A Strategic Business Model for the Introduction of Mobile Data Services in an Emerging Economy – The Case of the South African Market

by

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Submitted as partial fulfilment of the

requirements for the degree

MSc. (Technology Management)

in the

FACULTY OF ENGINEERING, THE BUILT ENVIRONMENT

AND INFORMATION TECHNOLOGY

UNIVERSITY OF PRETORIA

PRETORIA

November 2004

DISSERTATION SUMMARY

A Strategic Business Model for the Introduction of Mobile Data Services in an Emerging Economy – Focus on the South African Market

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This dissertation investigates the critical success factors behind the successful introduction of Mobile Data Services to the South African market. An evaluation of the history of telecommunications found that progress in the global telecommunications industry has been characterised by innovation in technological hardware, followed by innovation in policies. Such innovation mainly contributed to the development of voice services in the mobile telecommunications industry. Wireless technology is no longer simply an extension of fixed line voice communication, but a mature independent technology. This maturity is also reflected by the declining state of revenues generated by voice services. Market incumbents expect data services to provide increased revenues.

The current wireless industry business value chain is evolving and becoming more complex due to new incumbents in the market and new relationships that are formed between new and existing incumbents. Although a new structured value chain is presented, reality indicates a diffusion of functions within the value chain.

The study has identified a number of the Critical Success Factors, which will be required to facilitate the introduction of Mobile Data Services to the South African market. Central to

determining these Critical Success Factors is the design of a structured framework or model, which allows for this. The basic elements of this model are constructed from core concepts in the market, which became elevated during the literature study and industry survey. The model demonstrates the need to integrate the various components into a single coherent strategy, which is imperative for determining the Critical Success Factors.

SAMEVATTING VAN VERHANDELING

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deur

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Hierdie verhandeling ondersoek die kritiese faktore vir die suksesvolle bekendstelling van Mobiele Datadienste in die Suid Afrikaanse mark. 'n Ondersoek na die geskiedenis van telekommunikasie het bevind dat vooruitgang in die wêreldmark van telekomunikasie gekenmerk is deur tegnologiese innovasie in hardeware, gevolg deur innovasie in beleid. Hierdie innovasie het hoofsaaklik bygedra tot die ontwikkeling van stemdienste in die mobiele telekomunikasie industrie. Draadvrye tegnologie is nie net meer 'n verlenging van vaste lyn stemkomunikasie nie, maar is 'n onafhanklike tegnologie. Hierdie volwassenheid word ook weerspieel in die vlak van inkomste wat gegenereer woor uit stemdienste. Die mark deelnemers verwag van datadienste om die dalende vlak van inkomste te stabiliseer en uiteindelik te verhoog .

Die besigheidswaardeketting van die huidige draadvrye industrie is besig om te verander en word meer kompleks as gevolg van nuwe deelnemers wat tot die mark toetree asook nuwe verhoudinge wat geskep word tussen nuwe en bestaande deelnemers. Alhoewel 'n nuwe gestruktueerde waardeketting ontwikkel is, bestaan so 'n waardeketting in die praktyk as 'n diffusie van funksies in die waardeketting.

Dié navorsing het sekere Krietiese Faktore vir Sukses aangedui wat in ag geneem moet word om te verseker dat Mobiele Datadienste met sukses in die Suid Afrikaanse mark ingestel kan word. Die middelpunt van die identifisering van die Kritiese Faktore vir Sukses is die ontwikkeling van ‘n gestruktueerde raamwerk of model. Die elemente van so ‘n model bestaan uit basiese beginsels in die mark soos bepaal deur ‘n literatuur studie en ‘n industrieopname. Die model dui aan dat sekere komponente geïntegreer moet word in een samehangende strategie wat van uiterste belang is vir die bepaling van die Kritiese Faktore vir Sukses.

Acknowledgements

I wish to express my gratitude to people who through their contributions made this dissertation possible.

Thank you Elmine for all you patience and love. Thank you to my parents who always believed in me and supported me throughout my studies.

Additionally I would like to acknowledge the contributions of the following people:

Jan Liebenberg, for his thorough reviews of draft chapters and Greg Cress, for his help in the setup of the survey. Prof. M.O. Kachieng'a, for his reviews and provision of theoretical guidance during the research.

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Glossary of Terms and Abbreviations

Terms

1G	First Generation Mobile Network
2G	Second Generation Mobile Network
2.5G	Advanced Second Generation Mobile Network
3G	Third Generation Mobile Network
4G	Fourth Generation Mobile Network
5Ms	Tool to determine probability of success of a particular mobile data service against the following criteria: Movement, Moment, Me, Money, Machines
Access Focussed	Concentrating mainly on providing access to the Internet, used in context of a Mobile ISP business model
Bit-pipe strategy	A strategy whereby the Mobile Network Operators only concentrates on providing network access and no mobile data services.
Churn	Churn represents the loss of an existing customer to a competitor. Churn rate provides insight into the growth or decline of the subscriber base as well as the average length of participation in the service.
Content Aggregator	A content aggregator could perform the function recognized today as a mobile portal. The key function of the content aggregator will be to package and offer services from one or several content providers [68].
Content Provider	The role of the content provider is to provide services (“content” or applications) that add value to access and transport services. Value added services can be produced by the content provider or purchased from others [68].
Fixed Network Operator	An operator that maintains a telecommunications network where the subscriber equipment is physically connected to the rest of the network.
GINI Coefficient	A measure that is used to determine the spread of wealth across the population of a country. The Gini coefficient was developed to measure the degree of concentration (inequality) of a variable in a distribution of its elements. It compares the Lorenz curve of a ranked empirical distribution with the line of perfect equality. This line assumes that each element has the same contribution to the total summation of the values of a variable. The Gini coefficient ranges between 0, where there is no concentration (perfect equality), and 1 where there is total concentration (perfect inequality).
Horizontal Integration	In context of an industry: Companies located lower in the value chain supply technology to different companies higher in the value chain.
i-Mode	Low speed packet switched protocol offered by the Japanese operator, NTT DoCoMo
Killer Application	A single application that will, according to market expectation, be the most popular amongst users and generate significant revenue for network operators.

Mobile Data Services	Mobile Data Services is an umbrella term that refers to a vast collection of innovative value-added services. These services are offered to mobile subscribers and can be accessed by various devices such as mobile phones, Personal Digital Assistants, Laptop computers and even autonomous devices employing telemetry services.
Mobile Network Operator	An operator that maintains a telecommunications network where the subscriber equipment is connected to the rest of the network by means of a radio link. Subscribers are free to seamlessly roam in the coverage area of the network.
Mobile Portal	A Mobile Portal is an entry point to a wealth of information and value added services. Portals can be personalised and are Internet/Intranet-based with browser user interfaces. Portals will deliver content according to the device's characteristics and user's needs. [67].
Mobile Internet Service Provider	This provider extends the functionality of the traditional Internet Service Provider through the added component of mobility in access to the Internet.
Multi-band	Being able (e.g. Mobile Terminal) to operate in different bandwidths within the same technology.
Multi-mode	Being able (e.g. Mobile Terminal) to operate in different modes such as GSM, UMTS, CDMA.
NO	The network operator is the party that establishes and maintains the mobile network infrastructure. The key function of the network operator is to provide access and transport services [68].
Portal	An entry point to a wealth of information and value added services. Portals can be personalised and are Internet/Intranet-based with browser user interfaces. Portals will deliver content according to the device's characteristics and user's needs [66].
Portal Focussed	Following a Mobile Portal approach.
Teledensity	A measure of the penetration of telecommunication in a certain area. Expressed in the number of telephones available per one hundred people.
Telematics	The combination of telecommunications and computing. Data communications between systems and devices.
Universal Service	Also referred to the policy of Universality, these are policies focused on providing individual household connections to the public telecommunication network
Value Clustering	Value Clustering happens when a company seizes an opportunity in the market by employing a company strength. The company might however have a weakness in the specific area where a strength is required. The company then utilizes the strength of another company (in the specific area) through collaboration in order to seize the opportunity.
Vertical Integration	In context of an industry: A single company owns the majority of companies lower in the value chain from where technology is supplied.
WiFi	A technology similar to Wireless LAN but operating at a higher data rate. IEEE standard 802.11b contains the WiFi specifications.

Abbreviations

AMPS	Advanced Mobile Phone Service
AOL	America On Line
ARPU	Average Revenue Per User
ASP	Application Service Provider
CA	Content Aggregator
CAPEX	Capital Expenditure
CDMA	Code Divisional Multiple Access
CEPT	Confèrence de Administrations Europèenes des Postes et Tèlècommunications
CIA	Central Intelligence Agency
CIT	Customised Infotainment
CP	Content Provider
CSD	Circuit Switched Data
CSF	Critical Success Factor
DSL	Digital Subscriber Line
EC	European Commission
EDGE	Enhanced Data Rated for Global Evolution
ETSI	European Telecommunication Standards Institute
FM	Frequency Modulated
FNO	Fixed Network Operator
GDP	Gross Domestic Product
GIS	Geographic Information System
GMPCS	Policy Direction On Global Mobile Personal Communications By Satellite
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communication
HSCSD	High Speed Circuit Switched Data
IBA	Independent Broadcasting Authority
ICASA	Independent Communications Authority of South Africa
IMTS	Improved Mobile Telephone System
IP	Internet Protocol
ISP	Internet Service Provider
ITA	Interim Type Approval
ITU	International Telecommunications Union
IVR	Integrated Voice Response
JTACS	Japanese Total Access Communications
LBS	Location Based Services

MDS	Mobile Data Services
MDSP	Mobile Data Service Provider
MIA	Mobile Internet Access
MIEA	Mobile Intranet / Extranet Access
MISP	Mobile Internet Service Provider
MMS	Multimedia Messaging Service
MNO	Mobile Network Operator
MoU	Memorandum of Understanding
MP	Mobile Portal
MSP	Mobile Service Provider
MVNO	Mobile Virtual Network Operator
NO	Network Operator
NMT	Nordic Mobile Telephone
PDC	Personal Digital Cellular
PoC	Push-to-Talk over Cellular
QoS	Quality of Service
RIV	Rich Voice
SATRA	South African Telecommunications Regulatory Authority
SMS	Short Message Service
SNO	Second Network Operator
TACS	Total Access Communication System
TDMA	Time Divisional Multiple Access
UHF	Ultra High Frequency
UMTS	Universal Mobile Telephone System
US	Unites States of America
USSD	Unstructured Supplementary Service Data
VAN	Value Added Network
VHF	Very High Frequency
VoIP	Voice over Internet Protocol
WAP	Wireless Application Protocol
WASP	Wireless Application Service Provider
WIA	Wireline Internet Access
xDSL	Refers collectively to all types of digital subscriber lines, the two main categories being ADSL and SDSL. ADSL → Asymmetric Digital Subscriber Line SDSL → Symmetric Digital Subscriber Line

1 Introduction

1.1 An Overview of the Telecommunications Industry

1.1.1 Telecommunications Industry Internationally

The modern mobile communications industry is a relatively new part of the telecommunications sector which was conceived in the early eighties. This industry seems to go through a paradigm shift every 10 years [75]. Each shift is characterised by technologies known as first, second and third generation systems. Modern mobile cellular networks as we know them today are known as a second-generation system. The technology which enabled the start of digital cellular networks in the second-generation networks is known as the Global System for Mobile Communications (GSM). Europe pioneered this new technology in the eighties by setting up standard generating bodies which would allow the mobile industry to focus their technology development effort based on a single standard. Since the early stages, the global mobile industry has shown tremendous growth until the present day. Table 1 summarises the recent most relevant statistics.

