copper wire, GSM masts, etc. is in itself largely unaffected by network transmission efficiencies.

2.4.3 Mobile technology

The rise of cellular communications through the GSM standard has changed the face of African telecommunications. Already, mobile technology has achieved a penetration far beyond that forecasted in Africa. (Barendse, 2003; Afullo, 1999.)

Where POTS (Plain Old Telephone Services) failed was to provide universal access and services for all the citizens in a country. The costs of providing a country with comprehensive fixed access services, especially in rural areas where revenues were less than that of urban areas and the costs of providing access to the network were greater (Wilson *et al*, 2003) is inhibitive. Cellular technology is better suited to rollout in these areas, as user access is more easily provided than fixed access (installing a GSM mast to serve many versus trenching and cabling copper/fibre per customer) and access is relatively granular (as density of users increases the capacity of the mast can be increased).

It is logical that providing cellular access is cheaper on average for the operator to provide to rural customers due to densities and revenues. Note that the per unit call costs of cellular access versus fixed access billed to customers do not necessarily reflect this.

The number of mobile users in Africa surpassed that of fixed-line users sometime during 2001. There are presently 11.45 mobile subscribers per 100 people in the SADC, as compared with 6.4 fixed-line subscribers per 100 people (ITU, 2003).

The rise of mobile technology has enabled people in rural or otherwise commercially neglected areas to be connected to a telephone network, as wireless technologies are easier and cheaper to deploy and maintain (Kekana, 2002).

The proliferation of cellular technology has also helped alleviate technological illiteracy, and proven the market demand that exists in Africa for telecommunications facilities. And although costs of mobile phone calls are generally more expensive than fixed-line calls, and the instrument / handset costs are significant, demand has not been noticeably inhibited.

The diffusion of, and progress made possible by mobile telephony towards achieving universal access and contributing towards ICT literacy is substantial.

2.4.4 The Internet and fixed access offerings

At the core of modern network operators' networks (both fixed and mobile access operators) are fast, high-volume transfer mediums (e.g. Optical fibre) and technologies. Fixed-line networks have various core network technologies and many possible arrangements by which voice and data are transferred.

SDH (Synchronous Digital Hierarchy), ATM (Asynchronous Transfer Mode), FR (Frame Relay), TDM (Time Division Multiplexing) and IP are currently the major technologies at the heart of most fixed-line networks. By arranging other application, technologies and protocols across networks, operators are able to offer various services to the user, e.g. broadband access through DSL (Digital Subscriber Line) technologies and value-added services.

Current trends and technologies in the fixed-line environment are to reduce the complexity of networks (through for example MPLS, a technology that decreases network complexity and enables operators to carry many different services over a single (IP) network); provide efficient, high capacity access to users (through DSL, especially ADSL and ISDN, broadband technologies); and utilise the growing IP backbone to offer solutions with various cost and efficiency benefits such as VOIP and VPNs.

The Internet is generally considered important as a tool for businesses and individuals. IP (Internet protocol) – an addressing structure or connectivity standard on which the service called Internet runs – is the platform whereby electronic marketplaces, remote education services, procurement of materials or medicines, etc touted by IP enthusiasts are all made possible. IP can enable these basic services and contribute towards reducing the costs of doing so.

Fixed-access inhibitors

The most inhibitive aspect of fixed-line networks is enabling access to the network. Up to 80% of an operator's costs are incurred in this effort and therefore the revenue stream of a

new user who desires to be connected must be relatively certain and quite high for the connection to make economic sense. (Access costs include securing and maintaining sites, the costs of Environmental Impact Assessments, ensuring backup power supply, etc.) A large and certain revenue stream is difficult to guarantee for most rural users; hence the traditional focus in Africa by operators on urban, high-income areas such as large cities.

Voice access

In the recent past, the "killer application" is telecommunications from the operator's perspective is voice. Voice communications have by far the user percentage use in telecommunications networks and operators derive the most revenue from it. However, traffic and revenue form data transfer is fast becoming greater than voice, especially in mature markets.

However, the unsatisfied demand in the SADC is primarily for voice communications. Only in the cities and urban centres are there current needs for alternative, data-based telecoms services.

2.4.5 Compatibility standards

An important issue from an interoperability perspective and telecommunications in general, is the role played by standardisation, especially during the initial phases of a technology-rich endeavour.

Operational standards, that is, the paradigm or conditions under which systems and networks operate together, are a key determinant of a successful interoperator environment. The standardisation through the telecoms market of a particular technology or technology type is also important to secure inter-working efficiency, simplicity and cost-effectiveness.

However, a major problem cited by the World Bank and the IBRD concerning integration of telecoms networks through the SADC includes the standardisation of both technology and the operational standards and characteristics of that technology (McCormack, 2003).

The role played by compatibility standards as a response to burgeoning industries' initial uncertainty and the long-term technology survival, is critical (Wilson *et al*, 2003).

The technological standardisation through the market of a certain product (either through obvious performance superiority or through quality/price ratios or even a government-imposed regulation) will play a vital part in determining the shareholders of a successful technology. From a supply perspective, where only a few companies control the architecture of a dominant product, other suppliers and vendors are subordinated to their design specifications (Borés *et al*, 2001).

It has also been noted, however, that the technological superiority of an alternative is not a guarantee it will become the dominant concept of the market (Torngren, 1998). Overriding indicators in ICT that determine the dominant technology are more likely to be the diffusion through the market and total market share / number of users of the technology. The economic impact of an innovation depends on its diffusion (Borés *et al*, 2001).

2.4.6 Summary

There are several trends, technologies, standards considerations and market characteristics which have an effect on the diffusion of ICT through the SADC. Specifically, the advantages offered by mobile (mostly GSM) technology and the flexibility of IP as a service development platform; the influence of convergence on transmission and on content format and distribution; the costs of transmission decreasing; and the influence of standards on interoperational complexity; all support technological growth, uptake and access.

The risks and potentially inhibitive factors concerning technological factors is further elucidated upon in 2.6.1.

2.5. Economic Factors

The telecommunications sector is evolving through various structural changes: de-monopolisation, the introduction of competition, privatisation and liberalisation. These are commonly referred to as economic drivers of growth. The nature of the changes affects business and economics of the marketplace.

2.5.1 Liberalisation

Globalisation and the liberalisation of markets is probably the most important economic driver of telecommunications expansion. The "open-doors" corporate and government attitude toward foreign commerce, especially in traditionally monopolistic industries such as telecommunications, has increased the potential for economic and technological development through new markets. The barriers to entry have in this way been lowered (Torngren, 1998), resulting in an expansion of opportunities.

The value of a telecommunications network increases exponentially with the number of users of the network (Torngren, 1998). Hence, the value of a network that is itself large or seamlessly interoperable with another is more valuable to its users than one which is practically limited (i.e. by cost) to, for example, the borders of the country in which it resides.

Building a common market (across national borders and previously disparate technological markets) in the SADC region will stimulate competitiveness, drive economic growth and increase efficiency through concerned industries (the latter especially resulting in a win-win situation to customers and providers by decreasing costs) according to Wellenius, McCormick *et al* 2003, and SADC 1998. However, for this to succeed, activity must lie in the efficient use of this information more than the transfer thereof, and the framework through which information can be transferred must therefore be seamless in terms of its un-inhibitive nature. This means costs should be low and reliability high.

Liberalisation has enabled expansion of networks and businesses across borders, which has facilitated the growth of the customer base and potential for revenue for telecoms operators. Liberalisation has thus also allowed companies to diversify and leverage their risks through expansion into new markets. Existing, proven technologies can be rolled-out with fewer technological uncertainties.

However, the difficulties of interoperation and collaboration also increase in line with the number of actors involved (Torngren, 1999), both for technological and operational reasons.

Investment in new markets, as mentioned, can be accomplished through different means, but collaboration at some stage between firms (with varying degrees of formalised control) horizontally and engaging in vertical integration with other companies is likely to be a significant part of expansion. The regulatory environment is again very important to consider.

2.5.2 De-monopolisation and privatisation

The benefits of de-monopolisation and privatisation (enabling a competitive market place, better satisfying needs of customers, etc.) have been discussed in previous sections. However, there are potential drawbacks to the situation.

The requirement of investments in a competitive (privatised) environment is generally a return on the investment.

In the past, where international collaboration between telecommunication operators was regulated by governments in a monopolistic arena, this was not always so. Investments must now be justified by the return they will offer and long-term profitability, and because of the uncertain nature of leading-edge technologies in terms of the market demand and the changing regulatory framework in which the technologies will be employed, this is often difficult to predict (Samarajiva 2000, Spiller *et al* 1997).

Privatisation alone therefore, whilst considered a driver of telecoms development, expansion and service efficiency, also brings with it certain aspects which could restrain development (e.g. inhibit rolling-out of infrastructure to low-income or low-population density areas).

2.5.3 Attractions of emerging markets

A driver of telecoms growth is the perception of an "untapped" market demand in Southern Africa. An emerging market economy, such as the SADC is considered to be, offers investors and players a potential market with fast growth and greater margins than mature economies, and this attracts business interest.

Considering the over-investment of the telecommunications industry in some fields during the late 90's and early 2000, e.g. in 3G licences and the unrestrained spending on network core expansion, exploiting existing technology opportunities in new markets is an attraction to telecoms operators. Companies seek to increase revenues by expanding their customer base through geographically different markets, such as in Africa, Asia and South America.

Price competition in mature markets has also forced down telecoms profit margins, and the world-wide recession in technology and telecommunications has further stifled business.

Therefore, emerging markets offer potential advantages to corporations who accept the risks of investment in emerging markets.

2.6 Risks

This section briefly expands on the major risks and uncertainties which confront general telecommunications development and telcos operating in this environment specifically. Not all telecommunications risks are recognised and addressed, however.

The risks are categorised into four different sections: technological uncertainties, demand uncertainties, operational uncertainties, and legal and regulatory issues.

2.6.1 Technological uncertainties

The "digital divide"

A previous section mentioned the importance of telecommunications and ICT. But despite this potential, the real impact of information and communication technology has so far been centred on a few modern segments of society (Wilson *et al*, 2003). It was in these concentrated spots that the high costs of technology roll-out and development could be borne by customers.

In Africa, these areas are generally capital cities and a few high-population areas. In these segments, ICTs have indeed enabled integration with the world's information economy, but many of the country's citizens, not living in urban hubs, remain largely unaffected by developments. Universal access to ICT services doesn't yet exist (as discussed in 2.1), and infrastructure, business and living conditions in these areas are consequently quite different from the conditions outside of the urban locales.

This creates a new digital divide, not along international boundaries, but between different parts of society (Henten *et al*, 2003). It refers to the divide created and exacerbated by selective application, use and benefits of technology

The negative impact on development opportunities from the low penetration of telecommunications is well documented (Henten *et al*, 2003; Saunders *et al*, 1994). Countries without an adequate telecommunications infrastructure and sufficient local expertise will find it very difficult to remain competitive.

Further discriminatory advancement and technological progress in these centres without improving the general levels of technology throughout the country only make the situation worse. It is feared that such a situation will only plunge those affected countries and areas into further economic and social discord.

The risks of furthering of the digital divide is important for operators to consider as it represents potential high-level changes to the regulatory structures and perhaps service obligations which may not be economically attractive.

Convergence

The second issue worthy of consideration deals with convergence. Convergence can be perceived through its division into two essential components: a technical and a functional component. The technical element refers to the ability of any infrastructure to transport any type of data, and the functional aspect characterises the means by which users are able to integrate the functions of computers, television, media and voice into a single device (Borés *et al*, 2001). Hence, reaping the benefits of convergence concerns not only upgrading of equipment and software, but also a fundamental shift in structures which concern, control and otherwise use this technology. Realising the value and rewards is therefore not easy or cheap.

The extent to which convergence in Africa will be a reality should be questioned. What gain from convergence is reasonably and practically achievable, especially given the limited amount of money from users, buyers and the state?

High technology markets can be described as technology-driven (radical innovations) or demand-driven (incremental innovations) (Shanklin *et al*, 1988). Convergence is a supply-driven phenomenon. Supply-driven or technology-driven change is the outcome of

technological innovation. A secondary factor in the development of these markets is the demand, which later evolves. (The response in regulatory framework is an intention to give answer to these transformations) (Borés *et al*, 2001). But if the market is economically restricted, the potential for widespread dispersion of some features of convergence must be examined.

2.6.2 Demand uncertainties

The aim of section is make mention of various issues regarding demand uncertainty – the risks and doubts considering customer reaction to a product or service – and discuss the impact on a telecoms development strategy.

Market uncertainty

Most risks associated with new or improved products originate in technological and / or market uncertainties. There is never certainty about the consumers' reaction to launching a new product, whether it is a radical or an incremental innovation (Owen, 1999; Borés *et al*, 2001).

Technology-driven markets are more uncertain than purely demand-driven markets, since radical innovations are often based upon presumed or extrapolated needs, as opposed to existing, identified needs in demand-driven markets (Shaklin, 1998) where the improvements are often incremental. Even where a great need for technology and telecommunications exists, the quality and dynamics of this demand are difficult to predict.

Grant (1995), decomposed the risks associated with technology-intensive markets into three major categories: the lack of knowledge about the scope and size of the market; the unknowns about the evolution of the technology; and the difficulty of predicting the demand characteristics.

This uncertainty is generally reduced through various forms of testing on statistically representative sample groups, including concept testing, product testing and market testing.

(McCormack, 2003; Moore, 1999). However, the newer the product, the more severe the problem of forecasting a correct market-wide response, and obviously the less accurate tests will be. In these cases, trying to predict consumers' reactions and overall success is of reduced value, as the consumer lacks any familiarity with radical innovations and external factors such as social influences that significantly affect consumers' behaviour are absent (Moore, 1999). Also absent is any sort of historical usage information. Only iterative innovations can really be tested.

Moreover, there is a lack of accurate information in Southern Africa regarding the information and communications technology consumer, his / her preference, usage, spending habits, etc. The size, features and qualities of the Southern African market and its demand characteristics are also largely unknown.

Therefore forecasting the impact of particularly innovative ICT in Southern Africa and the consumer reaction to it is particularly difficult.

Market maturity

An issue concerning technology in emerging markets is the maturity of the market: neither the technology itself nor the market could be mature enough to realise economic success. (Henton *et al*, 2003). Some advanced ICT applications and services, for example, would have a limited use in Southern Africa (due to market immaturity). Or the technology could be too advanced and expensive (technology too mature), require too many users to commit to an expensive subscription, or have development costs which cannot be borne by markets that lack scale as in America or Europe.

A mismatch of the technology with the market is expensive and can lead to complete technology failure should the mismatch be substantial.

Product and service mix

In a changing market, firms must constantly reconsider their product mix and that mix which is available in the market.

A full discussion regarding product mix here is beyond the scope of this research; suffice to say that a firm's product mix in the greater market context has implications for the success of both the product portfolio and each product individually.

All products or services offered should be complementary with other products in a firm's suite, and satisfy in the market some gap or requirement. Focus on high-growth and high-margin technology areas should also not result in neglect of others areas, which could be as important in alternative features.

Diffusion and product adoption

Implementation and development of telecommunications networks requires huge upfront and investment costs. There is by implication a substantial commitment to the market, industry and country. In order to realise profitability, an economy of scale is necessary. This means a critical mass of subscribers or customers paying for a service are basic to the concept.

Should the revenue from paying customers not exceed (or at least approach) the costs of operation in a certain time, the telco will fail.

The diffusion or adoption rate by the market of a product is central to that product's success. "When" and "how many users" are key in determining if and when profit objectives are reached.

In the beginning stages of a technological product or offering, there are usually various alternatives struggling to emerge as a dominant design. The emergence of a product with a higher perceived utility function, such as a superior quality / price ratio, will ensure the rate of adoption and total diffusion is greater than other products. (Torngren, 1998; Borés, 2001.) The end result is that the product may become a *de facto* standard (see 2.4.5).

Aiding the diffusion of a product are so-called Network Externalities (Kats *et al*, 1985):

- Direct network externalities: The utility function (perceived quality) of each user increases with more people using that product.
- Indirect network externalities: The variety and quantity of complementary products (e.g. of software in computers).
- The customer footprint has a positive effect on the quality and availability of after-sales services.

Since consumers are not necessarily the best judges of new products (Foster, 1988; Moore, 1999) and consumer habits are difficult to change (Borés *et al*, 2001), diffusion is difficult to predict. Furthermore, the technological superiority of an alternative is not a guarantee it will dominate the market. To illustrate this point, consider the video recorder war between Sony's Betamax and JVC's inferior VHS system, where JVC licensed the technology to other manufacturers and Sony did not. This motivated suppliers of the content to supply in the VHS standard, and Betamax essentially disappeared from the market.

Another factor influencing market adoption is consumer education and technology literacy. This is addressed in 2.6.3, below.

2.6.3 Operational uncertainties

Operational uncertainties in this case refer to some of the difficulties of operation in Southern Africa and related issues which will have increasing significance.

Competition

Telecommunication and information technology markets in Southern Africa will become increasingly competitive as they open up to new players. Current cellular and fixed access operators and service providers will face rivalry from both local and foreign-owned and -operated enterprises.

The ICT sector will logically start to show lower profit margins as competing firms seek to offer price advantage over alternatives and have to compete for customers.

Basic economics decrees that the basic needs, which are presently unfulfilled, will be satisfied until natural service equilibrium is reached.

As the markets then start to mature, the landscape will become gradually more complex and occupied. The number and variety of business offerings will increase as the capability of the infrastructure improves, until the bottleneck for development will lie with the population's needs. (Gwartney *et al*, 2000.)

Consequently, organisations operating in this environment will have to consider the risks presented by competition: competing for a decreasing market potential on the basis of free-market factors such as price and quality of technological offerings decreases profit margins; and customer sentiment and subsequent business decisions made on the basis of brand image (e.g. the antagonism against traditional monopolies).

From a single provider perspective, competition increases the complexity and dynamics of operations. Interoperational issues such as regulation, interconnection tariffs, standards, etc. all become increasingly relevant.

Literacy

When consumers lack information and education about a product, they tend to reject it (Foster, 1988; Moore, 1999). This principle can be extrapolated to understand that when a product is too revolutionary and customers regard it as too foreign or with some level of alienation and fear (born of technological ignorance), it may not succeed.

Given that many people in Southern Africa are illiterate and technologically inept; the success of advanced ICT is not guaranteed. Generating revenue from these technologies requires of many the people a complete paradigm shift.

The market therefore needs time to be educated.