Total Global Mobile Users (all generations)	1.3 billion
Total Analogue Users	34m
Total US Mobile users	140m
Total Global GSM users	787m
Total Global CDMA Users	159m
Total TDMA users	120m
Total European users	320m
Total African users	39m
Total 3G users	130m
SMS Sent Globally 4Q02	95 billion
SMS Sent Globally in 2002	366 billion
GSM Countries on Air	190

Table 1: Summary of global mobile statistics at the start of 2003 [54, 17]

The start of the new millennium marked another paradigm shift towards third generation networks. This shift has, however, not been as swift as the change from first

to second generation networks. Discrepancies in standards and problems in the delivery of hardware and software are some of the causes for inertia.

1.1.2 Telecommunications Industry in South Africa

In South Africa, two operators currently dominate the market. These are Vodacom and MTN, which operate in the GSM 900 Mhz band. Both networks were launched in 1994. A licence was awarded in June 2001 to the Cell C Consortium for operation in the GSM 900 and 1800 Mhz bands. Almost 9000 new subscribers are signed up every day to all networks of which 90% are prepaid connections. The current market size of almost 14 million users has a potential to grow to 19 million users in 2006. Vodacom currently (03/2003) has about 55%, MTN 37% and CellC 8% of the total subscribers [54].

The South African market is currently worth R23 billion and it is expected to grow to approximately R45 billion by the end of 2004 [54]. It is difficult to exactly determine the global market worth in monetary terms. It is, however, possible to form a general idea of the total size in relation to that of South Africa. If one considers the number of local users and the local market worth in relation to the number of users in the global market, some idea can be formed regarding the region of global worth which is in the order of trillions of US dollars.

The size of both the local and the global market indicates the revenue potential which a new product could generate. The right product at the right time and place could be most profitable. A fact that is not so obvious from the statistics, is the level of risk involved in the introduction of a new product. There is very little guarantee that users will actually find a new gadget or service useful. Needs for the latest products might not even exist yet. In other words, technology might be too far ahead of the needs of users.

1.2 Research Problem

The natural evolution in the development of Fixed Line Operators was the inclusion of the concept of mobility into telecommunication. This led to the birth of Mobile Network Operators (MNOs). The feature of mobility in telecommunication proved to be a great success and brought significant profits to shareholders of MNOs. True to the nature of its origin, MNOs focused their attention on delivering voice services to subscribers. The problem is that the profits of MNOs are now slowly being eroded by ever decreasing levels of Average Revenue Per User (ARPU). The industry expects that this loss in revenue will be reversed by the introduction of Mobile Data Services (MDS), which focus on the delivery of various data services. The industry and more specifically, MNOs are faced with uncertainty in the introduction of a new technology, which is very different to their current area of expertise and experience. The marketing problems of early MDS such as Wireless Application Protocol (WAP) serve as a good example that by introducing the latest technology and services into a market does not guarantee the success thereof [38]. Such uncertainty poses a conflict since, revenue can only be increased by implementing new technology. It follows that, high levels of uncertainty coupled with the fact that technology by itself does not guarantee success, presents a problem to all stakeholders when contemplating the introduction of MDS. Consequently, a strategic business model is required which would maximise the probability of success when introducing MDS into the market. This model would reduce uncertainty by means of analysing market conditions and any other prerequisite conditions, resulting in a more accurate indication as to the probable outcome. In order to focus the research, the problem statement is refined in the form of a research question: "***What are the critical success factors for introducing Mobile Data Services in the South African mobile telecommunications market?***" The business model should facilitate the identification of the critical success factors of the South African market.

1.3 Significance of Research

Telecommunications provide a vehicle for economic growth. This is confirmed by PriceWaterhouseCoopers [49] when stating that: "*Without telecommunications, global commerce grinds to a stop*." The ability of companies to identify and manage emerging technologies and services is essential for survival and growth in an increasingly competitive marketplace [16].

This study endeavours to develop a business model to facilitate the management of the introduction of Mobile Data Services (MDS) in South Africa. Results of such a study will be beneficial to all stakeholders within the Telecommunications sector in South Africa with regard to providing some guidelines towards MDS implementation. Such stakeholders could include Government, Regulatory Bodies, Mobile Network Operators and Value Added Network Providers. The successful introduction of MDS has the potential to generate growth and prosperity in the Telecommunications sector and thus in the country.

On a more global scale, the conceptual framework presented by the model could be used to identify the main revenue drivers for the industry. Certain services will be more suitable for introduction into certain markets due to specific reasons pertaining to the service and the market. An example of this would be the Mobile Intranet / Extranet Access service to be used by Corporate Markets. Corporate clients might need mobility of their workforce outside the normal work place, but still need to have their Intranet available to the workforce. The suitability of services is, however, not always obvious and will require an in depth business analysis. The model will provide a structured method for conducting such an analysis. It should also be possible to develop a roadmap for the introduction of new services by applying "What-If" scenarios as input to the model. The aforementioned factors can provide company management with tools to make better business decisions.

1.4 Research Objectives

The main objective is to create a strategic business model for introducing MDS into the South African mobile market. This research will elevate various technological components and combine them in a way as to form a market focused strategic business model which could facilitate the generation of a revenue stream for Mobile Data Services.

Aspects to be considered in reaching this objective are:

- Stakeholders
- New and current technology in markets
- Relationships between stakeholders and technology
- Creating competitive advantage within markets

A further objective is to gather primary data from the South African mobile market which can support the creation of the model. The final objective is to come to conclusions and practical recommendations based on the research which can be utilised by the mobile industry to expand the local mobile market in terms of Mobile Data Services.

1.5 Research Methodology

The method of research is non-empirical model building using deductive reasoning. Empirical data sourced from the industry in the form of core attributes will be analysed and utilised to create the model. Furthermore, quantitative data in the form of an industry survey will be applied to strengthen the quality of information used to build the model. Finally, qualitative data in the form of interviews with industry experts will be used to verify the result of the combination of empirical and quantitative data.

2 Overview of the Telecommunications Industry

2.1 Historical Development of Telecommunications

The historical development of telecommunications is explored with a discourse on the major milestones in the history of this industry.

The basis for wireless telecommunications was established when electromagnetism was discovered in 1820 by the Danish physicist, Christian Oersted. This set the scene for the development of electrical power and communication. One year later this experiment was reversed by Michael Faraday and in doing so, induction was discovered. The first practical electrical signal was transmitted in 1830 by Joseph Henry, which enabled Samuel Morse to invent the first practical telegraph in 1837 [74].

Progress in this area of telecommunication was slow following this discovery as inventors and developers focused their attention initially on wireline telegraphy. The development effort in this direction eventually culminated in the invention of the telephone by Alexander Graham Bell in the late 1870s. A paper published in 1864 by Maxwell called “Dynamical Theory of the Electromagnetic Field” concluded that light, electricity and magnetism travelled in waves. This realisation brought new interest to the field of telecommunications and led to the eventual communication via wireless signals. Heinrich Hertz, however, only achieved the actual production and detection of radio waves in 1880. Marconi was able to transmit radio signals across the Atlantic Ocean in 1901. Up to this point in time, radio was limited to telegraph codes. This fact changed in 1906 when Reginald Fessenden transmitted human speech across a distance of 11 miles. This was an important milestone, which marked the beginning of the age of voice transmission [74].

The first car telephone appeared in 1910. The need that was fulfilled in this instance was the ability to travel but still being able to communicate with external sources. Although it did not involve wireless communication, it did introduce the concept of mobility. The need for external sources to reach people on the move became an

important goal to attain. In 1921, the Detroit police department started using the first land mobile radio telephone systems in their police cars [74].

The event of World War II resulted in intensive radio research and development for military purposes. Some of the notable results of these efforts were the first portable FM two-way radio, the "walkie-talkie" backpack radio and RADAR. Another product of the war was circuit boards, which became commercially available in 1946. Despite advances in this field, most radios during the 1940s and 1950s still relied on tubes for functionality [74].

DH Ring first recorded the concept of cellular systems in 1947 in a Bell Labs Technical Memorandum. Progress in this area in the United States (US) was hampered by tardiness of regulatory bodies to provide sufficient bandwidth. Additionally, inefficient radios resulted in wastage of bandwidth. One year later, another one of the major milestones in this industry was reached when scientists at Bell Laboratories unveiled the transistor. This achievement would revolutionise the industry as the era of miniaturised low drain radios was entered. In 1954, Texas Instruments extended this achievement by commercially producing silicon transistors. These devices allowed for lower operating temperatures with higher power output, which meant further miniaturisation of electronics. Another invention by Texas Instruments in 1958 was the integrated circuit. This was another achievement that extended the aforementioned advantages. The following ten years were spent on convincing the regulatory body in the US to grant more bandwidth for radiotelephones. This request was only granted in 1968. The industry in Japan had similar problems. Only government and large institutions could use mobile telephone systems due to limited bandwidth. The demand for such services in the public domain increased at a rapid pace [74].

Bell Systems introduced the Improved Mobile Telephone System (IMTS) in 1964 as a replacement of the Mobile Telephone System. The significance of IMTS was that it allowed full duplex, which meant that no button had to be pressed to enable communication. It now had the same characteristic as a normal fixed line phone where

conversation went back and forth effortlessly. In Europe, Nokia was established in 1967 by the merger of the Finnish Rubber and Cable Works companies. The combination of resources in later studies enabled the company to developed digital landline switches. This technology would later prove to be one of the cornerstones of modern mobile systems. Additionally, favourable market conditions set the scene for the development of digital technology. Creativity and competitiveness was fuelled by the fact that the Post, Telephone and Telegraph Administration whch was run by the Finnish government was not obliged to buy equipment from a single supplier [74].

Scientific studies also contributed to the progress of commercial cellular systems. One example is that of Okumura's "Field Strength and its Variability in VHF and UHF Land Mobile Service." This study enabled the prediction of frequency propagation characteristics in urban areas for cellular systems. The computerised versions of such characteristics are until the present day an indispensable tool in the design of cellular systems [74].

During the 1870s, Bell in the United States of America decided not to sell telephone instruments, but to lease them to network operators. This practice continued until the 1970s. Tanenbaum states that the "*…decision to sell service rather than hardware was a key element in the technological development of telephony.*" He qualifies this by further arguing that this decision "*…helped set the future direction by making the telephone company the owner and operator of all the hardware, end-to-end. The telephone company was, therefore, highly motivated to advance the state-of-the-art as effectively as possible, and to make equipment more efficient, more reliable, and less costly to own and operate.*" [58]. Innovation in hardware continued in 1971 when Intel unveiled the 4004 microprocessor. In 1973 Cooper, an employee of Motorola, made a telephone call on the first working prototype of a cellular phone. Although no commercial licences existed, the regulatory body in the US released another 115 MHz of bandwidth for cellular phone use [74].