Another concern must be that there are so many different languages spoken across the region. South Africa alone has 11 official languages. Without a common business language such as English, the difficulties of service provision and education are exponentially aggravated. Services and certain elements of a telecoms operation (such as voice prompts, billing, call centres, etc.) must all consider language when being set up.

Political and country risk

The political and business risk of an organisation, especially foreign, must be continually assessed. Changes in public and government sentiment, political structure, general economic conditions and social habits all have the potential to significantly disrupt business and even threaten its existence.

Fraud and theft

The issues of fraud, corruption, bribery and improper practice are not limited to African business, as demonstrated by erstwhile global giants like WorldCom, Qwest and Global Crossing.

However, there have been allegations of corruption and improper practice of officials and agents of authority in African environments. Legal and regulatory processes in Africa are often very bureaucratic and notoriously slow. It is sometimes suggested that this can be speeded up or an unfair advantage secured through a well-placed bribe. To what extent this and related issues are true, the author is unwilling to make further comment, other than that most companies that operate in certain African countries are and should always be *aware* of the difficulties, connotations, possible obstacles, and positive and negative consequences of such acts, which are reputed to exist across the continent.

Another problem is theft and fraud of equipment, software, and network access. This not only results in replacement costs incurred, but also loss of revenue for the duration required replacing the equipment and the costs of “theft proofing” equipment (which does

not seem to prevent theft in South Africa). Intangible costs such as the negative effect provoked in customers whilst there is lack of service are also a consideration.

Therefore theft and corruption are two important factors influencing telecommunications operation in Africa.

There are different schools of thought regarding the best manner to deal with these problems, including the use of local village leaders to curb crime (by paying them "security" dues) and licensing local network loops to local operators, therefore transferring the problem to people with contacts in the area (from interviews, a significant drop in theft is experienced), but the problem will nonetheless remain.

Other operational risks

One problem experienced by businesses and telecoms operators in certain areas in Africa is an irregular electricity supply. The result of this is that alternative power sources such as diesel generators must be supplied to guarantee service to within the required parameters. For example, a voice network may undertake to be operational for 99.999% of the time, which allows it only a few minutes in a year to be dysfunctional. It often cannot rely on the general power grid alone to comply with this.

A second point is the need for a supply of capable, educated personnel in the network deployment area. The success of implementation of ICT infrastructure relies to some extent on the support of the human environment in which it is employed. A large component of telecommunications is the human capital. Local personnel employed to operate, repair and manage aspects of the telecoms network must therefore receive sufficient training for any successful network implementation and operation.

Education is, however, often a costly and long process, and there is unfortunately no shortcut. To stimulate sustainable operation and development, there must be a certain standard of training and education among the employees of a telecommunications enterprise.

2.6.4 Legal and regulatory aspects

This section deals with the uncertainties of the legal and telecommunications regulatory environment in Southern Africa.

The success of attracting and keeping telecoms operators and service providers relies mainly on the stability and viability of the regulator (Kekana, 2002). Should this environment be subject to political interference or mismanagement, the development and progress required of the ICT sector is unlikely to materialise.

Licence obligations, while perhaps necessary to fulfil certain obligations made by government to the people, cannot be overly severe and inflexible. Experience in South Africa's mobile sector has shown that a flexible service obligation allows operators to fulfil obligations, achieve some profitability in rural areas and stimulate indirect benefits such as job creation and development of local industries (see Phoneshops in section 2.3.2).

However, where licence obligations are subject to repeated change and the regulator is not independent or endowed with sufficient authority, the environment ins likely to suffer.

A second worry is corruption in the legal and regulatory authority. Telecommunications disputes that require legal arbitration and judgement have the potential to severely impact on the perception of the sector by investors, operators and businesses. This can significantly hamper growth.

2.7 Summary

Section 2 has presented a summary of literature relevant to the topic of developing a telecommunications network in a country in Southern Africa.

It discussed the SADC body, the influence of this body on regulation and policy, and the relevance of it to an operator and an interoperation environment. The state of telecoms in the region, and the effect of this on business and policy are also discussed. The general telecommunications policies and the evolution of these policies are examined, and the

regulatory framework that exists in the region, as it affects users and operators, is considered.

The importance of telecommunications to social development and economic success in a national infrastructure is considered in 2.2.

Further issues relevant to the southern African telecommunications development were divided into technological issues (including convergence, compatibility, mobile- and fixed-access elements and networks); economic issues (including de-monopolisation, liberalisation and emerging market attractions) and risks (summarising the general risks facing organisations embarking on a telecoms network rollout.)

The following section analyses some of these issues and further develops gaps in the literature.

CHAPTER 3: ANALYSIS AND DISCUSSION OF ARISING ISSUES

This chapter will discuss issues arising from the literature and develop the implications of these issues to understand how a strategy could best exploit opportunities or manage the risks identified.

Discussion is structured according to the following sections:

3.1 Basic premises of the strategy

3.2 Economic and business issues

3.3 Technological issues

3.4 Market issues

3.5 Summary

3.1 Basic Premises of the Strategy

In order for one to "…develop a clearly defined framework through which a strategy organising and structuring the various stages and process involved a modern telecommunications network in a country or area in the SADC can be mapped", certain premises must be met within set parameters.

The development of a telecommunications strategy which specifically targets Southern African states presupposes some existing elements and standards (the parameters within which the strategy is set). Even though these may on a case-by-case basis be found erroneous, the general position and circumstances is assumed to be:

- A telecommunications sector is in the process of liberalising or opening its market up to new players, in the fixed access, cellular and other markets. However, licences must still be issued and purchased by operators, which is subject to the individual country's conditions. The number of licences is generally limited.
- The state has, or intends to, de-monopolise the state-owned operator and privatise at least some portion of it.

- A balance between public and private initiatives to develop the network exists (i.e. the onus is not solely on the telecommunications operator to address issues such as universal access, for example.)
- Domestic and foreign ownership or control of providers is freely allowed and not overly discriminated (by taxes or levies) against. The licence to operate must of course still by purchased.
- Administrative controls (through a regulatory agency) are not subjugated to unreasonable political meddling and subject to drastic change.

The basic premises of a development framework guiding strategy are that:

- The strategy must be economically attractive and enable profit opportunities. Incentive for telecoms expansion can only be on the basis of potential monetary gain by operators.
- It should include as primary beneficiaries of telecommunications development its customers. A high-standard of service without being unaffordable is important in poor countries to enable an economy of scale
- The framework is written from the perspective of a telecommunications operator environment, and is not intended to specifically benefit or achieve the aims of government policy makers or universal access activists. It is a roadmap guiding specific strategy formulation with the aims of maximising opportunities and reducing risks. It is a guideline towards forming a successful strategy to achieve telecoms growth.
- An independent, recognised, stable regulator has, or will soon have jurisdiction and overseeing control of the sector.

3.2 Economic and Business Issues

Although the further discussion sessions are structured by certain categories, many issues encompass two or more sections.

3.2.1 Complexity and interoperational difficulties

It is possible to distinguish various forms and expressions of complexity in any business. Complexity can represent opportunities and risks to a company, and issues must be actively and / or passively managed to maintain business focus.

Those forms of particular application to this research are technological complexity, organisational complexity, inter-organisational complexity, environmental complexity and marketing complexity.

As it applies to the SADC and this research field, technological complexity is addressed via the discussed sub-topics in section 3.3, and likewise marketing complexity in 3.4. Environmental and economic issues (the SADC and ICT landscape) have been discussed in the literature study and understanding it is central to the dissertation. The remainder of the economic complexity is in this case considered organisational and inter-organisational complexity.

An analysis of organisational complexity is beyond the scope of this research but interoperational and inter-organisational complexity is not. Intra-organisational complexity is closely linked with joint-ventures, alliances and general interoperation issues.

Since inter-organisation complexity difficulties increase in line with the number of players involved, standardisation between players on technological and operational levels is possibly the best way to reduce as far as possible interoperational difficulties. Standardisation forums such as Memoranda of Understanding can serve to reduce possible interoperational efforts as they apply to a particular technology. However there is no single way to reduce inter-organisational complexity, which can apply not only to

technologically-similar operations but complexity in relationships between, for example, an operator and environmental agencies, service providers and financing organisations. The best methodology is then to actively pursue practices and relationships which reduce potential problems and adopt "best practice"-styled operations.

3.2.2 Limitations of the SADC organisation

One of the hindrances to development in the SADC is that the organisation suffers from huge geo-political problems. Civil wars (both past and present), autocratic dictatorships, food shortages, poverty and poor basic health services plague its members and prohibit constructive development across the region. While guiding ICT progress and ushering in the information revolution will address many of Africa's needs, it is often less pressing than many other regional difficulties.

Bodies which facilitate integration and encourage progress therefore tend to be effective to a limited degree. Real telecoms access provision occurs through creation of economic incentive for corporations. It has become clear that a state of market competition will better satisfy the population's needs. Governments have also recognised that licences and counter-trade agreements create revenue in the process, and this has probably contributed toward de-monopolisation too.

3.2.3 The suitability of access providers of scale

The major economic drivers of telecommunications growth – de-monopolisation, the introduction of competition, privatisation and total liberalisation – have been discussed in previous sections. It has been explained that there are various stages of economic unlocking.

The opportunities presented by expansion are well suited to telecommunications operators of scale. They are in a good position to compete, being cash rich and already having a large existing customer base (and therefore can easily distribute their investments with many consumers) and are familiar with the various forms of complexity in telecoms.

Specifically, regional (i.e. existing SADC) operators are best suited as they know the culture, people, technological standards and general government style. The importance of this is not to be underestimated. The industry dynamics, style of government and operational difficulties of Southern African markets are significantly different to foreign regions.

Particularly, aspect of operations which could benefit from local providers' familiarity includes understanding of African leadership and management styles (e.g. "Ubuntu"); knowledge of local empowerment issues and the organisational effects; and perception of the market needs (since there is a general lack of statistical and market information when compared with information regarding markets in developed nations).

Local business would only have to extend (as opposed to completely restarting), and all the benefits of proximity could be conveyed to the project. In this case, the migration of business can take on aspects of a technology transfer scenario.

3.2.4 High- and low-end market segments

The telecommunications market can, within limitations, be divided into two parts: a low-end and high-end segment. Each of these market segments has different telecoms needs, available money for services and products, and utility values; and hence also different bases on which providers must compete for their business and loyalty.

The low-end market, of which the majority (by number of customers) of customers in Africa is presently made up of, consists of basic voice services and connectivity. In this market, the technology is generally well-established within the telecommunications context. Participating operators and service providers will compete almost solely on the basis of price, especially where pre-paid packages allow easy inter-changeability, although brand name is also an issue on some level. Low-end services can suffer from ineffective marketing communications, which can be fatal to that particular service / brand in an elastic market.

The high-end market, comprising mainly of businesses and higher-income individuals with advanced telecommunications needs, will compete more on utility value and the actual service provided. In this respect, the product / service performance must conform to the specified or designed product values (e.g. an ISDN line should meet the connection speeds claimed by the retailer.)

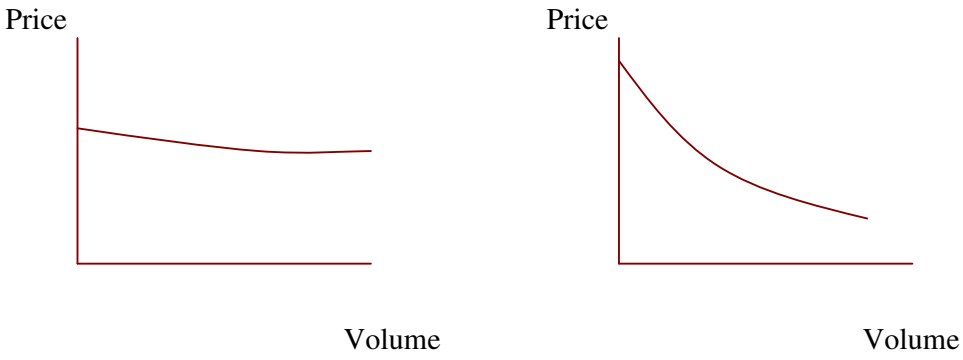

Figure 2: Elastic and inelastic market responses to price adjustment.
The figure on the left is an example of a product competing in a market where many alternatives exist and volume is thus price-deterministic. The figure on the right shows a product where few / no alternatives exist and pricing is not as critical to volume sold

Pricing strategies should be aimed at long-term customer retention above all else. However a product is positioned and marketed, keeping customers will be key to guarantee long-term growth and economic success.

3.2.5 Supportive infrastructures

An inhibitive feature of African business is the comparative lack of quality supportive business infrastructure such as education, energy and transportation.

These sectors are undergoing improvement in certain areas, however are still sufficiently underdeveloped as to be an issue of concern to incoming business.

Telecommunications is an important sector in a country's economic landscape which concurrently encourages the development of the above mentioned sectors as it develops, and to some extent the same can be said of the reverse.

However, until a certain levels of reliability are attained, the operator must take steps to address inadequate aspects, e.g. installing alternative power supplies with longer operating capacities than in mature markets. Partnerships or similar agreements with relevant businesses could be reached and strict SLA arrangements secured. In this way the one minimises to the furthest extent the possibility of failure of a crucial supportive business function.

3.2.6 Personnel education and skills levels

Telecommunications enterprises are organisations which employ and rely upon a large number of personnel. It is no exaggeration to equate the quality of employees to the quality of value-added service in a telecom operation.

Therefore education level of employees and the population from which these employees originate is important to an operator. It is difficult, expensive and unsustainable to staff most positions with foreign educated workers; and although this situation will be unavoidable in the initial stages of launch it is not viable to maintain.

Attention must therefore be taken to invest in employee training and skills development.

3.2.7 Fraud, theft and corruption

Corruption does exist in business and government. To minimise the opportunities for existence, companies should accept certain facts about business in Africa (the bureaucratic and slow nature of processes) and never allow the possibility of corrupt behaviour.

Consequences can range from more bribery demanded or needed, an unsavoury reputation which encourages more of the same, to prosecution and scandal, none of which is desirable.

Technological processes to identify and inform operators about theft like "clip-on fraud" (where thieves plug a telephone into another person's line) should be installed. Business processes should take into account this Airtime or network access fraud and continuously take action to isolate and shut down such theft.

Equipment and cable theft will remain a problem where there are poor, unemployed people and vast income differences between classes. Operators are limited to physical protection of equipment and sites. In some cases, innovative solutions such as paying influential locals "security dues", passing responsibility to people with sufficient authority to slow theft, and even supplying locals with some desired resources (e.g. cheap and unused copper wire) may curb the problem.

3.2.8 Counter-trade agreements

Telecommunications businesses must consider the existence of counter-trade agreements with the country in which it operates.

These are often quite severe and require a substantial investment in some part of the country's economy. It could therefore be beneficial to establish suppliers within the country or education centres that provide necessary skills to the business. Furthermore, industry-supported initiatives are well-received by government.

Here is scope for interoperational efficiencies through acting jointly on a project.

3.2.9 Political and country risks

Political risk seems to be inherent to business in Africa. It is no exaggeration to say the influence of political structures on business is so great that it can determine overall survival. This is a risk which the telecommunications enterprise should actively address at all times.

3.3 Technological Issues

This section highlights some important technological issues. Obviously, not all can be addressed in this dissertation. Only some general telecommunications issues, network evolution issues and factors critical to SADC telecoms development are therefore mentioned.

3.3.1 Sell services, not technology

Telecommunications operators should realise that they are in the business of selling services, not technology. Technology simply enables the ability to perform the service.

The customer has a need, for example being able to speak urgently with the unreliable electricity provider in the capital city, for which they agree to pay a fee. Operators can confuse and alienate some low-end customers by offering them a specific technology for purchase, the precise advantages and disadvantages of which a customer might not really know beyond the price paid for the service. The average customer cares about the ability to connect, not the necessarily configuration of technology the operator uses to enable connection. This is especially true in Africa, where there is a low level of ICT knowledge.

In the high-end sector, where better technological knowledge exists, the point still exists but is less critical, since high-end customers will care more about the technology itself. However, customers who do not precisely understand the particulars of their situation may be disillusioned when the performance of a service does not match expectations fostered

by media. Someone, for example, may purchase ADSL, believing it guarantees a 512kb downstream capacity, and become disillusioned when his / her ADSL solution doesn't perform at this speed, for example when surfing American Internet sites.

3.3.2 Provider- customer mismatch

A mismatch between consumers' needs and operators' offerings exists in the telecoms market:

- Customers are concerned with billing, levels of service and access / installations
- Operators are concerned with technological and operational efficiencies for the sake of maximising return on investment

Traditionally, telecommunications companies operate in a regulated market, perceiving customers as beneficiaries of a service they offer, not customers to serve and satisfy.

The approach of operators should be to adopt a "customer centric" style, and not a product- or service-focussed culture. The business process should be designed around a commitment to the customer. Similarly, the operator must provide the technology to support the business cases of its customers. Perception of quality of service is in this way enhanced.

3.3.3 Technological requirements

The nature of the deployment area requires certain features of the network. Specifically, it should be robust, scalable, flexible and redundant.

In layman's terms, a robust network in Africa implies it needs to function in adverse conditions, allow less-than-perfect operational procedures and configuration, and generally be technologically and operationally resilient. A scalable network is one which allows the size to be adjusted, i.e. it can be efficiently arranged to accept varying quantities of users. A redundant network is described as one which will not fail if a component of that network

fails (like a series circuit. The characteristics of a parallel circuit can be said to resemble a redundant network.)

Technology considerations in light of providing value to customers and streamlining financial efficiency can be identified. Further features of the network, according to Achterberg *et al*, 2001, therefore are:

- Access. The access network is the major cost contributor of the total network and the least manageable aspect of it. Complexity and cost must be minimised and manageability increased as far as possible.
- Accounting simplicity, flexibility and robustness. A mechanism to bill on the basis usage-based accounting will soon be necessary. There is a needs and movement for billing based on data volume transfer as opposed to time on network (e.g. IP resource usage.)
- Voice and data services. The technology must reduce voice operating costs while enabling revenue through new services such as pre-paid and VOIP. Quality of service must be maintained. The integrity of data transport must be ensured, while costs of providing services must decrease and the ability to offer and support new services must exist.
- Management. The network technologies must minimise the expenses related to configuration, operation, administration and maintenance of the network.

3.3.4 Technological standards and standardisation

Technological standards

Southern Africa falls under the ITU's Region 2, and so a particular set of standards and specifications is recommended to equipment and technologies.