The end of World War II saw Japan's infrastructure and economy in ruins. The first step towards prosperity was the rebuilding of the economy and the Japanese did so with vigour. Unlike the US, Japan had no space program or developments resulting from

defence to boost their technology innovation. Government funding of research and development projects eliminated these drawbacks. Additionally the Japanese, who with their inventiveness caused some American firms to go out of business, exploited the easy patent policy of AT&T towards the transistor. The aforementioned characteristics and the fanatical pursuit of quality and efficiency resulted in the Japanese surging ahead in the electronics industry in the eighties [74].

The next major milestone in the industry was the start of the First Generation (1G) analogue cellular systems. The Advanced Mobile Phone Service (AMPS) was launched in 1978 in the US. It was initially a closed trial with only employees of Bell and AT&T taking part. This was extended six months later with paying customers having car-mounted mobile phones. Competition requirement problems with the regulatory body in 1981 caused additional delays in the progress of the cellular industry [74]. This conflict seems to follow a pattern in the US. Solomon [56] describes it as follows: "*A pattern begins to emerge when one reads all of these books in succession: the telecommunications industry has always been in conflict with the government in the US; it has always tended towards monopoly; some simplistic mechanism for establishing competition has always been offered; but the competition itself has quickly run into conflict with the government over the same issues – beginning the cycle again.*" Texas Instruments unveiled their single chip digital processor in 1983. This device can be seen as the heart of a cellular phone and was an important step in the evolution of the cellphone [74].

The era of multinational cellular networks started in Europe when the Nordic Mobile Telephone System (NMT450) came into operation in 1981. The NMT450 network was launched in Denmark, Sweden, Finland and Norway followed, in 1985, by Great Britain's Total Access Communications System (TACS), West Germany's C-Netz, France's Radiocom 2000 and Italy's RTMI/RTMS. All systems were incompatible [74] which encouraged the establishment of a single European digital mobile service which would allow for easy roaming between networks. In 1982 the Confèrence de Administrations Europèenes des Postes et Tèlècommunications (CEPT) was established comprising twenty-six European countries. Despite the fact that most members

consisted of state owned monopolies, the decisive response to a Franco-German study regarding problems in the communication industry was visionary. They established the Groupe Speciale Mobile, with the main objective to develop a specification for a pan-European mobile communications network. In 1982 the European Commission (EC) issued a directive which required member states to reserve frequencies in the 900 MHz band for GSM to allow for roaming. The work done by the Groupe Speciale Mobile gained more support in 1985 when West Germany, France, Italy and one year later, the United Kingdom, signed an agreement for the development of the new technology. The new technology was later called Global System for Mobile Communications, but the acronym GSM became the used name. Characteristics such as speech security, data communications and the use of large-scale silicon technology dictated pursuit of a digital standard. Commitment towards the development of this technology was not sufficient in itself. An additional commitment towards the implementation of the technology was also required. The "Memorandum of Understanding" (MoU) was signed by fifteen countries in 1987, followed by the invitation by these countries of tenders in the following year [27].

The next hurdle in the deployment of GSM was the fact that there were no handsets available as a result of type approval problems. One of the most important features of GSM was international roaming. This feature would only be possible if all networks and handsets were identical. The problem was alleviated when the Interim Type Approval (ITA) testing procedure was developed. Despite concerns from some operators, only a subset of the approval parameters was tested. ITA terminals became readily available in 1992. The fact that the European Telecommunications Standards Institute (ETSI) was given the responsibility for development of GSM specifications significantly boosted the progress towards the launch of GSM. As a result of the work done by the aforementioned bodies, GSM was finally launched in 1992 with the first commercial network, Oy Radiolinja Ab, in Finland. Competition in the market was one of the most important success factors for GSM. It ensured low product and service prices with high quality of products and services. The number of subscribers grew tremendously during the following decade up to a point that was close to market saturation for voice services. This saturation and the need for enhanced data

services in GSM led to the research and development of third generation networks (3G) [27].

Table 2 indicates the evolution of mobile communications on a timeline starting almost two millennia ago [53, 74, 56, 58, 27].

Phase	Year	Important Developments
3rd Generation Cellular - Digital	2002	Growth in GSM market approaches point of saturation in traditional voice application. Mobile operators are cautious to implement 3rd Generation Cellular networks.
2nd Generation Cellular - Digital	1992	Actual launch of GSM Introduction of Interim Type Approval (ITA) procedure
1st Generation Cellular - Analogue	1988	Inception of the European Telecommunications Standards Institute (ETSI)
	1987	Inception of GSM Association for Mobile Operators
	1985	Inception of Groupe Speciale Mobile (GSM)
	1983	Texas Instruments creates the Single Chip Digital Processor Enhanced research, quality control and efficiency increases Japanese expertise in the electronics market.
	1982	Inception of Conference des Administrations Europeenes des Poste et Telecommunications (CEPT)
	1981	The first multinational cellular system launched across Scandinavian countries.
	1978	Advanced Mobile Phone Service (AMPS) starts to operate in North America
Cellular Concept	1971	Intel creates the Micro Processor
	1964	Improved Mobile Telephone System (IMTS) launced by Bell System
	1958	Texas Instruments create the Integrated Circuit
	1954	Texas Instruments produces the first silicon transistors, which results in increased power, lower operating temperatures and allows for miniaturization
	1948	Bell Labratories create the Transistor
	1947	Cellular Concept Created by Bell Labratories
Mobility Concept	1946	Intensive military research and developments resulting from World War II produces the first Circuit Boards
	1937	Low cost processors and Digital Switching becomes available
	1921	First land mobile radio telephone systems installed in police cars
	1910	First car telephone – not wireless but mobile
Wireless Signals	1830	First practical electrical signal sent
	1820	Electromagnetism first discovered

Table 2: Evolution of global telecommunication with focus of the mobile industry.

2.2 Overview of the Major Advances and Obstacles in the History of Telecommunications

The history of telecommunications indicates that innovation that took place can be divided into two types. The first type ranges from the beginning of the discussed history, until the late 1970s and early 1980s. This era seems to be characterised mostly by innovations in hardware. It commences with discoveries of fundamental concepts, which are built upon by the addition of suitable hardware. The hardware is improved over the years until it reaches a blocking point. This point indicates the start of the next era, which is characterised by innovation in policies. Standards are drawn up, which focus on development efforts and thus increase the pace of technology development.

Factors which seem to limit the progress in this industry during this period are mostly the tardiness of regulatory bodies to make sufficient bandwidth available. The brief lack of standards during the 1980s in Europe also indicates what effect it could have had on the industry if it were left to its own devices.

2.3 The Current State of the Telecommunications Industry

Telecommunications networks are being changed by the influence of data on the traditional voice applications. Pressure has been increased on operators by ongoing decreases in voice and data service prices. The global economic slow down exacerbated the decrease in profit for telecommunications service providers [50].

Some of the major challenges to this industry are [6,20,50]:

- The number of mobile wireless subscribers is increasing and will soon surpass the number of wireline subscribers on a global scale. New data services are being deployed, requiring major investments.
- Revenue is shifting away from traditional voice services towards data services.
- The current global economic recession is reducing revenue of major industry incumbents.
- Prices for services (for example voice) which previously generated high profits are decreasing.

In the United States companies are still experiencing ripple effects of earnings overstatement regulations (for example Worldcom). The amount of debt of operators due to various reasons (for example high cost of UMTS licences), are of concern in the industry. Despite these concerns the telecommunications industry and more specifically the mobile communications industry, continues to evolve and grow.

2.4 Mobile Network Generations

The global telecommunications industry can be segmented into four main areas as indicated in Figure 1. The three major areas are Fixed Line, Data and Mobile. Examples of areas covered under the heading "Other" are Satellite and Paging industries.

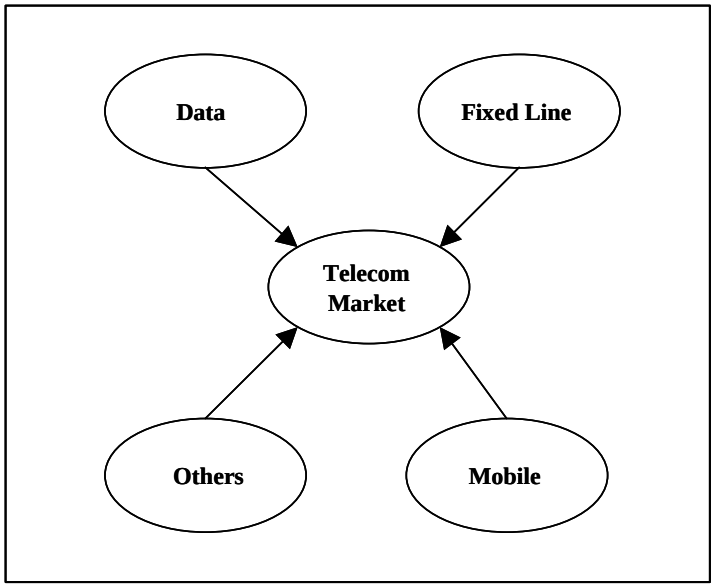


Figure 1: Simplified segmentation of the worldwide Telecommunications Market

The global mobile communications industry experienced significant growth in the early 1980's. GSM was mainly focused on promoting the Voice segment of the mobile communications branch in the Telecommunications sector. Following almost two decades of positive growth, this segment also became saturated. As a result the telecommunications industry, and more specifically the mobile industry, started to experience a significant decline in business growth. This state of affairs caused a priority shift to take place in the mobile industry. The focus shifted from voice services to the area of data services. Research and development into this area led to the creation of Third Generation (3G) technologies. Factors such as extremely high licence fees, uncertainty in the market, and lack of 3G terminals delayed the launch of 3G networks.

Products / technologies with similar characteristics to that of 3G technology are already available from GSM networks. Examples of such products / technologies are Wireless Application Protocol (WAP), General Packet Radio Services (GPRS) and related applications. However, the performance of these products / technologies in the market proved to be extremely disappointing to network operators. The reasons for such levels of performance are not clear. This fact causes more uncertainty towards the implementation of 3G.

The capabilities of 3G networks include advanced applications which will provide innovative new services to users. A market expectation exists that a single application will be the most popular amongst users and generate significant revenue for network operators. Such an application is referred to as a Killer Application. Although the technology hype suggests that such an application will exist, it is uncertain as to what the Killer Application will be or when it will be introduced into the market. As mentioned earlier, the stage of evolution in which mobile communications systems transpire, can be referred to as a certain generation. The following sections provide an overview of these generations.

2.4.1 First Generation (1G) Systems

During this generation, most countries had only one state owned operator with a low number of users. Analogue technology such as Advanced Mobile Phone System (AMPS), Total Access Communications System (TACS), Nordic Mobile Telephone (NMT) and Japanese Total Access Communications (JTAC), was employed. Very limited coordination took place at a global level, which meant that the systems were only designed to be deployed in a specific geographical area, not to be extended to other areas. The coverage and quality of service (voice focussed) was low. The equipment was bulky and had limited battery life.

2.4.2 Second Generation (2G) Systems

This generation is characterised by the use of digital technology. This provides more efficiency, capacity and services to the mobile networks. Increased capacity and the

need for roaming, were some of the key factors that led to 2G systems. The vision of a "Single Market" by European incumbents set the stage for the regulators to define a single standard. This enabled the new operators to enter the market and for current operators to grow their business. This system is generally known as GSM. Currently (03/2003) there are 787 million GSM users globally [54]. The spread of these users across the world is depicted in Figure 2.