While it is unlikely that a new technological standard will be developed with specific application to the Southern African market, discussion and contribution towards a level of operating and technical specifications and development of local technical solutions enables operators to link complementary assets; decrease individual development costs through

sharing the process; and eliminate the possibility of competing on the basis of technology differences (which is expensive, counter-productive for all parties and effectively dilutes the market size.) Standards often arise from and are best determined by some kind of standardisation forum.

Standardisation

As mentioned previously, the utility function of a telecommunications user increases with a high market proliferation (that is, it increases with the number of people using it.)

The role of industry standards dictates to a large extent the proliferation of technology. For example, the GSM standard has enabled the use of cellular phones to exceed that of fixed-line subscribers in Southern Africa in less than 10 years. The role of standards has also enabled the minimisation of technological interoperation problems.

Thus, from an ICT perspective, widespread standards positively affect the usefulness of the product.

The role of standardisation has been discussed earlier, but the ability to effect industry-wide conformance to a single dominant technology allows benefits to both customers and operators should be emphasized.

3.3.5 Interoperability

Digital transmission has not changed the multi-operator telecommunications world into a landscape of easy interoperability between companies.

Vendors who sell wholesale connectivity by running and leasing their physical infrastructure will sometimes deliberately avoid allowing total interoperability to clients. These vendors will run slightly different configurations, so that the service provider leasing lines from different vendors will have to have specific setups to operate on these different vendors' lines. They "run different services differently".

One reason for this is that service features were not standardised when switch vendors evolved decades ago and so the actual services now differ. Switch vendors are also protectionist of their presence in certain markets, and so will deliberately avoid allowing inter-changeability between vendors.

Another reason for interoperability difficulty is the variation in the signalling protocols used by switch vendors. This prevents the connection of one vendor's box to another vendor's. The standards governing protocols are not defined to a "bits and bytes" level and so minor variations exist even when a particular common standard is used.

The interoperability difficulties are often substantial and expensive, both for hardware and software considerations. However, there is no quick solution for this and telcos must simply be aware of the cost and operating implications. Again, a requirement for interoperational complexity awareness is significant.

3.3.6 Voice communications

Southern Africa's connectivity needs are currently and for the near future going to be dominated by voice connectivity. Advanced functionality beyond basic voice communications is not very important (by way of number of users) to most customers, especially in rural Southern Africa.

Furthermore, customer premises equipment (CPE) technologies are becoming more intelligent and have marginalised some network-centric value-added voice services. Customers are becoming unwilling to pay for value-added services since it is available on the handsets and terminals.

Expansion of the network to allow access to most of the population in Southern Africa should primarily address the need for voice communication. Unsatisfied demand for access to voice communications is the major failure of previous monopolies.

Revenue derived from voice communications is by far the most profitable telecommunications income stream in Southern Africa. Voce communication only requires narrowband or low volume connectivity. It is through these lines that basic services such as faxing can also be offered (all that is required is the terminal equipment in this case.)

However, narrowband fixed-line has significant long-term limitations for the operator and sometimes considered a technological dead-end, although there have been successful innovations in the field. Narrowband is expensive to install and doubly so to change or upgrade since many services offered are embedded on the network itself (as opposed to residing on a separate equipment or software layer.)

Therefore, installing narrowband copper lines to allow access to neglected communities is not usually a viable option, as it is expensive and unnecessary compared with wireless and radio technologies. Where fixed-access is required, higher-bandwidth lines are more likely to be employed since the possibilities for enhanced services and value-added products to be sold exists.

However, where data and voice services are required or a local loop involves both mobile and fixed access, cost-effective multi-service networks can best satisfy needs.

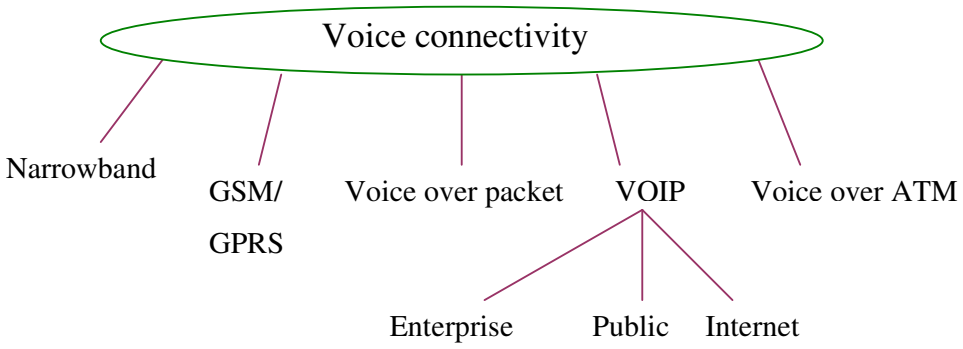

Figure 3: Major voice-enabling technologies

Figure 3 shows the major technologies enabling voice connectivity in a fixed and mobile field.

3.3.7 Data communications and the multi-service network core

Where there is need for a multi-service network, certain desired features, together with the technological need recognised earlier, can be identified. The network should be:

- Technologically and platform independent. Allow transport of and through various protocols
- Allow ease of interoperability between different carriers and technologies
- Allow critical services, such as pre-paid (see section 3.4, below)
- Transparent functioning to allow ease of operation

Evolution to the concepts embodied by the NGN (Next Generation Network) is currently taking place. NGN is generally accepted to be a service-rich, flexible, high-bandwidth and redundant network, with support for distributed applications and cross-platform development.

Most telcos seem to be evolving towards a consolidated IP / MPLS network core, from previously separate ATM, Frame and IP networks. This is attractive for a number of reasons: it reduces operational expenditures (no longer does one have to employ personnel and OSS for all these disparate networks) and capital expenditures; allows value-added services development and high-margin offerings such as hosting, storage and security services to be easily bundled and sold with existing products; and facilitates migration of completely different services to a common platform and enables delivery of many services over one line (e.g. internet, VOIP, fax and video over a single line).

The so-called IN (Intelligent Network) currently employed in various parts of the telecoms landscape lends itself to the above requirements (it is suited to interoperation in a deregulated environment; is technologically independent and reduces migration and evolution complexity; and offers many services), though has some drawbacks. The disadvantages include it's sophisticated, complex and dependant nature. However, given a high transaction rate, it is well suited. On the back of this, "Parlay" – an advanced series of services development built together by industry parties – can operate, but there is little service and feature transparency, which does not make it perfect for deployment in the

SADC. However, these issues will be considered on an *ad hoc* basis by the operator and projections as to a single solution cannot be made.

Broadband connectivity to certain customers such as large corporates is essential. Business customers and VPNs, for example, usually require broadband access to satisfy their own requirements and enable certain ICT services. This should be provided in certain regions. There are various technological alternatives to achieve this, each of which is best suited to different needs. Currently, the major DSL alternatives (ADSL, ISDN, etc.) and leaded lines best satisfy this and are usually offered by most telecom operators.

Note: It has been mentioned that advanced voice functionality is not generally required of the network. It must be clear that there is an important difference between operating a multi-service network and offering advanced functionality. The two concepts are not the same.

Drivers

A multi-service network, whether fixed or mobile, should also enable the various benefits possible of that technology, especially for future considerations. That is, the drivers of growth in certain spheres, whether in the future or presently, should be permitted. For example, a mobile network can and should promote location tracking; a banking / e-wallet / ATM facility; streaming audio / video and other applications. These will be increasingly used by businesses operating in or with the area. Technology myopia can limit future growth. Interoperational partnerships across the value chain that enable such services are important.

3.3.8 Innovation

High-technology firms can be classified as Pioneers or Followers, depending on whether the majority of their offerings are entirely new and internally developed, or whether they obtain most of the technologies through purchases or licences. Telecoms companies in the SADC will in general not be classified as pioneering firms. They are followers, albeit very fast followers.

However, telecommunications is a sphere in which innovation and initiative is prevalent both on a technological and business level. Innovation is necessary for the successful application in Southern Africa of various infrastructures and technologies to better target the local markets.

Business

Telecommunications strategies will have to fit to some extent within constraints such as licence conditions, low levels of education and literacy, low incomes and uncertain market demand characteristics. Ideally, initiatives should stimulate development growth while harnessing the opportunities that emerging markets afford. Empowering local SMMEs or individuals by licensing them as local vendors or franchises will educate and inform the populace (because it is in their interest to do so), while also creating infrastructure and creating customers is one method of achieving this. Of course, this particular approach also has its potential downfalls – perhaps entrenching incorrect perceptions, reducing profit margins and increasing organisational complexity – and these must be minimised.

However, the traditional means of selling services and products in certain parts of Southern Africa may not be as economically profitable as possible. Therefore, business will require this kind of innovation.

Technological

Technological innovation, with regards to expansion and development of telecommunications in Southern Africa, will mainly have to perform a role of enabling the efficient, flexible and reliable functioning and deployment of various business strategies. It is generally not a market yet mature enough to demand very advanced technological innovations beyond what is currently available on the market.

Technological innovation in the future will be predominantly software-based and strategically orientated to gain customers and users. Hardware innovation will be

necessary, though mostly to ensure interoperation and integration of various ICT and legacy systems.

3.3.9 Origin of equipment and suppliers

An operator must consider whether the source of its equipment (i.e. the vendor or supplier) should be local or whether the operator must import the equipment. The origin of the equipment supplier has implications on costs (if equipment is to be imported, the costs of long-distance logistics management, import taxes and levies, transport difficulties, etc. are all extra), implementation, manufacturing quality standards and reliability issues, personnel training, etc.

Should equipment be imported, the nature of the enterprise takes on some technology transfer characteristics, with many cost, licence and trade implications. If an equipment supplier can be established locally, benefits can also include counter-trade efficiencies.

The advantages and disadvantaged of either decision should be assessed on an *ad hoc* basis.

3.4 Market issues

Section 3.4 presents analysis of various market issues concerning telecoms in the SADC.

3.4.1 Easy network access

A major problem facing telecoms service providers and people wanting network access is the process of signing customers as subscribers to a service.

The general requirements by the service providers (both mobile and fixed-line) of a potential subscriber are strict and comprehensive. The providers generally require all or a

combination of the following: bank account details, proof of earnings, proof of permanent address, an identification document and possibly more personal particulars.

These stringent requirements eliminate a great portion of the potential market, especially in Southern Africa, as many streets don't have names, people don't necessarily have a permanent address, banks are sometimes unwilling to open transmission accounts (on the basis of no address or employment), and, if the regular earnings of a customer does not disqualify them from the limits set, providing proof in the form of a "salary slip" or similar is often not possible.

Pre-paid services were developed as an answer to these problems and to offer an alternative to customers.

Pre-paid services enable both fixed and mobile access providers the ability to sell a customer a limited period of access to the network. They do so without any knowledge of that buyer or their personal details, since there is no risk for the provider. Users then have the ability to spend a limited time on the network, making calls or sending text / SMS (Short Message Service) messages (on mobile phones).

Pre-paid services eliminate the risk of unpaid accounts borne by providers. They also eliminate any real responsibility to track down stolen phones, since that phone has the ability to access the network only for the time that has already been paid for, an so constitutes no illegal network access violations.

Pre-paid services are the best way for providers to allow all users access to networks in Southern Africa. The potential market increases exponentially by allowing low-income groups easy access through pre-paid packages.

Similar "easy access" services, many based on the pre-paid access idea are being developed. However, the concept of facilitating simple network access is not limited to pre-paid customer access and easy access should be an operator and provider priority.

3.4.2 Complementary products, network externalities and providing a range of services

One approach to stimulate the telecoms market, encourage new users and grow total industry revenue is by providing complementary products and services, or direct and indirect network externalities.

A complementary product can be described through example as the sale printers to computer users. Some complementary products, or secondary market products, are critical, such as tyres and garage stations to the car industry, while some are not as critical.

The existence and easy availability of complementary products to the market encourages increased use and market presence of both products. But a lack of supply or over pricing of the complementary products discourages potential customers, while the absence from the market of necessary complementary product is a total depressant.

Offering a suite of services which compliment each other will therefore serve to grow the market and the satisfaction of the users, which results in tangible (increased revenue and repeat customers) and intangible (brand image) benefits.

For example, the sale of cell phone covers, ring tones, operator logos, data services and other mobile-related products all feed off each other and the sale of cellular phones.

3.4.3 Market structure

The figure below illustrates the long-term economic suitability and the return on investment (red) in different stages of a telecommunications network (green).

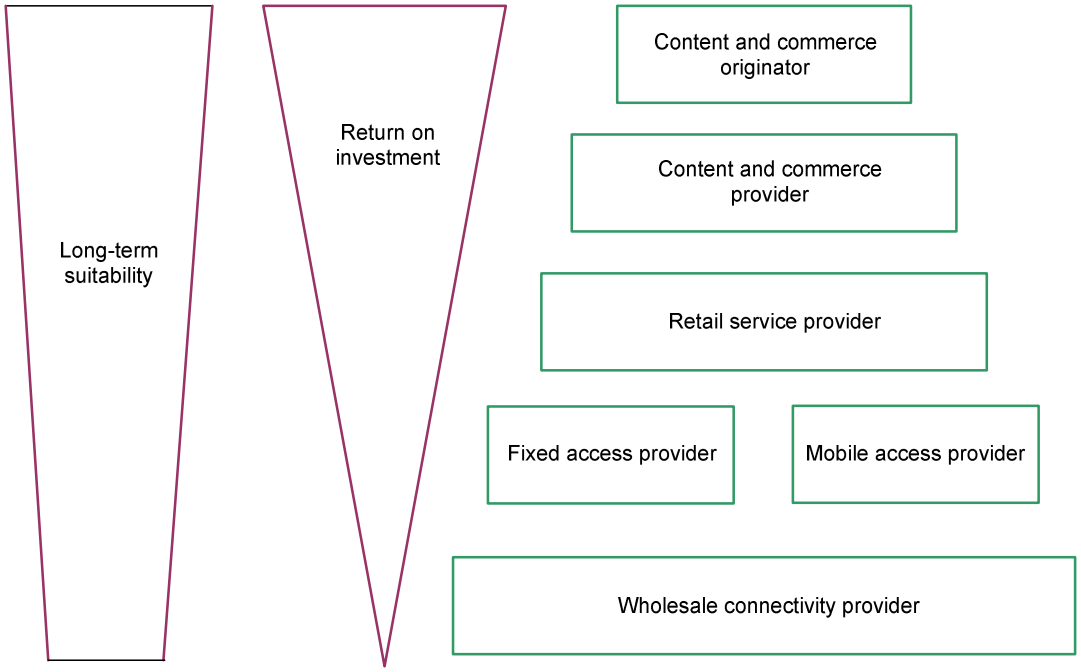

Figure 4: A generalised view of the telecommunications industry hierarchy

Source: adapted from Telkom communications

The figure implies that the companies that are positioned to address different customer needs have different ROI (return on investment) and long-term market suitability profiles. By long-term suitability is meant that as the information economy develops, those companies meeting advanced customer demands and are able to be flexible in their offerings are more likely to prosper than companies which do not have the ability to meet most progressive needs.

In the typical scenario, players at each level will generally use the infrastructure or service of the player situated directly below it on the illustration. That is to say, a fixed access provider buys connectivity from a wholesale provider and offers the service to customers; a content and commerce originator signs up subscribers and offers them a range of data, email and Internet services, and buys some of these from the content and commerce provider.

It is implied that the value-added position of those companies that offer a "one stop" solution or range of services meeting various needs has a superior long-term business proposition. The trend progressing up the diagram (from "wholesale connectivity provider"

to "content and commerce originator") is that companies are less capital intensive, have a shorter product lifecycle, and require less initial capital and investment.

Many large operators and service providers are extending or migrating their businesses to include capabilities of the player above it on the figure, in an effort to secure better market share, obtain alternative income streams, capitalise on the existing customer base and diversify for long-term suitability. However, others are not, as they prefer to concentrate on core competences. The author does not presume to pass judgement either way, but points out the concept and its pros / cons.

3.4.4 The customer window concept

An extension of the above is the concept of securing access through the "customer window."

The evolution of retailing (both products and services) reveals a pattern of increasing market dominance by the organisations that directly serve consumers. These firms are said to be located at the last step in the vertical chain.

There has been a shift in bargaining power from producers or suppliers to retailers, which can impose stringent conditions on producers, and thereby exercise a degree of control over the market.

3.4.5 Content type and quality

Content- and distribution-based issues are current uncertainties in ICT markets. These can be summarised by two questions: what content will turn out to be dominant / most influential and how will the quality of that content affect delivery channel usage? And what delivery channel will be superior / most desired by customers?

- Considering the delivery format: should ADSL, for example, turn out to be the clearly superior ICT transfer channel (in a certain environment), as opposed to

cable, a company would want to have access and subscribers of that technology and thereby be in a dominant market position.

- Concerning the role of content: demand for a certain delivery format is often subject to the content it transfers. For example, people must have and express a desire to pay for Internet-based services and applications above that of satellite television for Internet usage to supersede that of TV viewing. Furthermore, if the content on a particular delivery channel is poor, people will get bored or lose interest in that channel and probably abandon it. The final point is that should delivery channels end up being equally competitive or interchangeable, owning rights to the content will give the company a competitive advantage.

It is for this reason that firms are interested in having quality content or even access to the content creation sectors in addition to having direct access (through whatever channel) to consumers. Interoperation across the value chain in some sort of partnership is therefore valuable.

Securing access to the market can also be a way of protecting the distribution of content (Bores *et al*, 2001). ICT companies therefore often opt for a diversified portfolio of distribution assets and a wide variety of delivery possibilities.