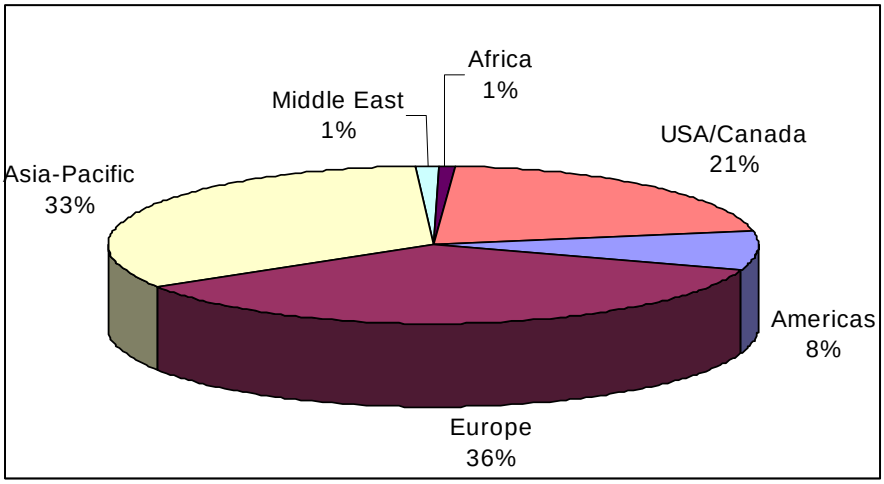


Figure 2: Cellular Market Shares in 2002 [54]

Since its inception the GSM standard has evolved from basic voice with simple text messaging, also known as Short Message Service (SMS), to an array of voice and data services. In most countries, up to 99% of the population is covered by GSM networks. The single standard allows for effortless roaming of subscribers across international borders using voice and SMS.

2.4.3 Second Generation Enhanced (2.5G) Systems

In order to enhance the data capabilities of networks, some operators migrated to 2.5G networks. The enhancement mainly consists of employing technologies such as General Packet Radio Service (GPRS), Enhanced Data Rates for Global Evolution (EDGE) and in a lesser sense, High Speed Circuit Switched Data (HSCSD). This generation was seen as an intermediate phase towards the full deployment of third generation networks without full capital investment and licencing fees.

2.4.4 Third Generation (3G) Systems

As can be seen in Figure 3, the positive growth of subscribers in 2G networks is still expected to continue in the next few years. The migration from 2G to 3G is expected to be a gradual affair.

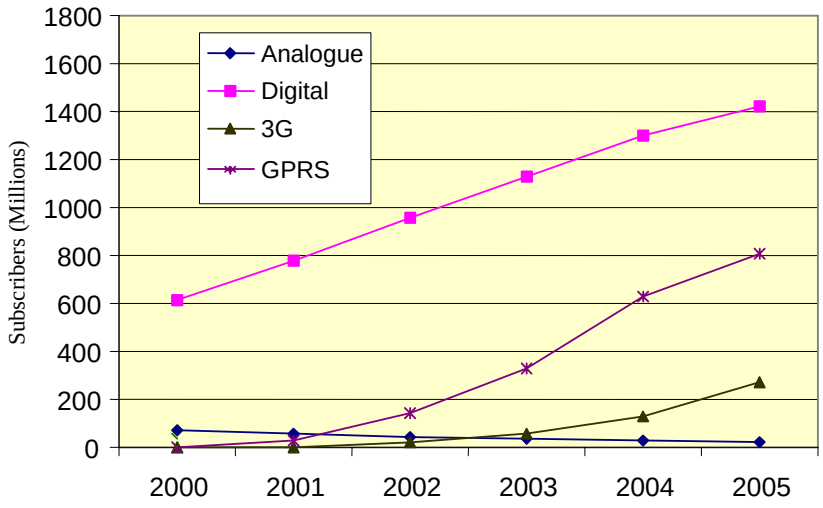


Figure 3: Worldwide Mobile Subscribers by Technology 2000-2005 [3]

The fact that the industry invested heavily in 2G networks required a change in the focus for introducing 3G into the market. Mobile operators want to protect existing investments while being able to upgrade to the latest technology. Additionally, the emergence of the Internet meant that 3G had to focus on higher data rates. The level of popularity of the Internet justifies this focus. This meant that in order to reach such high data rates, attention had to be shifted from circuit switched technology towards

packet switched technology. The evolution of data services from 2G towards 3G can be seen in Figure 4. Although it is still believed that technologies will converge, no single standard exists for 3G [66]. Rather than a current single standard, 3G now has a different meaning depending on the world region.

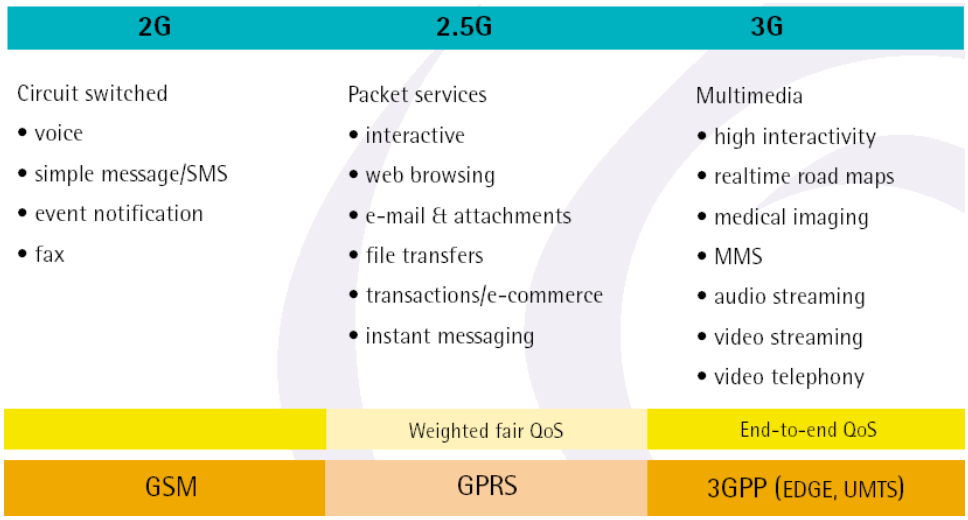


Figure 4: Data Services – Differentiation by Generation [63]

The Universal Mobile Telephone System (UMTS) is seen as 3G technology in Europe. This technology will also be deployed in most of the Asian region. New spectrum and international roaming are important concerns at present. The aforementioned factors are of less significance in the US where the focus is towards high data rates. 3G consists of derivative technologies from 2G. Differences in cultures in this case result in different approaches to standardisation. The US, for instance, applies one of the laws of nature "only the strongest survives" to standardisation. The market decides which standard will become the generally accepted reference. The majority of other countries takes the opposite approach. Standardisation is seen as a way to create new markets. An example would be the inception of GSM. Nevertheless, a single standard alone does not equate to success. Satisfying the expectations of the market will bring on success.

The success of 2G in markets was largely based on the fact that mobility was added to voice communications. The market and its expectations have since significantly changed. The feature of mobility is now taken for granted and does no longer imply success for the introduction of 3G. In other words, simply adding mobility to data communications will not guarantee the acceptance and consequently the success of 3G. Market expectations are largely based on developments in the fixed Internet world. This includes low cost, high-speed access to content. The same functionality at similar price levels with mobility is expected of 3G. The aforementioned are, however, not the only factors which will determine the success of 3G. As described earlier, one of the factors which resulted in a reduction in introduction rates of 2G was the availability of terminals. Figure 5 below indicates the reason for concern regarding the availability of 3G terminals. Manufacturers of terminals are faced with a multi-mode environment. They are strongly influenced by which products are used in the largest markets. Converging technologies in UMTS suggests that manufacturers will rather concentrate on multi-band than multi-mode terminals. In other words, technologies will be the same but bandwidths might differ.

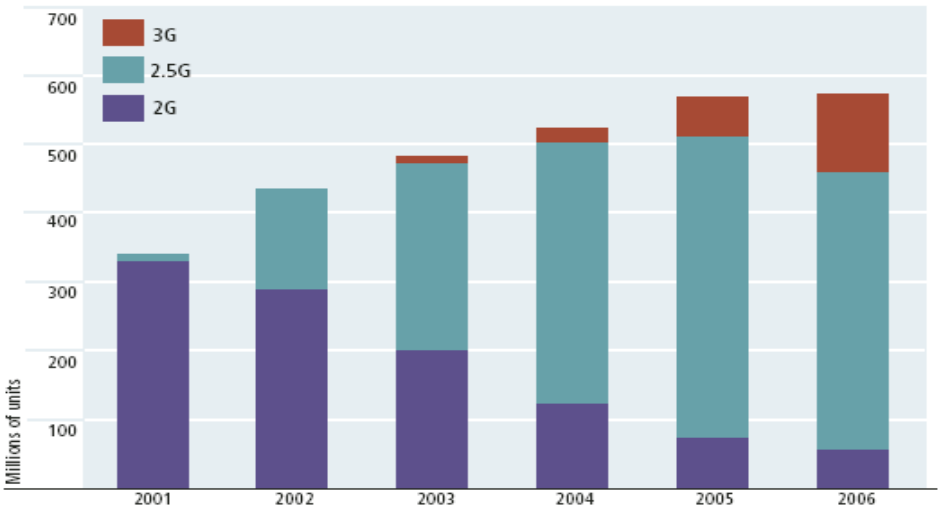


Figure 5: Worldwide Handset Production by Generation [50]

2.4.5 Fourth Generation (4G) Systems

Currently there is no fixed definition of 4G as it is simply used as a framework by stakeholders in order to compile future technologies. The target of 4G is to significantly improve transmission rates from 3G up to about 100Mbps [50]. It is speculated that 4G networks will only be implemented after 2010 and that about US$30 billion would already have been invested in this generation by end of 2002 [8]. Table 3 summarises the characteristics for the different mobile technology generations.

Generation	Advantage	Disadvantage
First (1G)	• True mobile communications • Designed for single speech service	• No data capabilities • No single global standard • Low quality of service • Application of analogue technology
Second (2G)	• Application of digital technology • Designed for primarily delivering speech with data capabilities • Increased user capacity • Roaming • Single global standard • Circuit Switched	• Limited data capabilities
Second Enhanced (2.5G)	• Enhanced data capabilities • Packet Switched	• Limited data capabilities with regards to new data applications employed • Lack of applications
Third (3G)	• High quality voice and multimedia services	• No 3G handsets available on time • High licence cost • High capital investment

Table 3: Mobile technology generation characteristics.

In order to provide an enhanced understanding of the industry and eventually the area of study, insight into the different elements in the industry is required. This will be accomplished by highlighting key factors shaping the market as well as the current state of cellular, data and Internet markets.

2.5 The Telecommunications Industry in South Africa

The telecommunications industry in South Africa consists mainly of government, as well as public and private enterprises. Figure 6 provides an overview of the industry.