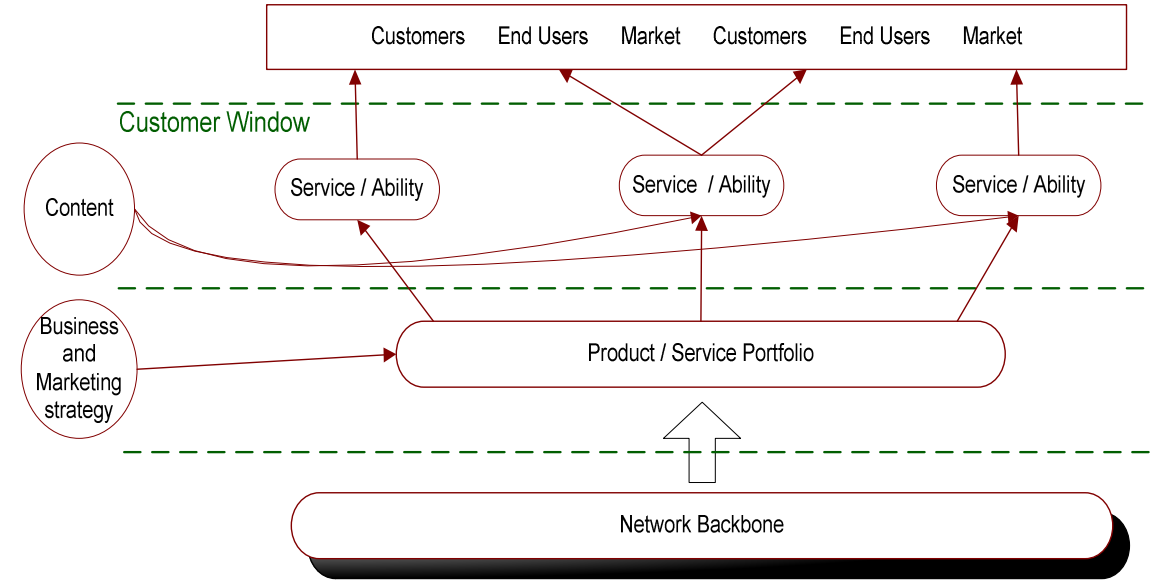

Figure 5: Illustrating the "customer window" concept

In the figure above, the customer receives telecommunication services from a provider. The service may have an element of "content" provided, in which case it is supplied. The product portfolio consists of the total offering available and is the marketing and business strategy manifested through enabling technologies.

3.4.6 The co-existence of alternatives

The co-existence of alternatives to a service or operator is usually recognised as competition, but one should appreciate that there are benefits to this, especially in a market which is uninitiated in the product or service being sold.

Alternative firms and products increase the awareness of new concepts and services through the market and share the responsibility of breaking entry barriers such as education and literacy needs. They stimulate the market through advertising and the economic interest spurred by competing players. They could also contribute by addressing obligations that are economically low-profit or even loss situations.

Competition and comparability to the user can encourage a more active interest in the segment, and thereby spawn development in related industries which can benefit the operator, such as new data services sent to customers via a carrier's lines.

3.4.7 Demand forecasting

Telecommunications is a high-technology environment which is constantly evolving, developing new and improved ways of transferring data. Because it is so technology, innovation and knowledge intensive, the capital and intellectual investment required in any service outlay is large.

The market, as with most high-technology sectors, is often understood to operate as a "push" market, as vendors and operators stimulate demand for new products and services. This high-end market certainly exists in the SADC, but a much greater portion of the market is the low-end market, where a need for basic telecommunications is clearly expressed and can be described as having a "pull" characteristic.

In both the upper- and lower-end aspects of telecommunications, whether considered push or pull markets, accurate demand forecasting is critical to the success and even survival of an enterprise, since each service rollout costs so much to develop and implement. If demand is incorrectly gauged or interpreted, the scale of the investment and resultant loss is significant.

The Southern African market is typically difficult to predict as little information exists about the characteristics of the telecommunications market. Aspects of demand forecasting that reveal more about the nature and characteristics of market need are therefore important. However, since little information exists, an operator's forecasting will be to analyse and react to the demand of its own rollout of services over a short time-frame. I.e. quarterly adjustments will be made to services as there is real demand in the local market. Once the service evolves, forecasting will become more accurate and reliable, and the measurement cycle can be extended.

3.5 Summary

Section 3 discussed issues raised by the literature study and introduced new ideas for analysis in this context.

Important economic considerations were simplifying interoperational complexity; acknowledging the limitations of the SADC body; the benefits of dividing the market into high- and low-end segments to understand elasticity; importance of employee education; implementing anti-fraud and -theft processes; establishing beneficial counter-trade agreements; and continually managing SADC political and business risk ("country risk").

Technologically, conclusions reached included selling services or abilities rather than technologies; designing processes around a customer orientation; the importance of standards and practices on interoperation; creating a multi-service core enabling growth into converged-services and broadband; innovation in the business and technological arenas and the origins of suppliers.

Market factors described the importance of offering users simple, easy network access; the positive influence of network externalities on the core business; the customer's perception and operator's influence illustrated by the customer window concept; the importance of content type and quality in data delivery applications; and demand forecasting.

Considering operations in the context of the SADC from an political and social perspective is relevant and significant. The strategic and operational challenges faced are non-trivial.

These conclusions are applied through the conceptual framework in chapter 4.

CHAPTER 4: CONCEPTUAL FRAMEWORK

The development framework is a response to a need to provide appropriate telecommunications for the heterogeneous Southern African people; reducing as far as possible the technology and market risks; enabling the alignment of strategy with technology availability and true market needs; and a logical approach to evolving the telecommunications network whilst preserving investment.

The concept behind the framework is to provide a logical structure through which operator strategy can be mapped. It is designed to enable a telecommunications operator to produce a roadmap that best meets the real needs of the Southern African ICT market, resulting in a best-case profit-generating service which allows the recipients to receive benefits of telecommunications.

The framework, due to its broad scope and complexity, is rendered in various forms which fit and apply together.

There are four main sections through which this dissertation communicates the framework. The first part maps from a certain perspective a telecoms operator as it exists and must function, while the latter sections aim to provide direction and perspective on particular issues. The sections are:

- Contextual framework: Depiction of the environment, the format of strategy expression, and a description of domains and the interrelationships between domains
- Business orientation and market strategies: A representation of various business orientations and market strategies
- Technology Decision Framework: The technological decision, evaluation and feedback framework
- Framework Enabling Roadmap: The structure which gives perspective and order of application to the various features of the model

4.1 Contextual Framework

Section 4.1 maps the context and describes the elements which need to be addressed by a telecoms strategy.

Figure 6 shows the environment in which the framework is situated.

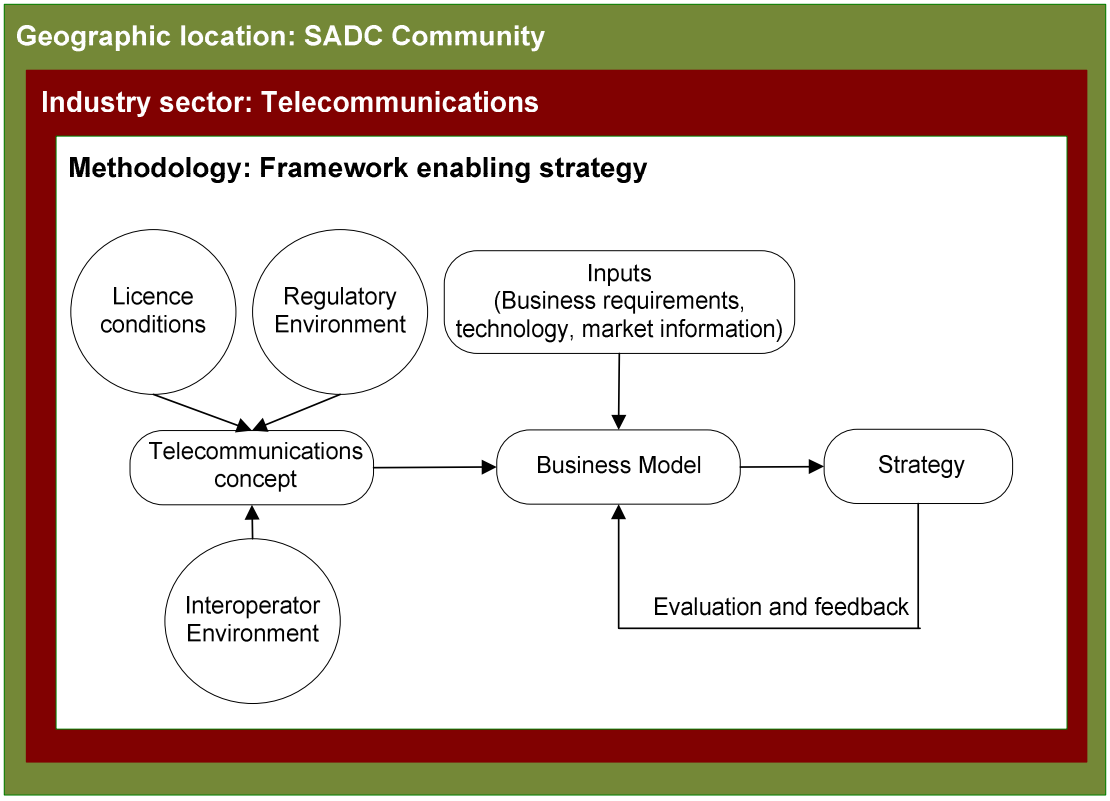

Figure 6: The context of the development framework and the major elements which influence it

A development framework whose purpose is strategy direction has various inputs; actors; informational, physical and logical quantities; outputs and evaluation / feedback elements.

The remainder of section 4.1 maps the elements of a strategy and operator environment from a certain perspective. The enabling framework (section 4.4) which guides strategy

direction (section 4.2 and 4.3) must be applied through elements described here (section 4.1).

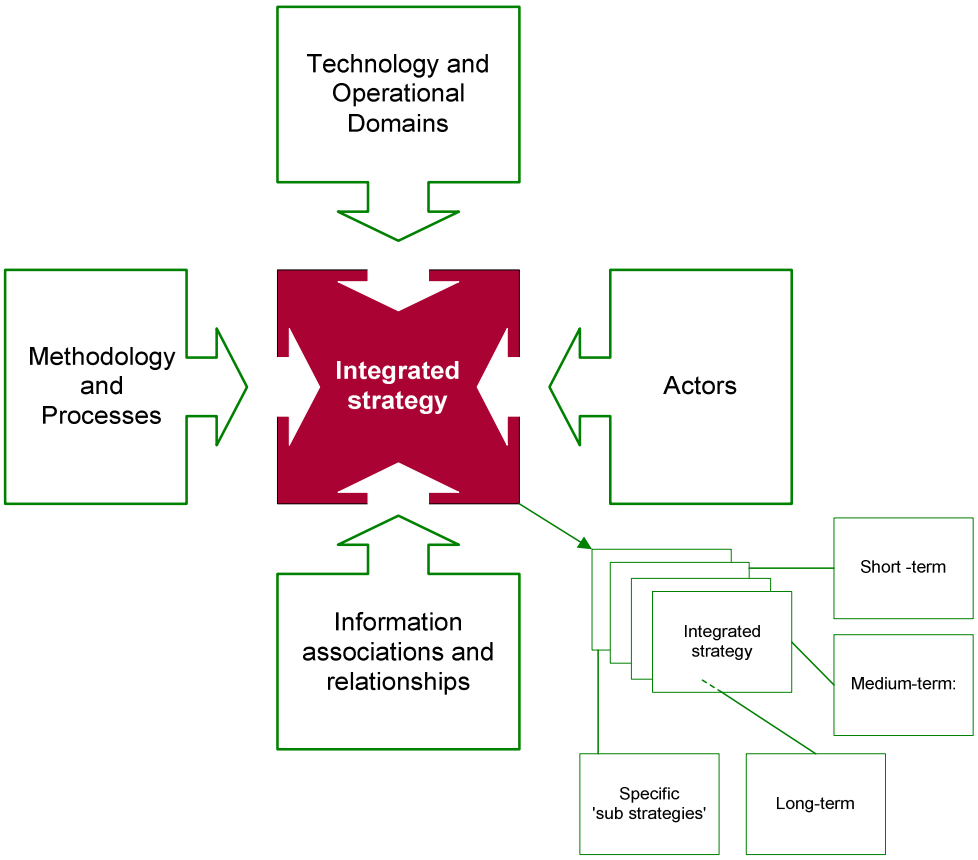

Figure 7: A framework which guides strategy must address all "puzzle pieces" depicted above. On a layer above this, the business, market and technological inputs must direct the strategy

Integrated strategy: The business strategy of a particular firm and the output expression of the framework.

Note: it is likely that a firm will have many solutions or different sub-strategies to meet specific requirements of certain networks or markets. Also, it will have different time frames: a short, mid and long-term strategy. The medium-term strategy will involve aspects which enable evolution of the network in other directions; the long-term strategy will embody the vision of the company in the market; and the short-term strategy will be aligned to enable acceptance of all current and emerging products and services.

Actors: All actors must be addressed and accounted for in a strategy. These include the regulator, partner companies, competition companies, the market / customers and any other body or organisation which has the ability to affect the strategy. The interoperator environment plays a role here.

Also particularly important in the African environment are actors like financiers and the IT industry, which can indirectly affect the performance of the telco. The situation must be assessed and addressed on a case-by-case basis.

Technological domains: a domain is a sphere or logical business area which forms one part of the whole business. It can be similar to functional area, though usually a functional area combines various domains. A telecom provider is large and complex, and can thus be considered from different perspectives. Configuring the business along "domain" business boundaries, rather than pure organisational differentiation or other differentiation, ensures the multi-service technology environment which best characterises telecoms is most accurately described.

The framework that enables a development strategy will consequently use domains as an organising structure. Technological domains include:

- Access technologies: Access technologies enable user connection to the network (but are not terminal or handset equipment). An example is GSM technology. They are the "first line" network elements which concentrate geographically distributed signals into the network, where they are routed to their destination.
- Edge domain: Edge technologies generally concern controlling and optimising access and traffic characteristics to core network technologies. An example of a service which is based on edge technologies is VPN.
- Core domain: The core domain is responsible for distributing traffic through high-bandwidth connections over distances.
- Voice Services: The voice services domain provides voice connectivity and value added voice-based services to the user through various carrier technologies.
- Data services: Data services concern providing a variety of data services to the user through a multitude of architecture configurations.

- CPE domain: Customer Premises Equipment is equipment that is owned and operated by the user which facilitates connection through various means to an ICT network. Examples are computer terminals and telephone handsets. This domain includes all customer facing technologies
- Management domain: The management domain concerns technologies that ensure the integrity, reliability and availability of elements in the network.

The author realises that voice services and data services will become increasingly indistinct.

Operational domains: These management and operational domains include:

- Customer domain: The customer relationship domain concerns all interactions, information and support operations which is user-related.
- Billing and accounting domain: This domain includes billing processes, invoices, accounts and operations which calculate and present to the customer network usage information and costs. It is considered separately from the software and management / OSS domain as it reaches across these domains.
- Product and portfolio domain: This domain includes the individual products and services offered, the instances and configurations, product SLAs, performance measurement systems; as well as the portfolio and product / service mix available in the market.
- Network domain: The overall functions, topological arrangement and capabilities of the total platform which makes possible various services and products.
- Hardware and technology domain: The hardware and equipment provides the channel through which services are made accessible. The domain includes equipment support, breakdown and performance measurement.
- Software technology domain: The collective group of individual software technologies through which services are rendered, performance is measured, traffic is managed, etc. This includes applications and OSS tools. There is some overlap with billing and accounting.

Methodology and processes: The methodology is the manner through which the corporate strategy is enabled and achieved. It consists of a sequential arrangement of business

functions and processes which are integrated in a particular manner to achieve desired outcomes, consistent with the strategy.

The framework enables a more business-specific methodology to be constructed.

Information associations and relationships: Informational associations and transactions occur between different elements of an entity. Formalised and informal relationships exist between various domain and functional areas.

A strategy often has to account for or formally describe the kind, frequency, extent and duration of information transfer in a relationship between entities. However, most relationships will simply exist and operate as part of the business. The business and actors should only be aware of the relationship in these cases.

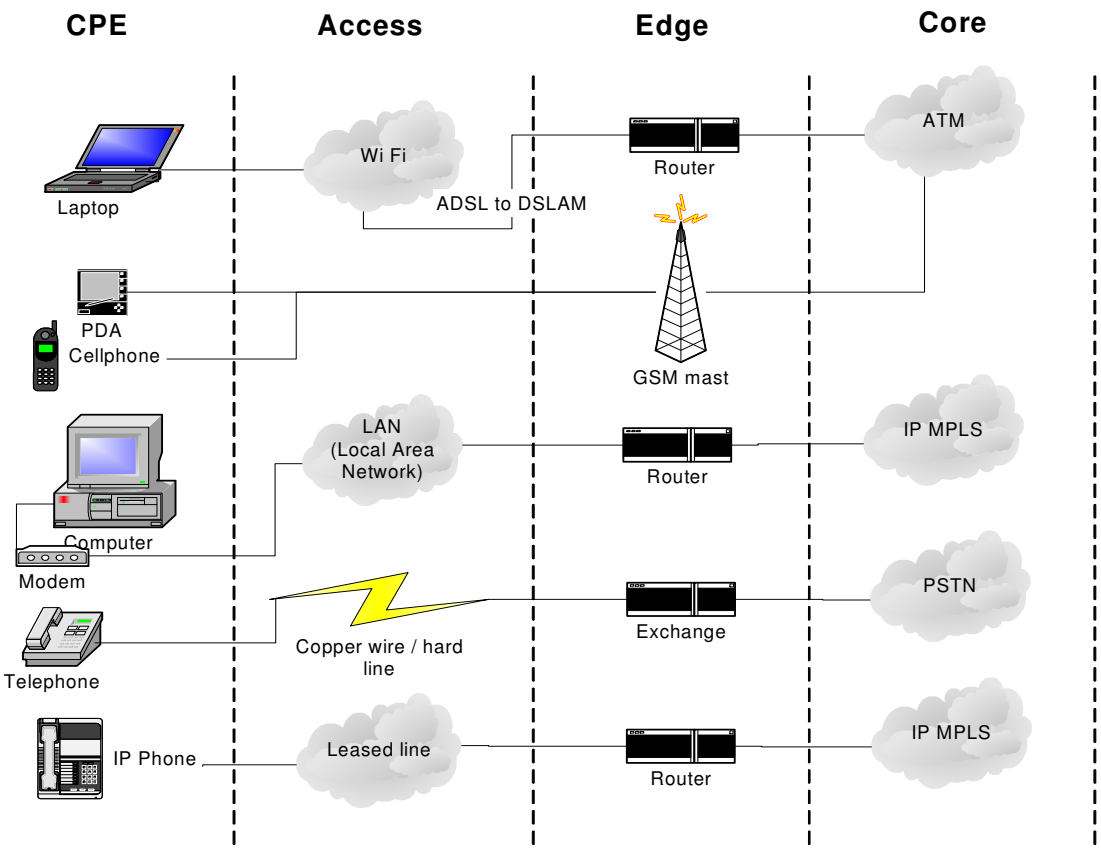

Figure 8: Technological domains as they may operate in various possible arrangements

The figure above shows the technological domains separated into “lanes” and shows how the various elements can combine in a network arrangement.

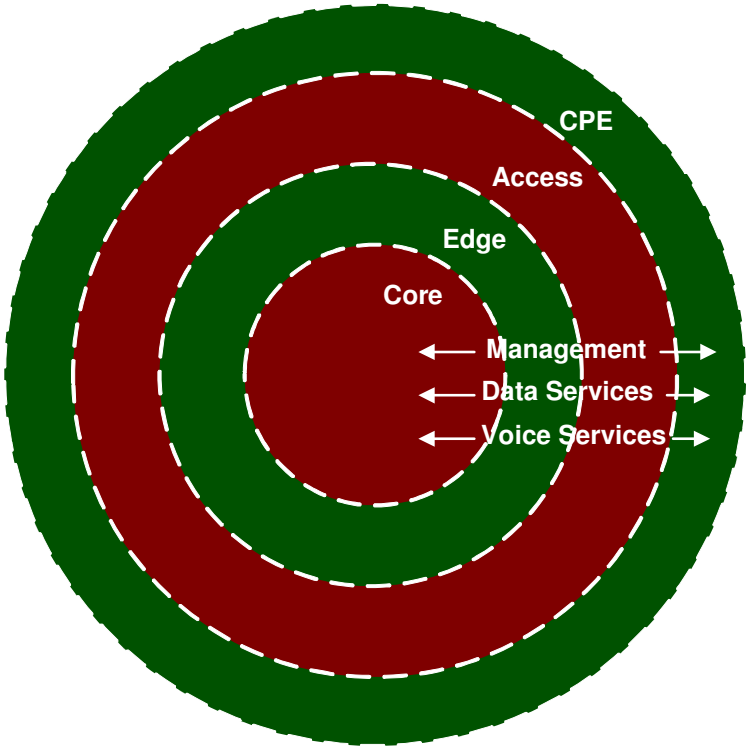

Figure 9: Topological perspective of technological domains

The above figure illustrates how technological domains can be represented from a network perspective. Management, data and voice services can function and influence the other domains from core to CPE. They must be considered in this context.

Summary

This section has mapped the telecoms operator environment. It has detailed the high-level architectural and topographic aspects of a provider of telecommunications services.

The following sections isolate specific issues which must be addressed in a business strategy in order to achieve sustainable telecommunications development.

4.2 Business Orientation and Market Strategies

The remainder of section 4 identifies specific issues and concerns on which an operator should focus.

This is done by considering how to:

- exploit the opportunities identified by the research
- improve the likelihood of success by dealing with probable failure factors

Since no single global formula for success exists, especially with high-technology sectors in emerging markets, this research isolates certain practices and procedures which are important as well as specific African business strategies.

4.2.1 Customer orientation

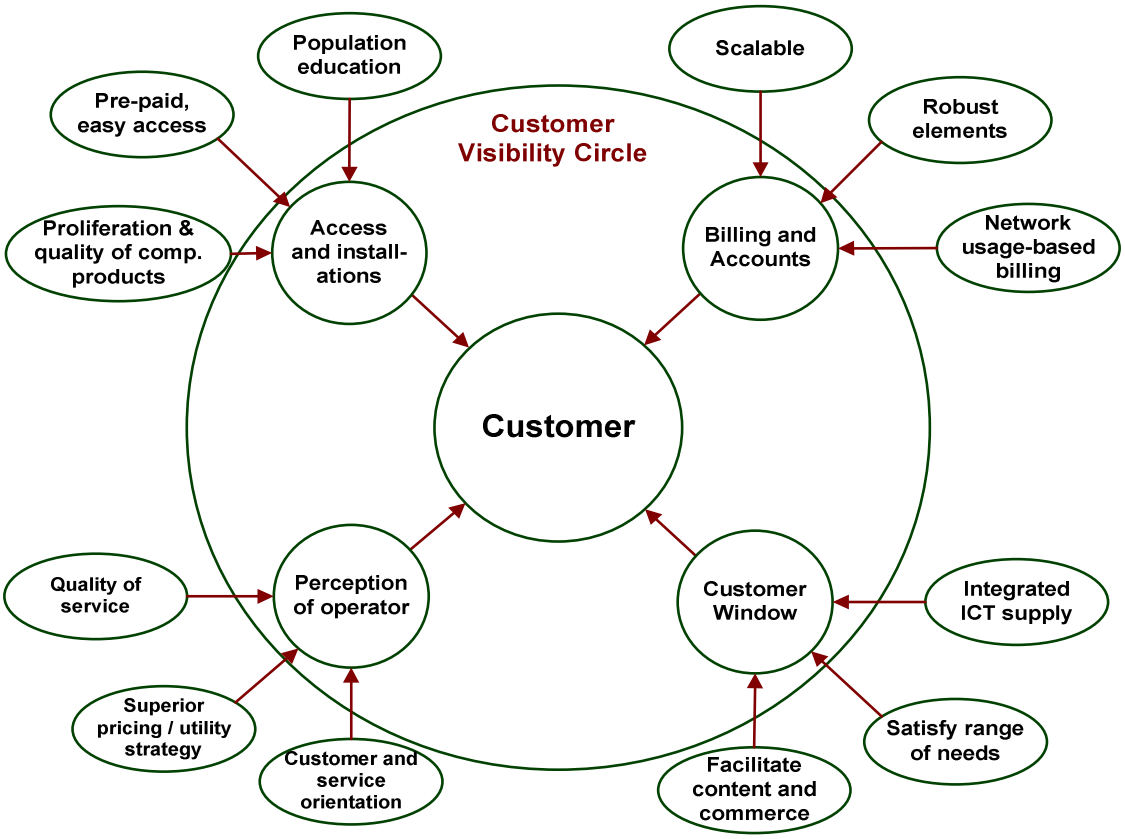

Figure 10: shows the customer orientation necessary of the network

The above diagram depicts the customer at the centre of a web of concepts this research has identified as crucial for telecommunications in Southern Africa. The four circles leading into the "customer" centre are issues which are visible to the customer. They are issues the customer uses to judge the overall level of service and will influence the user's perception and utility of the network.

These visibility circles are in turn made up of issues as they apply to the operator. They can be domains or functional areas or ideologies. These issues have been discussed in chapters 2 and 3, and are summarised here.

Figure 11 is an excerpt from the north-east quadrant of figure 10.

Scalable and robust elements: Billing systems should employ scalable and robust elements. (From 3.3.3).

Network usage-based billing: Certain billing processes should be based on appropriate measures of resource usage, such as the volume of data transfer in Internet pipes – as opposed to time of connection – as this is often unreliable and a point of contention to the customer, especially in high-end markets.

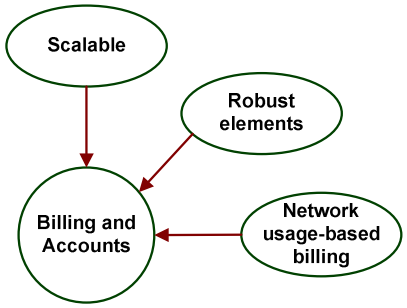

Figure 11: Billing

Figure 12 is an excerpt from the north-west quadrant of figure 10.

Access to the network, from the customer's perspective, should be easy and inviting. To achieve this, the access process should be made as simple as possible.

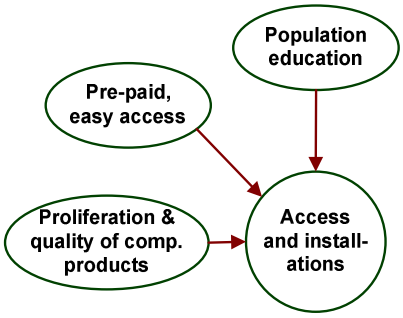

Figure 12: Access

Population education: The market needs to be educated about the technology and services available (2.6.3). Awareness of the service possibilities the operator and technology it employs should be propagated. Any "fear", technophobia or negative perception of the technology which arises from ignorance should be immediately addressed. This will also increase the market presence of that particular kind of service.

Complementary components: Complementary products and services (or network externalities) will encourage market awareness and participation in the telecommunications offerings. It is important to encourage participation of non-telecommunications agents in new markets (from section 3.4.2). This ties in with interoperator and inter-industry participation.

Easy access: Offering pre-paid and similar "easy access" services are critical to the initial growth and long-term success of various ICT services in Africa (section 3.4.1).

Figure 13 is an excerpt from the south-west quadrant of figure 10.

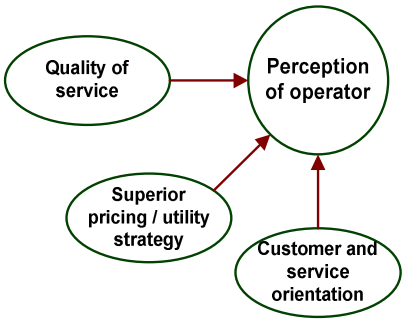

Figure 13: Perception

The perception and marketing of services is obviously important, especially where the technology is (1) relatively new and unknown, and (2) the traditional marketing channels do not have widespread diffusion or usage characteristics similar to more mature markets.

Superior pricing/utility strategy: However, a customer orientation which bases its edge on superior quality/price ratios is likely to succeed (especially where there is no brand loyalty). The telecommunications market is, as discussed, divided into a high- and low-end segment (see 3.2.4). The great majority of business will be, at least initially, derived from the low-end segment. Thus, pricing and marketing are critical issues to be considered.

Customer and service orientation: Also, an organisation orientated around providing service excellence as opposed to selling technology products is necessary (section 3.3.1 and 2). Projecting the operator as a customer-centric organisation is critical to the customer's perception.

Quality of service: Being perceived differently from the monopolistic enterprises which previously / still dominate the telecommunications landscape is important for customer perception. The best way to do this is to operate a business which offers excellent quality of service, providing reasonable services where the previous corporation failed to do so and offer a competitive quality / price basis to all products (section 3.3.2).

Note: the role of Quality of Service of data in the network, enabled through Classes of Service i.e. a DSCP (Diff Serv Code Point) or IP TOS (IP Type of Service) bit, though increasingly important to corporates in a bandwidth-constrained environment, is beyond the scope and not intended here.

Figure 14 is an excerpt from the south-west quadrant of figure 10.

The window (section 3.4.4) through which the customer receives ICT services contributes toward their entire perception of ICT, and consequently affects their spending and use of services. In developing countries, this is still fairly limited, and the customer's initial impression of services will therefore be amplified, as he / she has nothing to counterbalance the impression or compare the standard with.

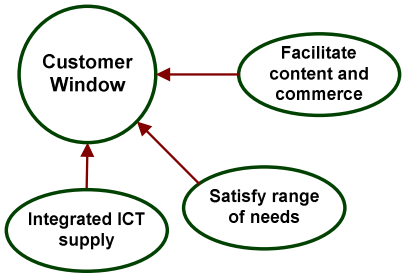

Figure 14: Customer Window

Integrated ICT supply satisfying a range of needs: For maximum economic gain and customer utility, a provider must satisfy a range of the customer's needs (section 3.4.3). Doing so results in a higher return per customer, a better ROI, heightened chance of loyalty and comeback business and the ability to sell other services. By integrating the suite of ICT supply sources as far as possible the operator is able to be a single point of contact for the customer.

Facilitate content and commerce provision: The operator should, for example, provide or facilitate provision of quality content and commerce which the customer wants together with the distribution channel (3.4.4 and 5). It should also enable a range of services – banking and entertainment services, for example – through partnerships or directly.

4.2.2 Aspects of Application

The figure below shows aspects identified in this research as important and the channel through which they are managed and applied.

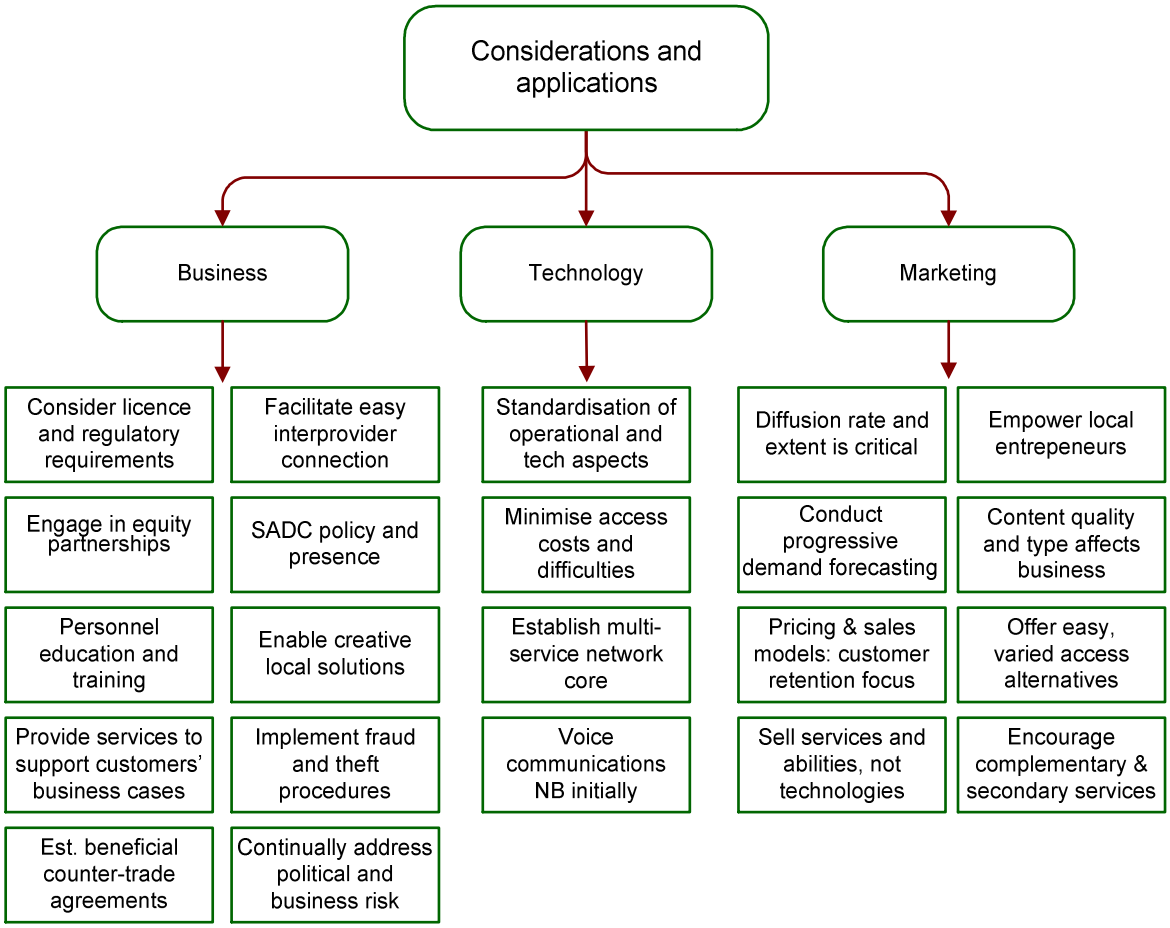

Figure 15: Considerations for strategy application

Business considerations

- The business should provide services to support its customer business requirements (section 3.3.2). For example, a solution to electricity payment problems could be to offer pre-paid account service. These accounts could then be "topped up" using mobile phones when necessary, and so the mobile operator should provide this.
- Implement anti-fraud and anti-theft of network access processes (section 3.2.7). These could range from watchdog software programmes identifying out-of-pattern account usage (thereby possibly detecting "clip-on fraud"), to network management processes set at certain operational tolerances and physical security measures at equipment sites.
- Education and training of local personnel (see 3.2.6) is critical to the survival of the network, from both a cost and operational efficiency perspective.

Telecommunications is still run by people and the level of skills of these employees often determines the quality of service rendered.

- Enabling creative local solutions and innovation (section 2.3.2 and 3.3.8) is important. Operators, especially foreign, often do not allow for potentially successful but unconventional solutions to problems such as providing access to poor rural areas in their business models. Speeding the rate of market adoption and brand presence in the new market can be accelerated by enabling (sometimes temporary) alternative sales vehicles.
- Engaging in equity partnerships could be important to establish insight into the local market, credibility, and smooth the licence procedure (where, for example, the local government wants to involve local companies). It can also reduce political risk (section 3.2.9 and 3.3.5).
- Counter-trade agreements (see 3.2.8) are usually required of business in foreign markets. Operators must consider the implications of such a constraint on revenue movement on their global operations. Creating trade relationships which directly benefit the operator, such as establishing local equipment supplier depots (assuming there are no quality and manufacturing issues), would be an ideal arrangement from an operator perspective.
- Managing political and country risk (sections 3.2.9 and 2.6.3) is an active, ongoing concern that will evolve as the political and socio-economic landscape changes.
- The SADC presence should be considered insofar that the body has the potential to effect changes in the economic environment (sections 2.1, 2.3. and 3.2.2)
- Interoperational difficulties, whether technological or operational, affects the efficiency of operations (sections 3.2.1, and 3.3.5). Interconnect agreements have a large influence on pricing models. Adhering to set standards (such as the ITU Region 2 set) and enabling best-practices will minimise these difficulties.
- The licence requirements and regulatory environment are important inputs to the business model (2.3 and 2.6). Universal service access requirements may be applied.

Technology considerations

- Utilising standardised equipment and technological specifications is a prerequisite for a modern, cross-country telecommunications network (sections 2.4.5 and 3.3.4).

Employing ITU region 2 practice, non-proprietary protocols and encouraging as far as possible ease of interoperation and service development will positively affect the probability of enterprise success.

- Minimising access costs (3.3.3 and 3.4.1), which are notoriously high and include EIAs (environmental impact assessments), site costs, backup power supplies and theft devices, must be pursued.
- Establishing a multi-service network core is essential for future data and voice services (section 3.3.7). The possibilities enabled by a multi-service core (e.g. VOIP, video, storage, data, secure VPNs, etc.) with a flexible billing engine enable many possibilities for growth with an efficient operating budget.
- Voice communications (see 3.3.6) in relatively undeveloped nations will initially be of greatest demand. Data services, VPNs and internet access are increasing but remain secondary to volume demand for voice connectivity.