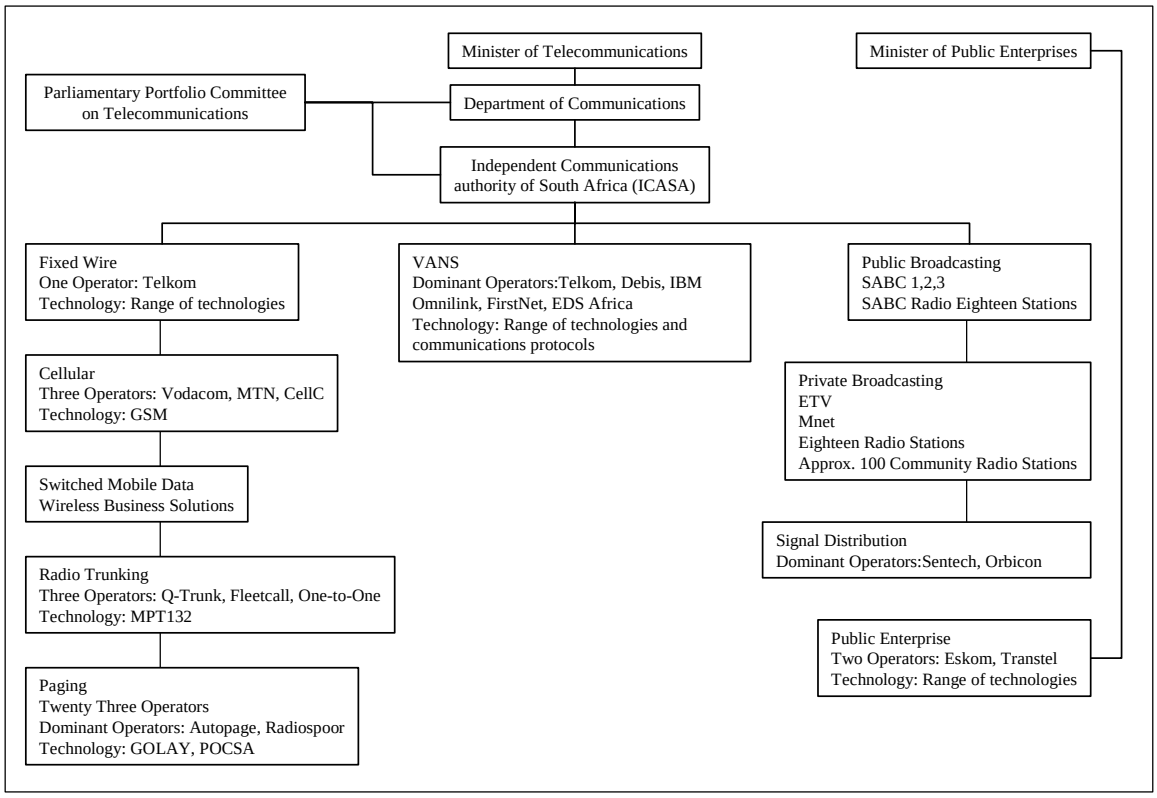


Figure 6: South African Telecommunications Structure [30]

2.5.1 Key Factors shaping the Telecommunications Market

A recent BMI TechKnowledge report identified five factors that play an important role in shaping the future telecommunications market in South Africa [41]:

- Impact of the Third Cellular Operator: Cell C
- Establishment of the Second Network Operator (SNO)
- Telkom Services Strategy
- The endeavour of Value Added Networks to utilize *Voice over Internet Protocol* (VoIP)
- New products and services

These factors are discussed in more detail below:

Cell C had already reached the 1 million subscriber mark by the end of 2002. It is expected that this operator will capture the lower ARPU range of prepaid subscribers. Thus the operator will probably focus on gaining more subscribers rather than taking part or initiating price wars with other operators.

It is forecast that the fixed line services market will be worth almost R33 billion by 2006 [41]. Approximately 11% of this market share will belong to the SNO at this time and, depending on the business model followed, the potential revenue could be as high as R6 billion.

Telkom has ventured into the data services provisioning market with an aggressive strategy. By doing so, it moves into direct competition with companies such as OmniLink and Arivia. The strategy will focus more on delivering a Quality of Service Internet Protocol Virtual Private Network solution than on transmission.

The fact that VANs are not permitted to make use of VoIP, but that no such restrictions apply to Telkom and the SNO, will leave VANs in an uncomfortable market position. Existing and new clients and thus potential revenue might be lost due to this fact. Additionally the fact that the SNO will enter the market means that VANs and ISPs are no longer obliged to do business only with Telkom.

New services such as GPRS and xDSL have been be launched although they will only have an effect on a very specific market segment. This segment, namely the sophisticated consumer market, will receive these services depending on the level of disposable income. This income is expected to remain strained within the next few years.

2.5.2 Economic Impact on Telecommunications

According to BMI TechKnowledge, growth in telecommunications at a macro-level is influenced by [41]:

- Overall economic growth
- Population growth

- Income levels
- Distribution of income

Additionally, BMI TechKnowledge mentions that "*the real growth and employment performance of the South African economy reflects a secular deterioration that has been occurring for decades*". This stems from the fact that GDP growth has steadily fallen since the 1960s from 6% to 1.3% in the 1990s [41]. Additionally, as can be seen from Figure 7, the real annual economic growth rate has shown erratic behaviour since the 1970s.

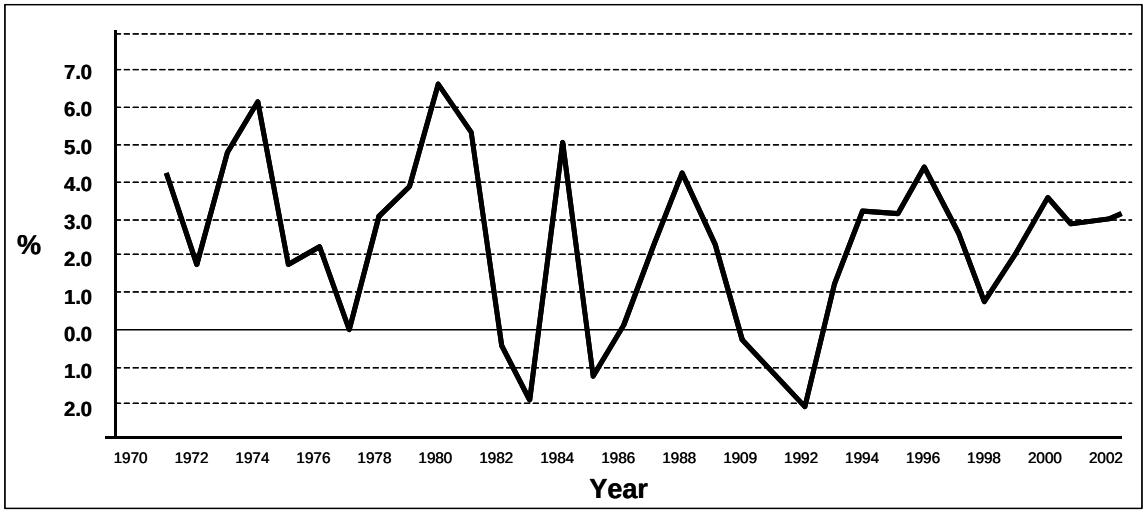


Figure 7: Real annual economic growth rate: 1970 to 2002 [52]

The unemployment rate is high and the country suffered from the notorious brain drain for several years. A measure which is used to determine the spread of wealth across the population of a country is the GINI coefficient. A low GINI coefficient corresponds to a more balanced spread of income. As can be seen from Figure 8, the GINI coefficient for South Africa is one of the highest in the world. Compared to other corresponding economies, it falls into a group with one of the highest inequalities in income distribution.

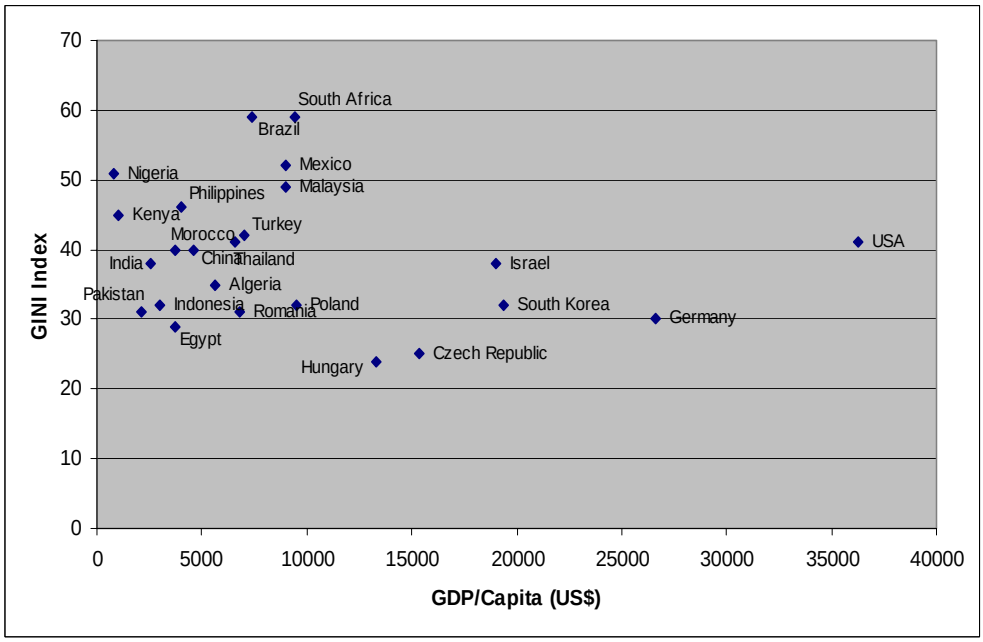


Figure 8: GINI Index versus GDP/Capita [9, 33]

Despite the strengthening of the Rand against the major currencies, the economic mood is less positive as a result of high crime levels in South Africa. On the positive side, the potential for overall market growth is good [41]. Although South Africa is the largest economy in Africa, it is dependant on the export of minerals and agriculture products. In order to move away from being a Technology Colony, the economic base must shift away from the exploitation of raw resources to that of the processing and manufacturing of goods and hi-tech products [12]. This is one of the key issues to be addressed in order to increase disposable income, which will in turn promote growth in the economy.

One of the standard measures of economic development in a country is teledensity. Evidence suggests that countries with a low teledensity have a lower GDP compared to similar economies with higher teledensities [41]. From Figure 9, it can be seen that the teledensity for the cellular market has increased at a steep pace since the inception of GSM networks in South Africa.