Marketing considerations

- The product diffusion rate and extent through the market determines the economic success of that product (section 2.6.2). Maximising this is a marketing priority.
- Focus on the local customer, and sell the services which are actually needed (3.3.1 and 2).
- The type and quality of the content carried (section 3.4.5) affects the transmission business. Providing content that is desired and of good quality will result in more traffic over that transmission channel. Conversely, poor content or a lack of content will adversely affect traffic.
- Demand forecasting (section 3.4.7) is important to perform in any possible way.
- Offering easy, simple and varied access alternatives with low entry barriers is important in emerging markets (section 3.4.1).
- Pricing and sales models should be focused on customer retention (see 3.2.4). Whilst product pricing should probably be within any similar existing service price ranges, product differentiation on the basis of quality (3.2.6) or some other aspect should be focused on maintaining customers rather than revenue maximisation.
- Encouraging complementary services and network externalities results in a higher awareness of both services / industries, and is mutually beneficial to sales (section 3.4.4).

Figure 15 summarises various issues important for strategy formulation to consider. These are of particular applicability for operations in Southern Africa.

4.3 Technology Decision Methodology

Telecommunications is a high-technology environment and an evaluation methodology is therefore concerned with technological solutions to business and market objectives. Technology choice must be subordinated to business requirements, and those requirements must be part of customer needs (as determined in section 3.3 and 3.4).

The technology decision methodology is a process which aids in the choice of technology options which are available to a firm. It is by nature a looping or feedback mechanism and is an iterative process.

The appropriateness and timing of a technology or class technologies in the market will often determine the relative success of the firm at that time. Orientation with the greater company strategy, product portfolio and business objectives are of course also crucial for success.

Market and business needs must drive the technology choice, as is fitting with the customer-centric approach. However, technology markets are often supply-driven, implying new technologies are "pushed" to the market and that actual market needs are often imprecisely addressed. The methodology suggests that the technology be represented by or take form in an expression which best suits the market. Customers should be respected. It should be remembered that technological superiority is no guarantee of acceptance by or dominance in the market (section 2.4.5).

Telcos utilise many different technologies in the network core, edge and at user access points. The methodology presented in figure 16 is meant to be applied at all stages of the strategy definition. "The market" can also be different at different geographic locations, so a different technology can be the result of the methodology as applied in a different region.

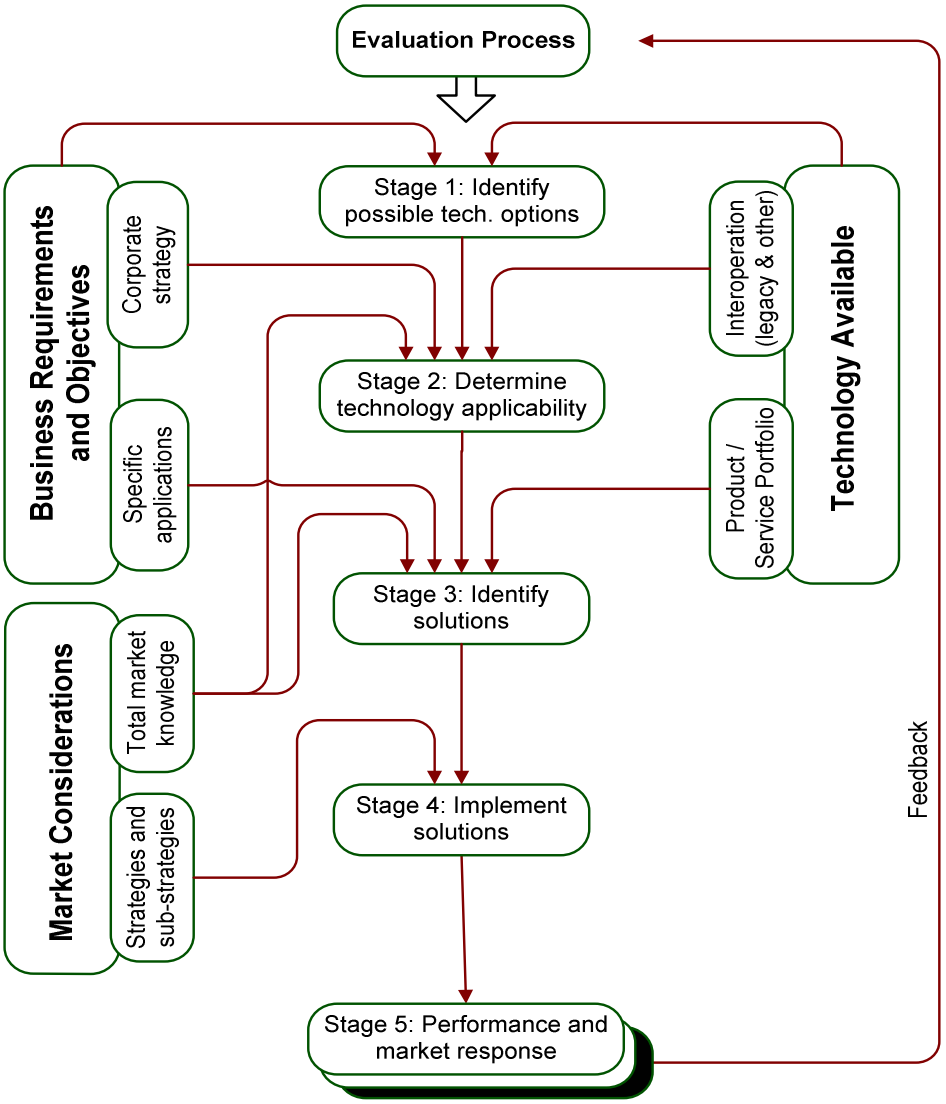

Figure 16: Technology decision methodology

The above 5 stages can best be explained by way of example: an operator believes there is a gap in the African wireless data market, in the form of relatively small "hotspots" or larger-footprint wireless communications.

Stage 1:

Business requirements and objectives: The company defines what it wants to do, where the opportunity lies, what sort of initiative they are embarking upon, financials, legal, etc.

E.g. The Company decides major cities and urban spots in the central and southern African continent would respond well to an ICT wireless data initiative of some sort. The company wants to dominate this market, especially businesses and government users. Its objectives are to have a presence in 5 major sites in year 1 and 15 in year 2; and to break-even on the investment in year 3, returning approximately 20% on EBITDA.

Possible technology options: Possible technology options are identified, explored and understood.

E.g. in this case, GPRS, Wi Fi (802.11), WiMAX, Bluetooth and various other forms of satellite- and radio-based technology platforms could be utilised.

Stage 2:

Interoperation with legacy and other technologies: Technologies are evaluated in terms of their holistic integration into the technology and technical context.

E.g. Wi Fi and Bluetooth are technologies for which there is widespread interest, relatively easy integration capabilities with legacy networks, low-cost hubs / stations (compared with satellite technology) and high-data transfer rate (compared with cost-effective cellular rates). WiMAX is still very immature and largely-untested. GPRS access can be slow but ubiquitous where cellphones and laptops are relatively new and mobile operators have established presence and GPRS capability.

Corporate strategy: Technologies and their implications are checked against their alignment with the greater corporate strategy.

Wi Fi fits with the corporate strategy of targeting businesses, organisations, foreigners, travellers and others for whom connection to email and databases could be important in the region. Cost implications of the technology are not so significant that they debilitate the business.

Total market knowledge: Marketing acumen, knowledge and experience is applied to the technologies. Positioning, cost, etc. are evaluated.

E.g. Market knowledge has led the company to believe Bluetooth is a technology which has a large following by certain wealthy groups and individuals; cellular connection speeds using laptops and PDAs can be acceptable under certain conditions; and Wi Fi has already been proven in mature markets as a useful and verified computer technology. WiMAX is unknown. GPRS has various pros and cons.

Stage 3:

Specific applications: The specific application and targeted market is defined.

E.g. Specific applications would be in airports, upper-market hotels, Internet cafés and certain hotspots in large cities.

Product / Service portfolio: The application and technology is considered as part of the greater set of offerings – does it suit the image, will there bee cross-elasticity or cannibalisation, etc.

E.g. Wi Fi fits within the organisations' image and service portfolio as the company has a "coffee shop" presence and has other products which appeal to the upwardly-mobile, young business individual.

Total market knowledge: Marketing knowledge is applied to the now-defined initiative and technology.

E.g. It is believed (from limited demand forecasting) there is a need for Wi Fi in the mentioned areas and it would take 12-15 months for rollout. Uptake will be exponential.

Stage 4:

Strategies and sub-strategies: Detailed marketing strategy is applied.

E.g. pricing will be low and tentative at first. Cheap, long-term contracts will be offered to businesses and frequent users. There will be stations at each place for hire.

Stage 5:

Performance and market response: The performance of the service / product is evaluated and strategy and tactics adjusted against objectives.

E.g. measurement and feedback of the amount of use, characteristics of user, etc are evaluated and used as inputs to improve the strategy.

4.4 Enabling Framework

Figure 17 is the framework which gives form to the separate figures in chapter 4. It can be understood as an "enabling framework".

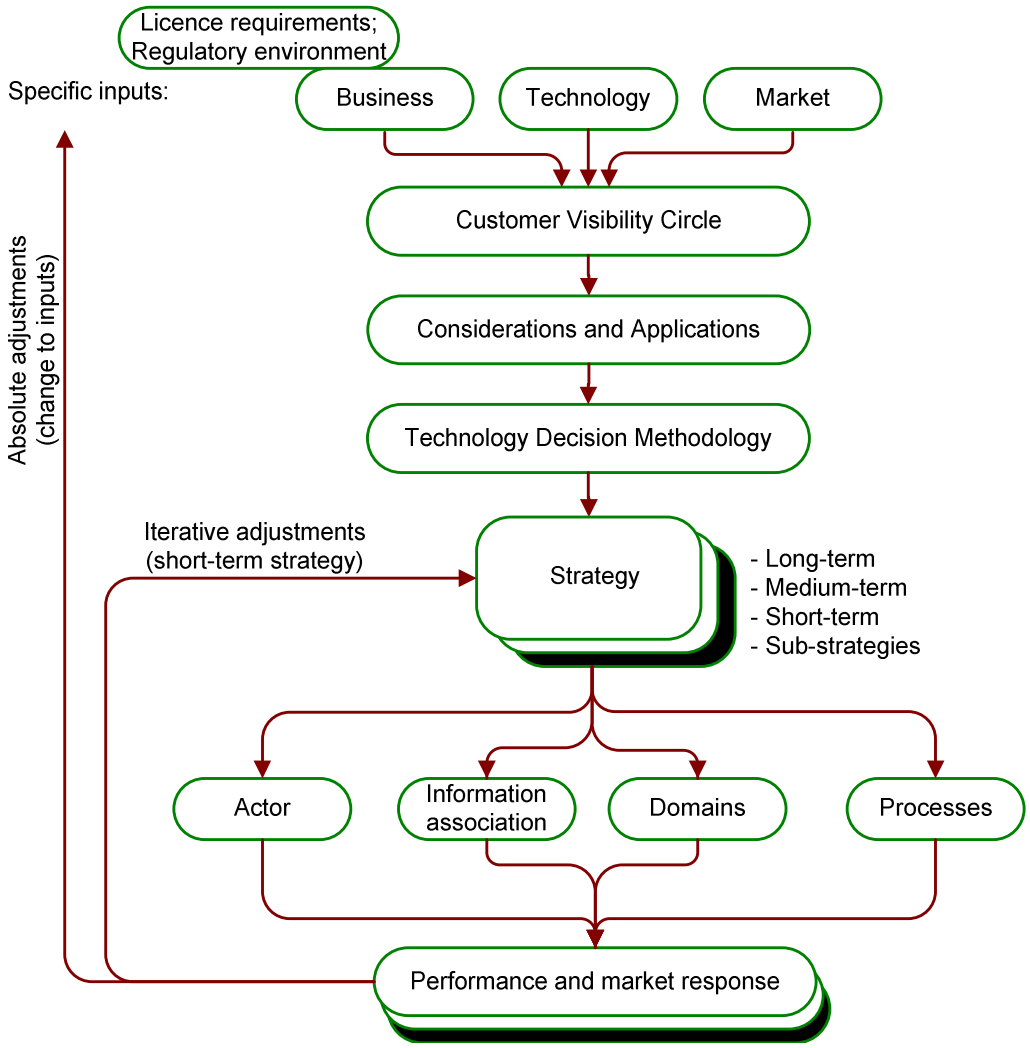

Figure 17: Framework enabling roadmap

Figure 17 is the framework which enables the various aspects of conceptual model. It is the total roadmap. It provides sequence and order to all that has been discussed in chapter 4.

The major inputs into the development framework (the regulatory conditions, licence requirements and interoperator environment; business requirements and direction;

technology available, resources and needs; and marketing knowledge) must be defined and applied to figures 10 (Customer visibility circle / orientation), 15 (considerations and applications) and 16 (technology decision methodology), in that order.

The outcome of this is:

1. A customer-orientation approach to process design and awareness of user perception.
2. Adequate high-level strategy definition and refinement for the considerations presented in figure 15.
3. Specific technology selections for various applications, geographic locations and market needs.

A high-level strategy formulation is then possible and expressed in the form described in figure 7. The strategy which is arrived at by following the framework is applied in its various forms (as mapped in section 4.1) across the organisation.

Market response is then interpreted and the updated information fed back into the framework, resulting in both short-term adjustments (mainly to short- and medium-term strategy) and long-term adjustments (to inputs, business objectives and long-term strategy.)

Development of a particular telecommunications network infrastructure hereby guided and the strategy mapped.

4.5 Summary

In summary, the conceptual models presented here are the result of a need identified in the research for a clear, defined development framework specific to Southern Africa.

The development framework presented here is enabled by figure 17 and uses figures 7 through 16 to map various aspects of it. It utilises the principles and concepts, as identified by the research as important, of:

- defining processes around the customer's satisfaction and needs

- ensuring issues that are particular to Southern African operations, policy, markets and environment are considered and adequately addressed by strategy
- subordinating technology choices to business requirements and ensuring technology selection is guided by and aligned with the total strategy
- expressing strategy in terms of domains to most accurately describe the multi-service technology environment which best characterises telecoms

The framework applies the socially, economically and politically relevant attributes of operations in the SADC. In this way the framework maximises the probability of achieving economic success.

CHAPTER 5: RESEARCH METHODOLOGY

5.1 Research Strategy

The structure of this dissertation follows a theory-based empirical research approach.

The literature and theory has been studied in chapter 2, analysed and developed in chapter 3, and a new model formulated from conclusions in the research in chapter 4. The model must now be tested in the most appropriate empirical manner.

In order to test and validate the development framework is it necessary to test it against a case study where there has been a telecommunications rollout in a SADC-member country. The rollout must be conducted at a nationwide level where some network rollout (either cellular or fixed-line) by a foreign or new corporation in the country has been undertaken.

Fixed-access operators have not really expanded into the SADC on a national level. They have completed specific jobs for certain businesses, though. Mobile access providers have however entered Africa and are the most active players in the SADC market. Cellular operators provide access to networks by enabling the "last step" (technology-wise) to users very efficiently, and transmission between GSM masts and into fixed-lines and other networks employs non-mobile or traditional fixed-access operator technologies such as microwave, copper wire and optical fibre. Also, these can be seen as growth points with possible service alternatives in the future. It is acceptable therefore to study a mobile operator network expansion case study and assume this to be representative of much of the large-scale expansion for which the framework was designed.

However, not all parts of the framework – such as a comparison of data and Internet services offered – will be addressed by the case study since it is not offered (yet.)

5.2 Research Instruments and Methodology

5.2.1 Methodology

The relevance and usefulness of the framework is assessed by gauging the extent to which it successfully structures, orders and adds to important aspects of the each case study's expansion process and whether it could be used as a template for expansion.

Testing of the model will be conducted by comparison of the model with the actual strategy employed and general results of the case study on the following levels:

1. General strategy formulation and expression. Model's overall applicability to strategy and technological rollout
2. Comparison of various aspects and focal points of model with case study. These are:
    - Technology decision methodology (figure 16)
    - Aspects of strategy application (figure 15)
        - Business
            - Importance of interoperation and interconnection issues and management thereof
            - Licence conditions and the regulatory environment: importance; influence of the regulatory environment on behaviour
            - Personnel education and skills training
            - Enabling creative local solutions; utilising local knowledge
            - SADC policy and influence in the environment
            - Equity partnerships
            - Provide services to support customers' business cases
            - Implement fraud and theft procedures
            - Establish beneficial counter-trade agreements
            - Continually address SADC political and business risk
        - Technology
            - Standardisation of operational and technological aspects

- Focus initially on voice communications
- Multi-service network core
- Minimise access costs and difficulties

- Marketing
  - Concentration on service diffusion rate and extent
  - Empower local entrepreneurs
  - Content quality and type affects business
  - Sell abilities, not technologies
  - Demand forecasting
  - Easy, varied access alternatives
  - Complementary products and services encouraged
  - Pricing strategies and sales models focused on customer retention

- Customer orientation / visibility circle (figure 10 through 14)
  - Access and installations
  - Billing / accounts
  - Customer window
  - Perception of operator

5.2.2 Selection of operator

Selection of operators to study was influenced by the presence of that operator in a SADC member country and the willingness of that company to share information about that presence. Consequently, Vodacom Pty Ltd., South Africa's largest mobile operator and active in various African states, was selected. Other companies approached could or would not share a sufficient amount of information for a complete case study.

Case study information was obtained through interviews with relevant employees at Vodacom and material (articles, PR material, company publications) which has been made available.

5.2.3 Selection of country

The choice of specific country case study was based on the following factors:

- Quality of information available about the telecoms rollout and country
- General maturity of the network and time period spent in the country by the new operation
- A certain level of success achieved by the business

CHAPTER 6: RESULTS

6.1 Vodacom in the Democratic Republic of Congo

6.1.1 Background

Vodacom is South Africa's largest cellular operator. It is involved in core network applications as well as other related cellular services and access provider activities.

Vodacom has or is intending to expand from its "base" in SA to the DRC, Tanzania, Mozambique and Lesotho. (It has a licence to operate in Zambia but is not presently nor intends to in the near future launch operations there.) This migration into Africa is primarily driven by a need for to maintain a high growth rate (they strive for about 25%), while using South Africa as a stable base of operations and financing source.

6.1.2 Case study specifics

DRC background and demographics

The Democratic Republic of Congo is Africa's third largest country geographically with a resource-driven economy. Since 1995, when Laurent Kabila took power, until now, there has been much political and economic turbulence and since 1998, civil war. It is considered a highly dangerous political landscape and unstable economy. There is a large degree of practical lawlessness in many areas.

Population is primarily concentrated in Kinshasa and surrounding areas, Lubumbassi and the mining areas, with dispersion through the rest of the country generally even. The total population is 53 million.

The GDP (Gross Domestic Product) is US$6 billion, with GDP per capita US$113.

War and political upheaval has its effects in destabilising mining and industry operations, destroying educational and social organisations where they existed and discredited leadership and government structures.

Vodacom Congo

Telecommunications development before mobile technology cannot be described as good. In 2001 the teledensity was 0.04 fixed telephones and 0.29 mobile phones per 100 inhabitants. Services were generally inefficient, unreliable and lines were not widespread. With the advent of cellular technology, the uptake has been brisk and surprisingly lucrative considering the official GDP per capita characteristics.

Vodacom International believes the GSM market is approximately 5%, or 2.65 million people.

Vodacom currently has a 51% shareholding in an operation which competes with Celtel/MSI. They launched operations in May 2002 (by launching a joint venture with existing operator and licence holder Congolese Wireless Networks (CWN)) and by the end of August 2003 their shareholding was 42%, with 412 743 subscribers. It is anticipated that by the end of March 2004 Vodacom Congo will have 600 000 subscribers.

Vodacom Congo invested US$ 39 million into the DRC and projects operational profit by March 2006.

The cellular industry focuses mainly on two indicators: driving the revenue per subscriber and keeping EBITDA (earnings before interest, tax, depreciation and amortisation) high. In the DRC, the ARPU is surprisingly high at about US$ 95 – 110. This essentially implies more money ("mattress money" in Vodacom's terms) exists than official figures. Compare this with South Africa's ARPU of about R160 – 180.

Vodacom's strategy in a new market is to rollout a fairly comprehensive but "lean" network from inception. They follow an "adjusted SA model" in that similar business units

and structures are implemented and operated independently from Vodacom SA. All the Vodacom IP (Intellectual Property) and services such as "Customer Care" – once adjusted for the particular country, the legal framework and industrial law – is rolled out. The best and latest products, such as pre-paid roaming and corporate top-ups (which even South Africa does not have), are offered, and the newest equipment is installed for best reliability and adaptability.

Vodacom Congo has focused on voice communication products as the majority of its revenues are derived from voice communications, and data products are released more slowly or later (they are also generally more expensive.)

6.2 Model comparison

The conceptual model proposes to be useful to an operator in various spheres and therefore contains issues regarding fixed and mobile network access, such as internet, data networks and cellular applications. Vodacom Congo does however not offer all these services. It is predominantly a GSM network. Therefore the model can only test those aspects which do apply.

Some of the information obtained about Vodacom Congo is unfortunately not publishable. Specifically, some quantitative figures regarding average user airtime, total network usage, detailed revenue sources and projected revenues; certain aspects of the business strategy; and some detailed information about operations cannot be made public yet. That which is allowed is included in the evaluation and discussion below.

6.2.1 Results

Testing of the model is conducted by comparison of the model with the actual strategy. The results are the following:

1. *General strategy formulation and expression. Model's overall applicability to strategy and technological rollout.*

The rollout by a cellular network is currently based on the GSM standard. The standard was defined in 1987 through a widely-accepted Memoranda of Understanding, and consequently many operational and technical aspects of it have been optimised and problems resolved. Operational concerns during GSM rollout are therefore focused on logistics, reliability issues and distribution (of SIM cards to users, GSM masts / receivers, etc.)

The nature of the uncertainty therefore lies not with as much with detailed technology selections but rather with market demand characteristics. In a country that has experienced civil war and unrest for more than 5 years, the size and nature of the market is one of the biggest unknowns.

The Technology decision methodology therefore has a reduced influence or applicability in the overall framework, but still is important and the technology decisions as the network expands (e.g. by offering Wi Fi or similar) will possibly become important. Technology decisions were still made with regards to broadband transmission channels e.g. microwave or satellite, and future evolution decisions such as 2G, 2.5G or 3G network platforms. The issues contained in the "customer orientation / visibility circle" and "applications aspects" were however of more pertinence in this case.

In terms of the actual overall strategy expression, the development framework in chapter 4 does successfully encapsulate:

- The overall means of strategy formulation (framework enabling roadmap, figure 17) and expression (strategy application, figure 15, and customer orientation / visibility circle, figure 10), though obviously does not exactly replicate the precise methodology employed by Vodacom; and
- The identification and thrust of the high-level business, technology and marketing concepts. Vodacom Congo's focus on marketing and brand presence, voice communications, focus on customer retention and growth, easy access offered, intensive training of local personnel, maximisation of product diffusion, and

employment of creative local solutions, as described in the development framework, is particularly applicable.

The framework lacks adequate consideration of the following cellular business issues:

- Detailed explanation of sales and customer retention models, including issues such as churn rate and nature (i.e. soft and hard churn and the effect on the network).
- Recognition of constrained resources in the regulation / licensing sphere (i.e. frequency allocation).
- Acknowledgement of importance of models describing the management of the subscriber base

2. *Comparison of various qualitative levels and focal points of model with case study*

- *Technology decision methodology*

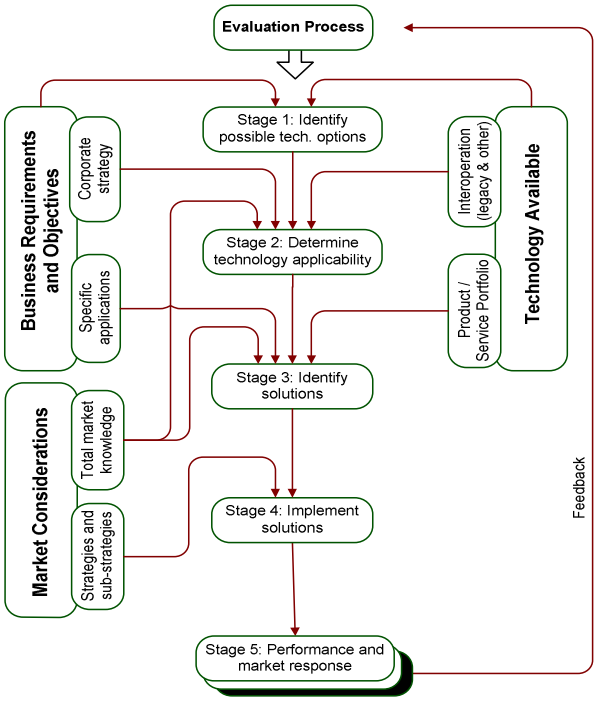

Figure 18: Technology decision methodology

The technology options in the cellular market are not as varied as in the fixed-access markets. GSM, GPRS (and EDGE, in the near future) technologies are the major standards which a cellular operator may consider using in various

arrangements and products. The decision methodology adequately describes the inputs and high-level decision-making process, but does not *specifically* mention the cost variances, licences and implications of implementation of new technology.

- *Aspects of strategy application*

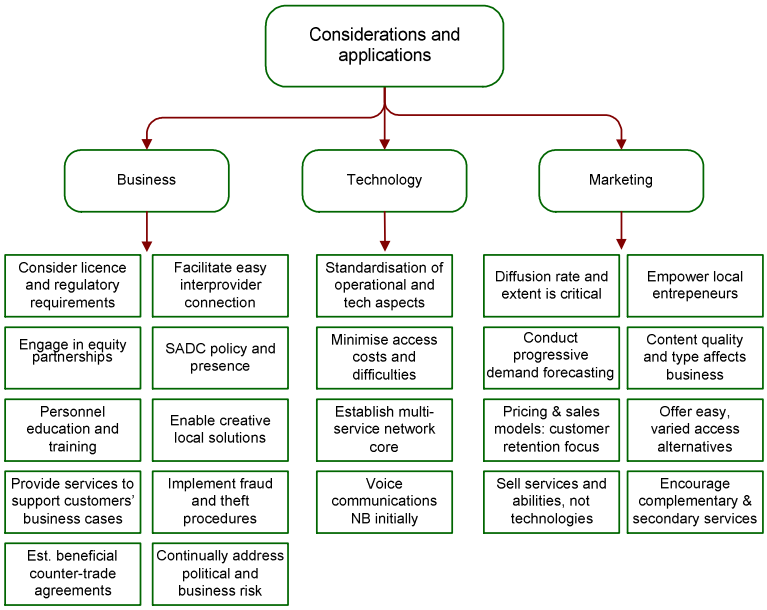

Figure 19: Aspects of strategy application

- *Business*
  - *Importance of interoperation and interconnection issues and management thereof*

    Interconnection agreements and provider interoperation as a legislated aspect of the business is important from a legal / regulatory perspective and a cost / revenue perspective. Attention in the DRC was focused on the interconnection regulations and aspects such as the international gateway (as allowed in the licence) as this affects revenue models and has implications on international and local connectivity structures.

  - *Licence conditions and the regulatory environment: importance; influence of the regulatory environment on behaviour*

Vodacom's licence agreement ends effectively in 2018. Vodacom entered the country through a joint venture with a company that already owned a licence, so the procedure obtaining it did not involve the government of regulator.

The conditions of the licence do not contain any forced rollout or stipulations for service provision.

The regulatory environment in the DRC is obviously important as an initial input in the business and regulatory tariffs affect pricing strategies, but the environment is not at all restrictive and doesn't in any meaningful way limit operational and profit opportunities for operators.

Since the country is suffering through a civil war and government is unstable, it is difficult to imagine an overly-regulated environment in the near future. Mobile operators are positioning themselves to address the most likely potential customers requiring telecommunications as it is and competing with other firms, so prices are not overly inflated.

- *Personnel education and skills training*

  Education of employees is acknowledged to be absolutely vital and a comprehensive programme of training and education of local personnel in all fields has been embarked upon.

  Vodacom Congo is, as mentioned, adopting a similar business model in the DRC as in South Africa, a maturing market. All business units and services available in South Africa are, within reason, being implemented in the DRC. Local employees are being trained to operate and manage these units independently from the South African office and its employees.

- *Enabling creative local solutions; utilising local knowledge*

  Local solutions are encouraged on a case-by-case basis. Vodacom offers various alternatives to local entrepreneurs who wish to act as vendors of airtime and to others, who for example act as mobile public phone booths. Ventures like "phoneshops" are being investigated.

  Local knowledge will be systematically obtained through employees and applied in operations as the venture matures. Cultural distance between the DRC and South Africa is not so great as to have caused problems thus far. The marketing campaigns have apparently been well received.

- *SADC policy and influence of the environment*

  It is unclear if or to what extent the SADC organisation had any influence in liberalising the DRC telecoms environment, or whether it advocated universal service access to the country when there was a monopoly.

  Since Vodacom was not involved at the beginning of the liberalisation phase, this did not affect its operations.

- *Equity partnerships*

  Vodacom has a local equity partner, previously known as Congolese Wireless Networks, which controls 49% of the enterprise.

- *Provide services to support customers' business cases*

  Vodacom Congo has focused on providing voice services and network coverage in as much of the country as possible. It has introduced products that make it easy to access the network (through various forms of pre-paid products and "top-up" services) and intends to introduce wide-spread electronic pre-paid services (where customers purchase airtime electronically or via their phones).

  It is introducing data services as required, mainly for future growth streams.

- *Implement fraud and theft procedures*

  Site physical security and procedures as in South Africa have been implemented across all network points and systems.

- *Establish beneficial counter-trade agreements*

  Vodacom has established counter-trade agreements; however details are not available for publishing.

- *Continually address political and business risks*

  The country risk in the DRC is extreme. Vodacom Congo is therefore especially aware of the political and business risks operating in the DRC.

  The telecoms business environment is for the moment relatively steady but aspects such as personnel safety, long-term political stability, network protection and business stability will be an issue for the foreseeable future.

- *Technology*
  - *Standardisation of operational and technological aspects*

    The widespread use of various accepted standards precluded potential major technological problems.

    Intercarrier agreements did not involve technological troubles. In this case, technological and operational standardisation minimised the potential interoperator problems.

  - *Focus initially on voice communications*

    Voice telecommunications is the focus of the business in the DRC for the moment. Data services, though possible on the networks, are not widely used or offered. It is expected that this will change over time.

- *Multi-service network core*

  The newest equipment and technology core was implemented in the DRC, to provide flexibility, adaptability and reliability, and also for future considerations.

  Vodacom is a mobile operator and so providing multiple services of various configurations is not part of their business. The capacity of core networks is however sufficient to enable broadband if required.

- *Minimise access costs and difficulties*

  A lean rollout, by which is meant the capacity and therefore quality of service offering is started at a low level until demand is proven. This serves to minimise the capital expenditure per user as far as possible at the initial rollout stage.

  However, security and especially long-lived power supplies have driven costs upwards. While sites are not yet expensive of taxed, the possibility of future expenses is admitted. EIAs are not required.

- *Marketing*
  - *Concentration on service diffusion rate and extent*

    The marketing and proliferation of the brand was a distinct feature of the DRC rollout. Vodacom is focused on increasing the number of users as fast as possible, as obtaining high a growth rate was a driver for moving into Africa, and has already captured 42% of the market. (The ARPU is relatively high per user, effectively translating into a solid EBITDA on average.) The rollout strategy – accepting a large capital investment (though low CAPEX per user) in order to allow access to all major areas as soon as possible – directly encourages this. See appendix A for the footprint as at May 2003.

- *Empower local entrepreneurs*

  Various entrepreneurial deals and discount structures are offered to interested entrepreneurs in order to promote and distribute the Vodacom SIM cards, top-up packages, brand name, etc.

- *Content quality and type affects business*

  As voice communications are the primary driver behind Vodacom's growth, content quality (i.e. data services) is not yet a major concern. However, quality of related products (see "complimentary products" below) is a consideration.

- *Sell abilities, not technologies*

  Vodacom is aware of not trying to sell a technology. Their product is "airtime", or time to communicate using a mobile phone. The promotion of simple structured incentives and packages of airtime to a country generally not concerned with involved technology issues is obviously important.

- *Demand forecasting*

  Demand forecasting was done, though the state of the country and economy meant it would its accuracy would be very limited. The "lean rollout" concept was therefore the real demand forecaster. Vodacom is analysing and adjusting accordingly the service as demand grows.

- *Easy, varied access alternatives*

  Products which are not even offered yet in mature markets like SA and which encourage purchase of airtime and easy access are offered in the DRC. Easy access has been (and is a necessary) focal point in a country experiencing civil war. Less than 5% of Vodacom Congo's customers are contract subscribers.

- *Complementary products and services encouraged*

  It is expected that complimentary products will further encourage growth, through the industry is still relatively new and has not yet spawned the

plethora of mobile phone-related products (secondary market products) as in SA or Europe. Vodacom is actively pursuing various complementary services and features however, as much of their pricing strategies depend on value added services.

- *Pricing strategies and sales models focused on customer retention*

  A generalised summary of Vodacom's pricing policy in the DRC is the following: the regulatory environment and interoperator tariffs (across international gateways and other providers' networks) provide ranges within which the calls are costed. The competition's pricing levels are also used as a benchmark. Vodacom chooses to compete on a product differentiation basis, by offering value-added services and quality connection and service levels. The pricing model then builds in all discounting structures and incentives available (see "enabling local solutions" and "empowering entrepreneurs") into the pricing structures to yield results.

  A major consideration in customer sales models is the retention of subscribers, the changing of providers referred to as churn. Churn in pre-paid products, because there are no real cost considerations to the user, is especially problematic. Churn refers to a customer changing either service providers (soft churn) or an operator's network (hard churn), the latter resulting in a decrease of the subscriber numbers. Focusing on offering a superior product (differentiation) is aimed at retaining customers.

- *Customer orientation / visibility circle*

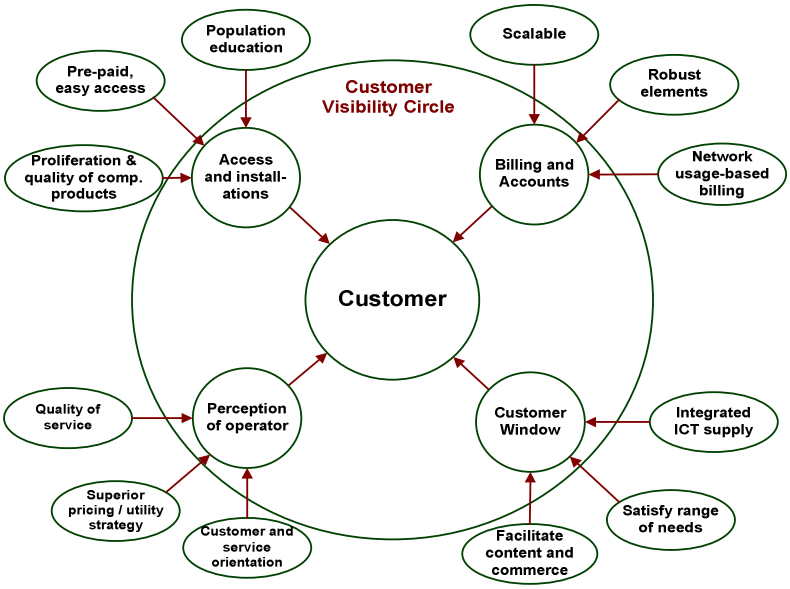

Figure 20: Customer orientation

- *Access and installations*

  Vodacom has rollout out extensive network coverage and facilitated extensive easy access products such as pre-paid cards and promotional access packages. This is definitely an important part of the strategy employed in the DRC.

- *Billing / accounts*

  The newest equipment and services result in maximum adaptability and flexible billing measurement techniques to be applied.

  The scalability and robustness of billing processes is an important factor in accounts in the DRC.

  Also, the level of dormant subscribers (people who have not recently used the network on a specific phone number) will decrease due to a policy change (after 3 months, down from 6, customers will be deleted from the system) resulting in a more efficient and cost-effective system.

- *Customer window*

  Vodacom is very aware of the revenue, service control and customer loyalty implications of the customer window concept, as displayed by the nature of its business and the facilitation of various offerings through their network.

- *Perception of operator*

  Vodacom embarked on a large marketing and promotions campaign in the DRC. It promoted as a competitive edge various aspects of the operation (value-added services and superior offerings), and as large part of pricing is based on superior brand perception, marketing is critical. Perception is difficult to quantify, however.

6.2.2 Summary

The relevance and usefulness of the framework is assessed by gauging the extent to which it successfully structures, orders and adds to important aspects of the case study's expansion process and whether it could be used as a template for expansion.