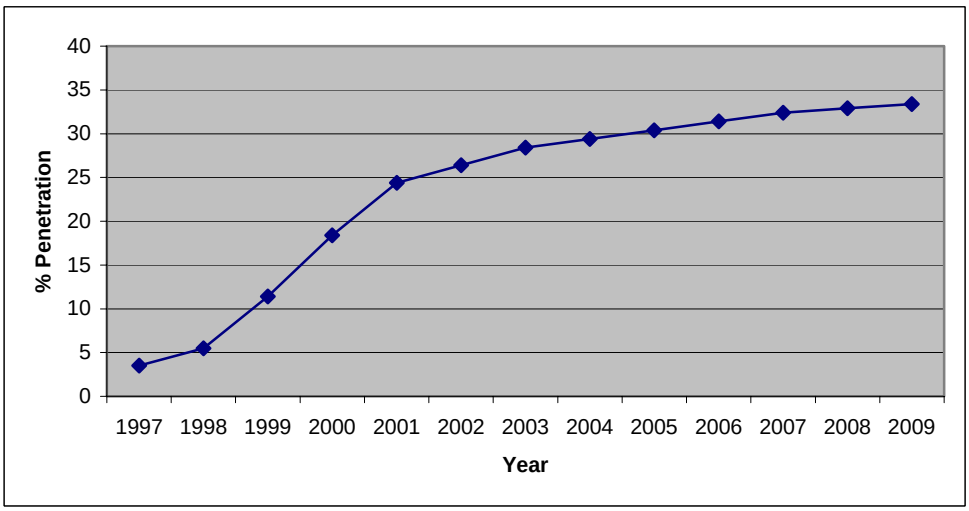


Figure 9: South African Cellular Teledensity [33]

Positive market reforms in the telecommunications sector can increase Teledensity. This is done by introducing competition, privatisation and pricing to ensure sufficient supply. On a higher level, a program for overall economic growth needs to be in place to maintain high levels of employment. The ITU, states that on average, people spend about 2% to 3% of their monthly income on telecommunications [30]. In order to promote universality, this would mean the following:

If the monthly cost of providing telecommunications to a certain area is more than 3% of the local income, external subsidies must be found since the local population might not be willing or able to carry the additional cost. If the cost is less than 3% and there is currently no service available, it usually points to a constraint in the policy [41].

2.5.3 Telecommunications Regulatory Environment

The merger of the South African Telecommunications Regulatory Authority (SATRA) and the Independent Broadcasting Authority (IBA) was brought about by several factors, one of which being the rapid convergence of technologies in telecommunication. Figure 10 indicates a timeline with the most important events in the telecommunications liberation process in South Africa.

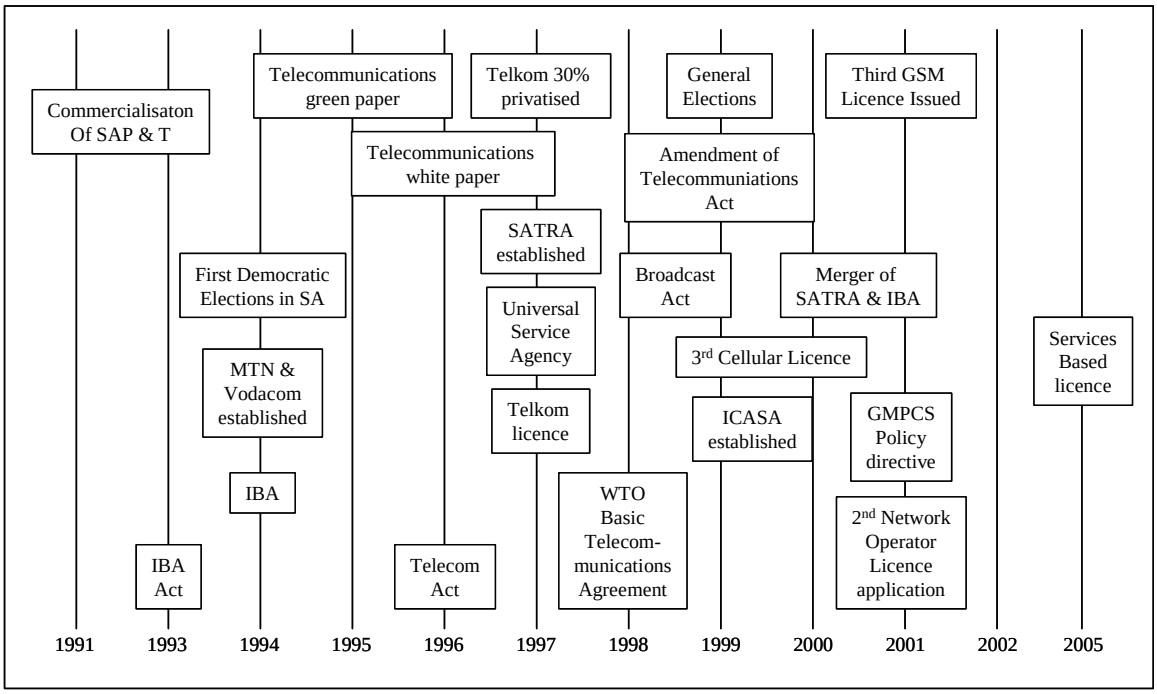


Figure 10: South African Telecommunications Timeline [30, 33]

The ICASA directive is derived from four statutes namely the ICASA Act of 2000, The Independent Broadcasting Act of 1993, the Broadcasting Act of 1999 and the Telecommunications Authority Act No. 103 of 1996.

The key functions of ICASA include [29]:

- to make regulations and policies which govern broadcasting and telecommunications
- to issue licences to providers of telecommunication services and broadcasters
- to monitor the environment and enforce compliance with rules, regulations and policies
- to hear and decide on disputes and complaints submitted by industry or members of the public against licensees
- to plan, control and manage the frequency spectrum

- to protect consumers from unfair business practices, poor quality services and harmful or inferior products

The South African government follows a policy whereby all people should have access to basic telecommunications services at affordable prices. ICASA as a regulator is charged with achieving this goal. Additionally, it promotes the ownership and control of telecommunication services by historically disadvantaged groups. The regulator ensures regulatory fairness by initiating constructive processes for the development of telecommunications policies. Such policies create regulatory certainty, which is vital for establishing competition and building market confidence that will lead to investment.

2.5.4 Cellular Market

The cellular market is currently served by three operators: Vodacom, MTN and CellC, with a total subscriber base of almost 14 million subscribers. A continuous decrease in handset prices enabled subscribers, especially in the prepaid market to afford their own handsets. Certain shops selling handsets by using in-store credit cards have further supported handset sales.

According to BMI TechKnowledge, the average revenue per user (ARPU) has declined since 1997 [41]. The industry is currently worth about R23 billion and has the potential to grow to R46 billion by 2005 [41, 54]. The operators are cautious with the introduction of 3G services. They are rather testing the mobile data market with the use of GPRS. This is expected to continue until at least 2005 [41].

2.5.5 Data Service Market

Recently the business areas of Value Added Networks (VANs) and Telecommunications Providers have started to merge. Market incumbents are striving to provide end-to-end solutions to customers. Due to regulatory restrictions, VANs are not permitted to provide voice services. This has led to large corporates being hesitant to outsource their entire telecommunications network to VANs. The need for data

services is increasing as Internet penetration increases into private households. Increasing downloading speeds and bandwidth-intensive applications are Internet user demands that are augmenting. In February 2002, BMI TechKnowledge stated that the mobile data services market for VANs and ISPs was worth about R2.88 billion [41].

2.5.6 Internet Service Market

Following the demise of the dot Com hype, industry was left with a pessimistic view of the Internet and e-Business. A market already filled with ISPs offering an array of services, was put under more pressure. Despite these problems, the market is growing at a steady pace. The Internet has changed the face of business forever and customers will continue to influence the change in traditional ways of doing business. The total market size was estimated in 2001 to be just more that R2.8 billion [41].

2.6 Technology Under Investigation - Mobile Data Services

Mobile Network Operators are experiencing a decline in revenue from their traditional core business which consists mostly of voice services. It is expected that this loss will be converted into even greater profits through the implementation of Mobile Data Services (MDS). MDS is an umbrella term which refers to a vast collection of innovative value-added services. These services are offered to mobile subscribers and can be accessed by various devices such as Mobile Phones, Personal Digital Assistants, Laptop Computers and even Autonomous Devices employing telemetry services. From Figure 11 it can be seen that MDS resides in the Service / Application Layer, which fits on top of the Technology Bearer Layer.

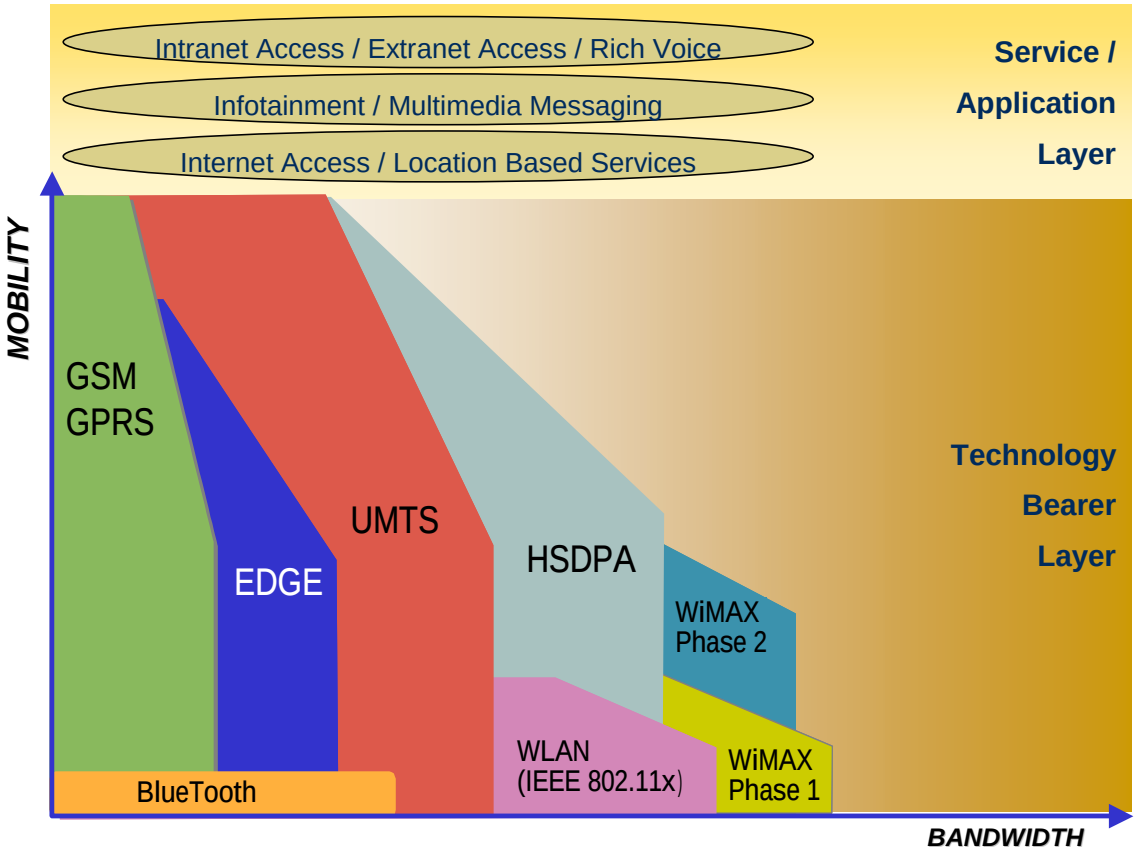


Figure 11: Service and Technology Layer Model

Figure 12 demonstrates several prominent services that compose the family of MDS [19]. MDS is usually discussed in conjunction with 3G networks and more specifically, UMTS. A possible perception which could be created is that UMTS / 3G networks are a prerequisite for the implementation of MDS. Actually, this is not the case as an ARC report remarks, "*The introduction of a 3G network is definitely not a prerequisite for the introduction of valuable data services*."[3].