In this case study, the results show that the model:

- Successfully replicates and structures the initial business entrance mode and general description of the new business elements on a high level. It accurately describes the relative importance of various business, technological and marketing issues and inputs, and successfully identifies and describes marketing concepts and the customer orientation perspective to business design.
- Successfully addresses the specific geographic (country and context) requirements of a strategy.
- Expresses strategy in a satisfactory manner in that it does not omit elements, however the exact form of strategy expression in terms of the model's division into actors, methodology, domains and informational relationships is impossible to compare as the unavailability of such documentation precludes such a detailed comparison.
- Addresses aspects which will become relevant as the network develops, such as establishing a multi-service core for various future service features and the

importance of establishing a sustainable enterprise (through, for example, comprehensive local personnel training).

- Mentions most of the main descriptive characteristics of the case study, i.e. a customer orientation to business design; the importance of key marketing concepts (product diffusion, easy access facilitation and focus on customer retention); the consequence of inputs such as regulatory and licence conditions on the business model; the difficulties of African business and the way to deal with them (lack of market information, theft and fraud, regulatory concerns, importance of equity partnerships, counter-trade agreements, location of equipment suppliers, and interoperational difficulties) and the importance of the customer perception of the telco.
- Provides order and structure to the business.
- Identifies growth-points for the business.

The results suggest that the framework can be used as a general template for description of elements, processes and a checklist for issues which are particular to African operations. The various representations (figures 10 through 17) are applicable to the case studied (on a high level) and describe the general processes followed.

The actual methodology used in such a case is very likely to be different from the conceptual model proposed, however. On a more detailed level, where the actual technological and business architecture of a specific business (such as GSM rollout) is formulated, the conceptual model has limited usefulness other than to order and structure the business approach, provide an overview of the whole process and give graphic illustration to concepts (such as the visibility circle in figure 10 / 20.)

CHAPTER 7: CONCLUSIONS

The emerging markets in Southern Africa represent viable opportunities to various businesses, especially in the sphere of infrastructure development. Telecommunications infrastructure development is crucial to facilitate economic growth and an increasingly required service in the region, which has a history of a low penetration of telecoms services. Technological developments over the last 15 years however, especially in cellular technology, have enabled service access to many people.

Economic changes in African countries such as the de-monopolisation and liberalisation of key markets (such as telecommunications) over this same period have allowed foreign corporations into the markets and spurred development. Socio-economic and political organisations such as the SADC have provided support, encouragement and pressure for reform of these markets and an extent influenced the environmental changes.

With the existence of economic profit opportunities, a legitimate and accessible operating environment and demand for telecommunications development, telecoms companies have entered or will enter these countries. However, the lack of a clear structure guiding this entrance and further development is potentially damaging for the long-term economic and social development, with the costs and consequences passed to the customers. Therefore the formulation of an operator strategy framework or roadmap, which addresses all the issues pertinent to telecoms development in a Southern African country, is required to enable the economic success of that operator and therefore also benefit the recipients of a successful network rollout.

This dissertation therefore presents a logical methodology for telecoms operators (whether predominantly offering mobile- or fixed-access) to guide business development and formulate strategy specific to the SADC environment. The proposed development framework gives structure and organisation to various aspects – business requirements, technology choices and market decisions – of a telecoms business in Southern Africa. The total model mainly consists of 3 associated representations which fit logically in a fourth "enabling framework" (figure 17). Also in figure 17 is the strategy expression format

(which is described in more detail in figure 7) and the feedback elements which help to continuously guide the strategy direction.

Central to the framework is a technology decision methodology (figure 16), structuring and aligning the technology decisions with business and market conditions, and guiding the evolution toward a flexible and multi-service (NGN) network core whilst preserving existing investment and smoothing interoperation of elements. Subordination of technological choices to business requirements and the needs of customers are central to the framework.

A customer orientation to business and process design is also important. This is expressed through figure 10, the "customer orientation" illustration. This figure also describes those elements of the telco which are most visible to the customer and which will form the basis of the customer's perception of the company. These visible aspects are then distilled into the constituent components of the operator's network and thereby allow the operator to focus on improving the perception.

Further business, technology and marketing considerations and strategy application areas are summarised in figure 15, considerations and applications. This graphic loosely divides various critical issues identified in the research into business, technology and marketing channels, and provides strategy direction for these issues.

The aim of this dissertation was to "develop a clearly defined framework through which a strategy organising and structuring the various stages and processes involved in a modern telecommunications network in a country or area in the SADC can be mapped".

Through the total conceptual framework presented in chapter 4, the result of the development of various converging themes, the dissertation achieves this aim.

The objectives were to prove that the framework is both valid and useful by:

1. comparing it with existing case studies and determining whether the framework successfully replicates and orders the necessary elements involved in new telecoms business in Southern Africa
2. determining whether the framework adds to or could have enhanced the actual strategy employed in the case study

The model was compared with the case study of the launch of a mobile network in the Democratic Republic of Congo, or DRC, by Vodacom SA. (The initiative is referred to as Vodacom Congo.) The model was compared on two main levels:

1. General strategy formulation and expression. Model's overall applicability to strategy and technological rollout; and
2. Comparison of various aspects and focal points of model with case study. The "various aspects" referred to are summarised by figures 10, 15 and 16.

From the results presented in chapter 6, it is clear the model successfully achieves the first objective of identifying, replicating, ordering and structuring the necessary elements of initiating a telecommunications business in Southern Africa.

The second objective describes the possible improvement or enhancement the framework offers by virtue of its structure, concepts or specific format. The model is addresses high-level strategy and is fairly generic (i.e. does not aim to distinguish between fixed- and mobile-access, for example) and therefore it addresses certain aspects which the case study did not (e.g. content provision such as Internet services and corporate data services provision). It does therefore identify growth areas and further aspects on which the operator can focus in the future. The framework could be used as a template identifying and orientating further growth, and providing a framework within which the growth should be evolved in the company, but not to a very detailed level.

The development framework does therefore achieve the goal and first objective on a high level. The second objective is satisfied to some extent, but because the framework is conceptual and fairly generic, only does so to a limited degree. The real usefulness of the framework is therefore in identifying, ordering, structuring and guiding the overall concept and methodology of strategy formulation of Southern African telecoms. It provides a

means of directing and understanding important parts of the business in a clear and logical manner. It also succeeds in applying and adapting the general concepts to the local environment, as well as and identifying and dealing with issues particular to the Southern African region.

By acknowledging the significance of, and then addressing the issues specific to operating in the SADC, and focusing on the operations within an interoperator, multi-provider context with interactions across the value chain, the model encapsulates and expresses all aspects of the roadmap formulation process.

CHAPTER 8: RECOMMENDATIONS

While the goal and objectives of this dissertation are achieved, the framework and concepts contained within are positioned at a high-level, describing mainly conceptual business, technology and market structures and concepts. Although the development framework achieves this quite well, a further more-detailed level is recommended.

The framework is necessarily generalised, and in some respects this undermines and reduces the direct applicability of the framework to a telecommunications business, which is usually highly complex.

There is therefore need for a further detailed level of research into specific aspects of the framework. These can be:

- Particular technology rollout strategies in certain homogenous markets, taking into account the specific characteristics of that technology and the specific market, e.g. core IP rollout in urban centres; metro Ethernet in urban centres of the SADC; converged corporate networks
- Growth points in mobile networks, e.g. mobile data use especially with respect to corporate clients; value-added services; location tracking
- A more specific technology decision methodology, taking into account expert decision systems or the financial impacts of certain technologies
- More attention to the evolution of existing network technologies (legacy technologies) in the area to a multi-service NGN

Weaknesses in the models, which the framework does not fully address and that could be further researched, are:

- Detailed models describing the rate and characteristics of product diffusion of telecoms products in Africa
- Alternative demand forecasting techniques where little market information exists
- A detailed risk analysis of some of the identified risks and how these can be reduced, e.g. theft and fraud of network airtime, equipment and subscriber contracts
- Entry mode choices and how these affect the business operation

An area which hampered this research was the access to and availability of quality case study information.

Telecommunications companies are rather protective of strategy, market information, detailed performance characteristics and especially pricing and sales models, especially if the initiative is relatively new. This makes research very difficult. A “catch 22” situation may also result in that if a researcher has access to information by virtue of working in a company whose business involves the subject matter, he/she cannot publish it since it was obtained while in the employ of that company and thus confidential, and if the researcher is not in the employ of such a company then access to meaningful information, especially potentially sensitive subjects, is difficult to come across.

So then while research into a field such as pricing models which will best suit a particular technology in a certain market would be very interesting, it is the opinion of the author that this will be particularly difficult to carry out with any real accuracy or application (not to mention that in this case the models will probably reveal more about company-specific policies than market characteristics.)

BIBLIOGRAPHY

Afullo, T.J.O. (1999) *Telecommunication and information infrastructures in the Botswana and SADC development strategy*. Internet Research: Electronic Networking Applications and Policy, Vol. 9 No. 4 pg 287-296

Achterberg, R., Hanrahan, H. E., (2001) *Mapping business and technological factors in convergence*, IEEE 2001

Amin, S (1997) *Capitalism in the age of globalisation: the management of contemporary society*. Zed Books, London.

Barendse, A. (2003) *Innovative regulatory and policy initiatives at increasing ICT connectivity in South Africa*, Telematics and Informatics.

Barnes, F. (1998) *Regulating telecommunications*. Competition in regulated industries. Oxford University Press, Oxford

Borés, C., Saurina, C., Torres, R. (2001) *Technological convergence: a strategic perspective*. Technovation Vol. 21 pg. 112-120

European Commission (1997) in Borés, C., Saurina, C., Torres, R. (2001) *Technological convergence: a strategic perspective*. Technovation Vol. 21 pg. 112-120

Foster, R.N. (1988) *Timing technological transitions.* In: Thusman, M.L., Moore, W.L. (Eds.), Readings in the Management of Inn. Harper Business

Gronroos, C. (1999) *International Strategies for services.* Journal of Services Marketing. 13 (4/5), pg. 290 – 297

Grant, R.M., (1995) *Ventaja competitiva en sectores intensivos en tecnología y la gestión del conocimiento.* Dirección Estratégica: Conceptos, Técnicas y Aplicaciones. Cívitas In: Borés, C., Saurina, C., Torres, R. (2001) Technovation Vol. 21 pg. 112-120

Gullish, J. (1999) *The origins and objectives of the Telecommunications Regulator's Association of Southern Africa*, PriceWaterhouseCoopers, Fairfax, VA.

Gwartney, J., Stroup, R., Sobel, R. (2000) Economics: Private and Public Choice, 9th Ed. Dryden

Helm, D., Jenkinson, T. (1998). *Introducing competition into regulated areas.* Competition in regulated industries. Oxford University Press, Oxford

Henten, A., Falch, M., Anyimadu, A. (2003) *Telecommunications development in Africa: filling the gap*, Telematics and Informatics 2003

Hossain, L. (2003) *Is a formalised structure a necessary prerequisite for implementing national telecommunications plan in developing and developed economies?* Technovation Vol. 23 pg. 39-49

Hodge, J (2000) *Liberalising communication services in South Africa.* Development Southern Africa 17(3) pg. 373-388.

International Bank for Reconstruction and Development (1998) Telecommunications Policy Document, http://www.worldbank.com

International Telecommunications Union (2003) www.itu.org (Accessed 15 May 2003).

ITU (1995) *World Telecommunication Development Report: Information Infrastructures*, Geneva, 1995

Joskow, P. (1998) *Regulatory priorities for reforming infrastructure in developing countries.* Paper prepared for the annual World Bank conference on development economics.

Katz, M., Shapiro, C. (1985) *Network externalities, competition and compatibility.* American Economic Review 75, pg. 424–440

Kekana, N. (2002) *Information, communication and transformation: a South African perspective*. Communication, Vol. 28 No. 2 pg. 54-61.

Khalil, T. (2000) Management of Technology: The key to competitiveness and wealth. International Edition. McGraw-Hill, Singapore

Kogut, B., Singh, H. (1988). *The effect of national culture on the choice of entry mode.* Journal of International Business Studies, 19, pg. 411-432

Levy, B., Spiller, P.T. (1994) *The institutional foundations of regulatory commitment: A comparative analysis of telecommunications regulation.* The Journal of Law, Economics and Organisation Vol. 10 no. 2 pg. 201–246

Makhaya, G., Roberts, S. (2003) *Telecommunications in developing countries: reflections from a South African experience.* Telecommunications Policy Vol. 27 pg. 41

McCormick, P.K. (2003) *Telecommunication reform in Southern Africa: the role of the Southern African Development Community.* Telecommunications Policy Vol. 27 pg. 95-108.

Moore, J.F., Koprince, S., (1999) *A digital television ecosystem: the battle to shape the future.* The Economics, Technology and Content of Digital TV, Kluwer Academic Publishers, Dordrecht

Nzo, A (1999) *SADC in the next Millennium: The opportunities and challenges of information technology*. Proceedings of the SADC consultative conference, Lusaka, Zambia

Owen, B. (1999) *The Internet Challenge to Television*, Harvard University Press, Cambridge, MA

Pieterse, H.L., Pretorius, M.W., (2002) *A model for telecommunications transfer and diffusion into the rural areas of Southern Africa*, South African Journal of Industrial Engineering Vol. 13 No. 1

SADC (1998) Transport and Communications Report. Maputo, Mozambique.

SATCC-TU (Southern Africa Transport and Telecommunications Commission Technical Unit) (1998) *SADC protocol on transport, telecommunications and meteorology*. Maputo, Mozambique

Samarajiva, R. (2000). *The role of competition in institutional reform of telecommunications: Lessons from Sri Lanka*. Telecommunications Policy 24, pg. 699–717

Saunders, J., Warford, J., Wellenius, B. (1994) *Telecommunications & Economic Development*, John Hopkins University Press, Baltimore

Shanklin, W., Ryans J., (1988) *Organizing for high-tech marketing.* In: Tushman, M.L., Moore, W.L. (Eds.), Readings in the Management of Innovation, 2nd Ed. Harper Business

Southern African Development Community (1993) *A framework and strategy for building the community*. Gaborone, Botswana.

Spiller, P.T., Cardilli, C.G. (1997) *The frontier of telecommunications deregulation: Small countries leading the pack.* Journal of Economic Perspectives Vol 11 no.4 pg. 127–138.

Torngren, J. (1998) *MoU success stories: interoperability in telecommunications within a competitive, multiprovider, multicultural environment.* Computer Standards & Interfaces, Volume 20, Issues 2-3, December, pg. 135-139.

Wellenius, B. (1997). *Extending telecommunications service to rural areas—the Chilean experience.* Note No.105, World Bank

World Economic Forum website (2003) *Global competitiveness Report*, www.weforum.org (Accessed 25 June 2003.)

APPENDIX A

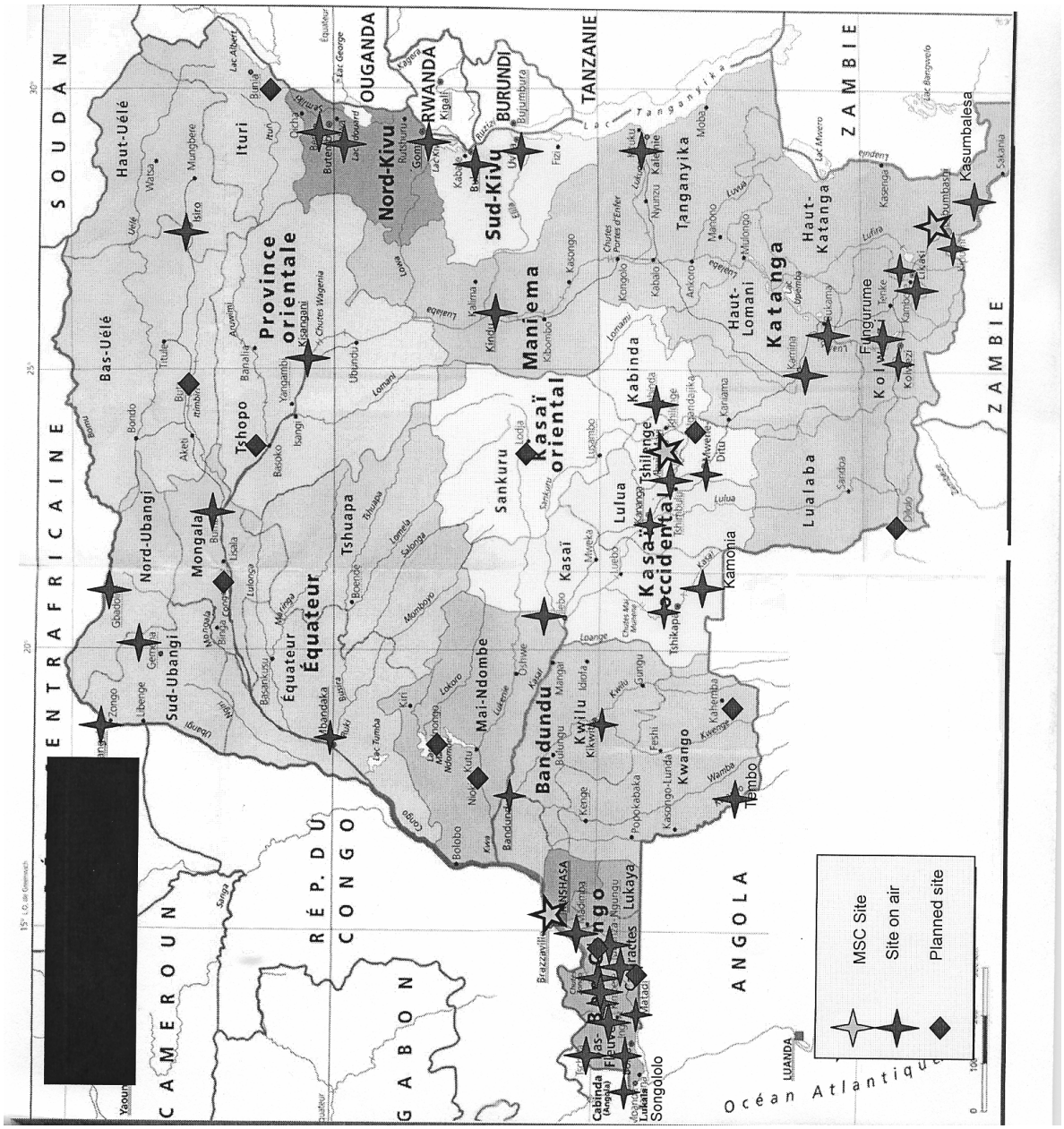

Figure 21: Vodacom's footprint in the DRC. May 2003.

Source: Vodacom communications