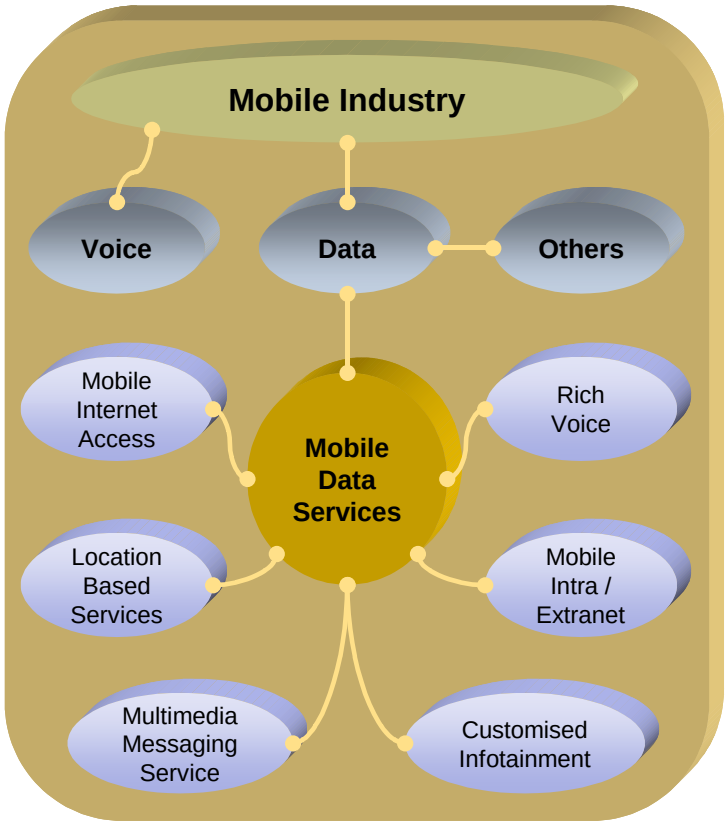


Figure 12: Simplified Segmentation of the Mobile Market Including MDS

The expectation of MDS in industry is clear, nevertheless. These services are predicted to generate future income for mobile operators. Figure 13 indicates that it is expected that income from voice service will steadily decrease, with a dramatic increase in income from MDS especially towards the latter part of this decade.

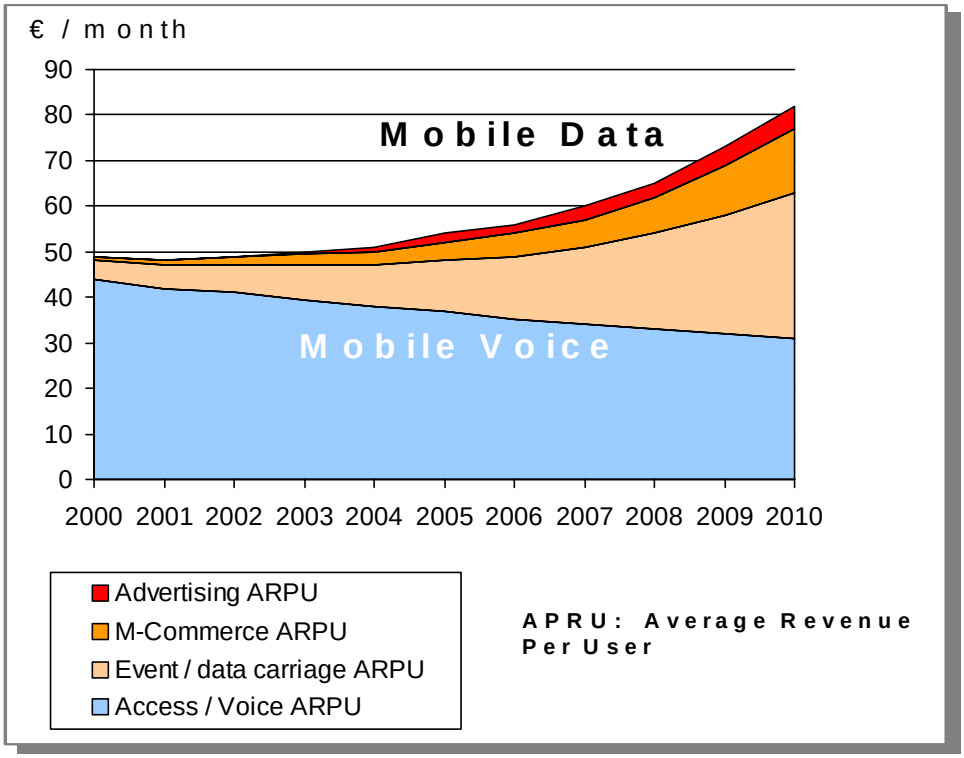


Figure 13: European ARPUs for Mobile Voice and Mobile Data [19]

The UMTS Forum defined six groups of mobile data services. This classification is graphically depicted in Figure 14. An overview of these services is presented to serve as background to the dimensions to be considered for the MDS introduction model.

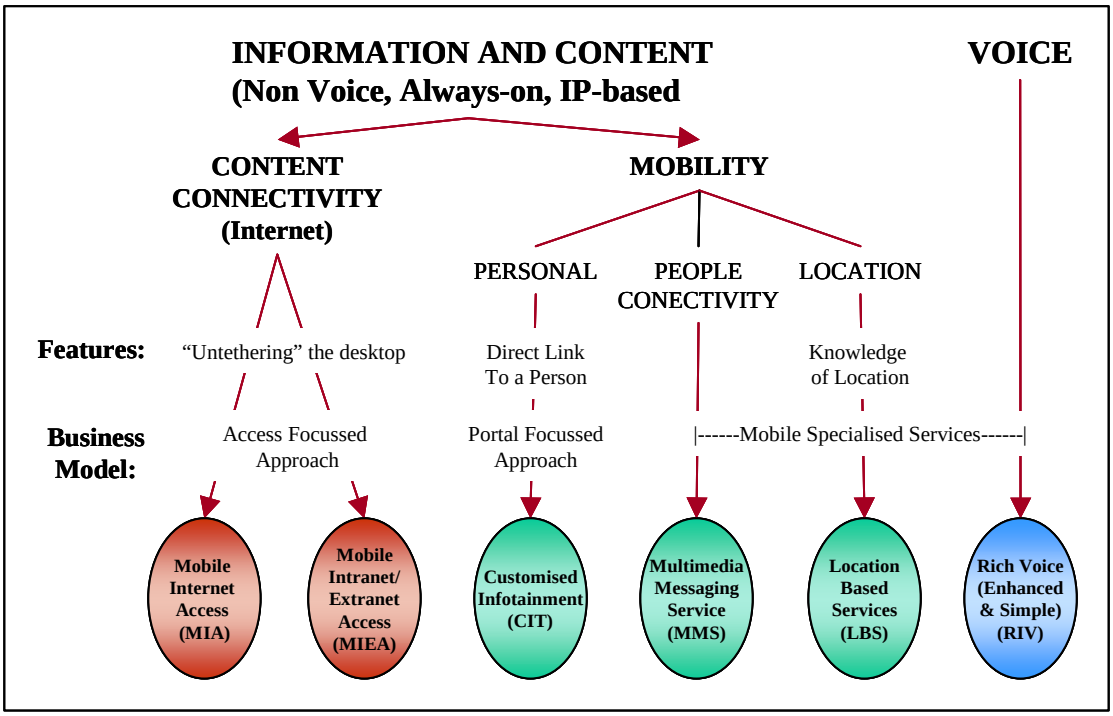


Figure 14: 3G Services Framework [63]

2.6.1 Mobile Internet Access

Mobile Internet Access (MIA) will provide similar features to Wireline Internet Access (WIA) such as speed, quality and pricing. Full access to services such as streaming audio, file transfer and email will be available. The additional benefit will be the added feature of mobility while still being able to access the same content. It is expected that email will be a major driver of MIA [66].

This category of services will also enable the user to take part in Mobile Commerce including the buying items and the transferring of funds. Mobile Banking, similar to the process of current Internet Banking, as well as travel arrangements and ticket bookings will also be able to be done via the mobile phone. Other services could include:

- Fleet management of for example the vehicles of a parcel delivery company [19]
- Surveillance service for remote monitoring purposes by security companies

- Telemedicine services which will enable users in for example the rural areas to access a medical database or real time doctor's advice. X-ray pictures, could be swiftly sent to a central hospital for specialist diagnosis.

The precedent of very low access cost has been set by wireline Internet Service Providers (ISP). This means that subscribers will be unwilling to pay more for MIA (as opposed to wireline Internet access) simply because of the mobility component added to the service [66]. Currently MIA cannot compete with WIA due to technical factors such as limitations of current mobile devices and access to bandwidth. According to predictions such obstacles will be overcome by 2005 [66]. An example of market expectations which was set but could not be met, is that of MIA via Wireless Application Protocol (WAP) [38]. The fact that the Internet gained a mobility component was not enough incentive to overcome the severe reduction in content, speed and graphics. According to the UMTS Forum, Mobile Web browsing will mainly take place in a personal area network as opposed to a wide area network [66].

2.6.2 Mobile Intranet / Extranet Access

The Internet traffic generated by corporate employees outside the office (external) are said to already have exceeded the internal traffic [66]. Subscribers will soon have a need to access email, spreadsheets, and corporate management systems in the same way as they do in the office. Mobile Intranet / Extranet Access (MIEA) is similar to MIA mentioned earlier, but the focus is on business users who need more sophisticated interfaces to the enterprise portals rather than on private users. Some of the obstacles for Mobile Service Providers related to the shift from voice to data centric networks are listed below [66]:

- A deficiency in Information Technology and IP/Internet technical expertise throughout the organisation
- A high end-to-end network reliability is required
- A usage-sensitive billing structure should be setup

- A deficiency in marketing and sales experience in dealing with IT departments and multi-location enterprises

Acceptance and growth in this service will be inhibited by several issues if not resolved in time. Such issues include the absence of low cost terminals allowing full Web browsing and unresolved security issues. Security in the corporate world is of vital importance. Access to intranets and secure transactions will be crucial factors to address in order to obtain interest from corporate business. Additionally the quality of service and bandwidth on demand are attributes of such a service which will be of interest to corporate business.

An additional factor to consider is billing. Corporate business will be interested in flat rate offers. Systems which will be able to handle billing for packet data while still being able to be customized to individual client requirements are not available. Since multinational corporate clients are not restricted to single countries, international roaming will be an important consideration. Roaming does, however, complicate the introduction of service level agreements and flat rate pricing [66].

2.6.3 Customised Infotainment

Examples of Infotainment services are Logos, Ring Tones and Games. Such services are generally not aimed at the corporate market, but rather at individual subscribers.

Customised Infotainment (CIT) enables the user to access content that can be personalised and manipulated to suit their needs. Besides personalisation, the ability to pay for content as it is used will be attractive to users. Content is provided to users via a Mobile Portal (MP), which provides support service and billing of content. MPs could obtain subscribers directly or via Mobile Service Providers (MSP). A MSP could also become a MP in order to retain revenue. In order to maximise profit, content must be suitable for the local culture, in the language of the local culture.

Infotainment services have already proven to be very popular in NTT DoCoMo's iMode technology. iMode is an example of an early pre-3G MDS system which will be discussed in the next chapter. Similar services on wireline networks can be studied to provide some idea of which services will prove to be popular in MDS. Figure 15 provides an indication of such services in the United Kingdom.

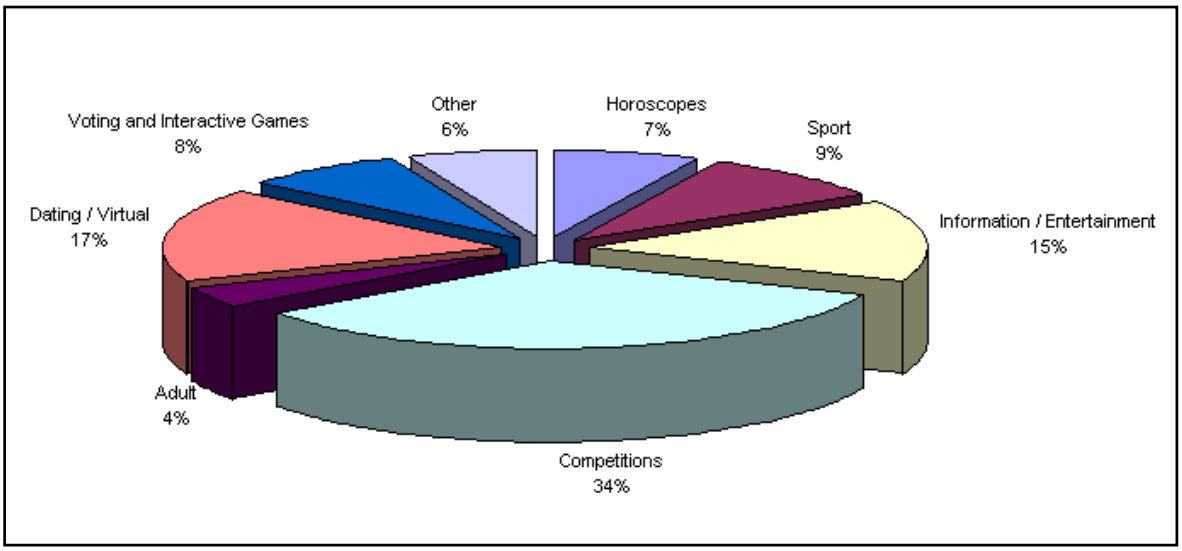


Figure 15: UK Premium-Rate Services: Share of Call Minutes by Service Type [66]

Important guidelines to keep in mind for the success of CIT are [66]:

- The success of a mobile service is not dependant on the replication of Fixed Network services. Marketing CIT as an enhanced mobile service rather than an Internet service should properly position this service for successful implementation.
- Wireline Internet subscribers should not be the only target market for CIT.
- Competitive pricing will determine the number of users.
- Services should be skilfully marketed in carefully designed bundles.
- Content should be carefully selected, as should business partnerships with content providers.

2.6.4 Multimedia Messaging Service

Traditional mobile communication is predominantly done via voice and simple text messages. Multimedia Messaging Service (MMS) "*…is the next step that allows anyone to blend sound, text and pictures into rich messages*."[72]. The popularity of communication by text messages is indicated in the unparalleled success of email to the extent that voice and fax communication have declined. This statement can be further sanctioned by recalling the previous time a letter was written by hand. Email has changed from a delayed to an almost real-time communication method. MMS will have the advantage of being an instant messaging service due to the always-on characteristic of packet-based technologies. Additional advantages of email over voice is the ability to structure communication. Interest groups are setup and information is distributed to some or all members at the push of a button.

A powerful feature that sets mobile communication apart from wireline communication is one-on-one personalisation. When messages are distributed via wireline, they are sent out almost to a void. In contrast, a message to a mobile phone is similar to delivering the message personally to the receiver's ear. This statement is substantiated when one considers the use of SMS's by for example teenagers. Instant messaging using SMS, was found to be dominant for mobile data usage [66]. This finding is supported by a study done by American Online and others who found "*communicating with friends and relatives*" to be the dominant activity of online users [66]. By adding sound and images to the existing text, two additional senses are stimulated, which increase the power of the message.

As with CIT, MMS can also be used by the operator to reduce churn. Once users have opened an email account, they are discouraged from changing operators due to the change in email address. A change in email address is comparable in changing a telephone number. Only with great effort is the new information communicated to all the relevant parties such as friends, family and businesses. Another potentially powerful application of MMS is that of an extremely efficient marketing tool. Companies could advertise on mobile phones in a similar fashion as currently on Television and the Internet. Such advertising would most probably be permission based

with user subscription based on certain incentives (e.g. call rate discount). Information contained in the user database, combined with information on the specific location of the user (Location Based Services) could be used for delivering customized information to the user. The addition of GPS (Global Positioning System) and Geographic Information Systems (GIS) allows users to navigate to places of interest. These information-push methods should be applied with discretion, as a fine line exists between well-timed information which is welcomed by the user and information similar to spam email.

According to the UMTS Forum, MMS would be one of the first mobile data services to be deployed [66] in a mobile network. In order to generate the required initial interest in MMS, pricing will play an important role. Users will not be swayed to migrate from existing messaging services such as SMS to MMS if costs are significantly more. The precedent of simple, relatively inexpensive text messaging has been set. A "soft" migration process could be followed with more advanced features and increased cost introduction over a period of time. Additionally to this, low cost handsets with adequate functionality is a prerequisite for a complete rollout of MMS.

2.6.5 Location Based Services

One of the main characteristics of Location Based Services (LBS) is the ability to provide localised content to users. This service enables users to determine their own location or that of another user. Examples of information to be distributed via LBS can be found in Table 4.

Weather Reports	Hotel Information	Navigational Services
News	Telematics	Restaurant Information
Mobile Commerce	Traffic Reports	Travel Reports

Table 4: Examples of LBS Information Services

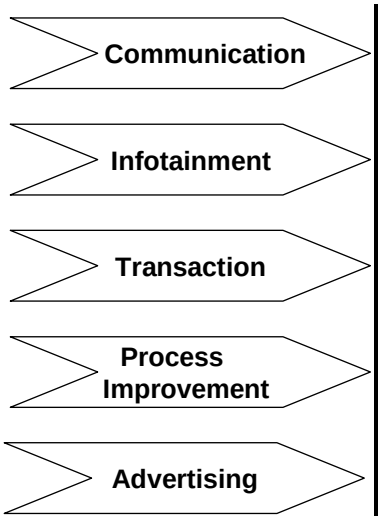
Advertising is one of the primary Location Based Services which will enable sponsorship of the service to the user. Business owners will know that customers

entering their store are already aware of specials or specific products. LBS can be thought of as the infrastructure element of the personalised package for a subscriber. This means that content providers might be directly billed for information delivered to the subscriber. Of course, the resultant increased network traffic will also benefit the network operator. As with other Mobile Data Services, service portability between mobile network operators is required in order for the service to be offered globally. It follows that billing needs to be carefully defined to avoid problems that might arise with roaming.

2.6.6 Rich Voice

Rich Voice (RIV) is a real-time bi-directional service which allows for simultaneous voice and data services. Additional applications are voice activated Web access and Web initiated voice calls. Another evolutionary application is that of the videophone, which is expected to be taken up by early adopters while the actual demand, is still unknown [66]. Voice still remains an essential part of any bundle of Mobile Data Services. Future target markets will not only be aimed at a general market but also be segmented into different lifestyles. Users are continuously migrating from fixed networks with circuit switched equipment that cannot compete against the services provided by packet-switched mobile networks. *"According to current industry opinion, over half of the current voice traffic on fixed networks will have shifted to mobile networks by 2010*" [66]. A service which has the potential to become very popular amongst users is that of Push-to-Talk also referred to as Push-to-Talk over Cellular (PoC). This is a voice communication service which provides simultaneous group communication in one direction at a time by simply pushing a button. This service is similar to that of a CB radio or walkie-talkie.

A definition of MDS groups are listed in Figure 16. This segmentation provides more background on the actual characteristics behind the services as well as the content thereof.



Characteristic	Content	Services
Data Transport	Own created, or forwarded	SMS, Unified Messaging, MMS, Video-Telephony
Paid Content	Aggregated and provided by 3rd party	Gaming, Logos, Ring Tones, Finder Services, Info Retrieval, Event Services
Booking & Payment	Transaction related (information, confirmation, authentication)	Banking, Shopping, Ticketing, Mobile Wallet
Efficiency & Productivity Increase	Company specific	Fleet Management., Field Services, Surveillance, Telemetry, Telemedicine
Marketing	End User specific originated, real time	Push Ads, Banner, Sponsored Messages

Figure 16: Breakdown of MDS Elements [19]

2.6.7 The Global Status of MDS

An early example of the successful implementation of CIT is called Zed. Zed is an example of a MP that was setup by the mobile operator Sonera in Finland (1999). The system is based on a SMS platform with 30% of the total network subscribers using the Zed service. Examples of services offered by Zed are listed in Table 5. Zed has since become available in Germany, UK, Malaysia, Italy and the Philippines.

Examples of Zed Services	
Information Services	Zed delivers informative and entertaining content. News, jokes, horoscopes, weather forecasts and sports scores can be delivered to a mobile phone on a regular basis. Another popular service is the facility to check the balance of mobile phone bills.
Entertainment Services	Accessories are services that give "personality" to mobile phones. For example, users can choose favourite pop songs as handset ringing tones as well as choosing new caller group icons.
Mobile Commerce	Zed enables users to purchase products over mobile phones. In Finland, goods can be ordered, paid for and delivered using Zed. The cost of the transaction is charged to the user's mobile phone bill.
Mobile Chatting	Similar to Internet chat rooms, Zed offers mobile chatting. Information about the user is entered into a database held centrally by Zed. Zed then puts mobile chat users in touch with other users who have similar interests. The user's identity remains anonymous when exchanging messages with "mobile friends."
Zed Finder	Zed Finder has access to a directory of 300 million telephone numbers covering Finland, Austria, Belgium, Denmark, France, Switzerland, the UK and shortly to cover the US. The service enables users to search for contacts within all listed countries. The reverse search, which allows users to find the name and address of a caller from their number, is available in Finland, France, Switzerland, and will soon be available in the US. Selected Zed Finder services using a mobile phone have been available in Finland for nearly two years.
Zed Travel	Zed Travel allows users to access accurate information on particular flights to be sent directly to the mobile phone, therefore minimising the amount of time wasted at airports. If any relevant delays and/or terminal changes occur, Zed Travel sends real-time updates. A pilot scheme is presently in operation in Finland.

Table 5: Services offered by the Zed MP [66]

The fact that such services, although primitive compared to 3G service expectations, are already available will create eagerness with subscribers to obtain full 3G services. It also demonstrates that the large subscriber base of mobile operators will play a significant role in the success of CIT introduction. International roaming with all the personalised services will be an expectation of 3G users. Service portability will be an important attribute to MPs.

According to *3G Today*, as of 4 April 2003, there were 41 commercial 3G operators in 23 countries [25]. Figure 17 indicates a list of mobile operators in different countries where 3G mobile data services have been launched.

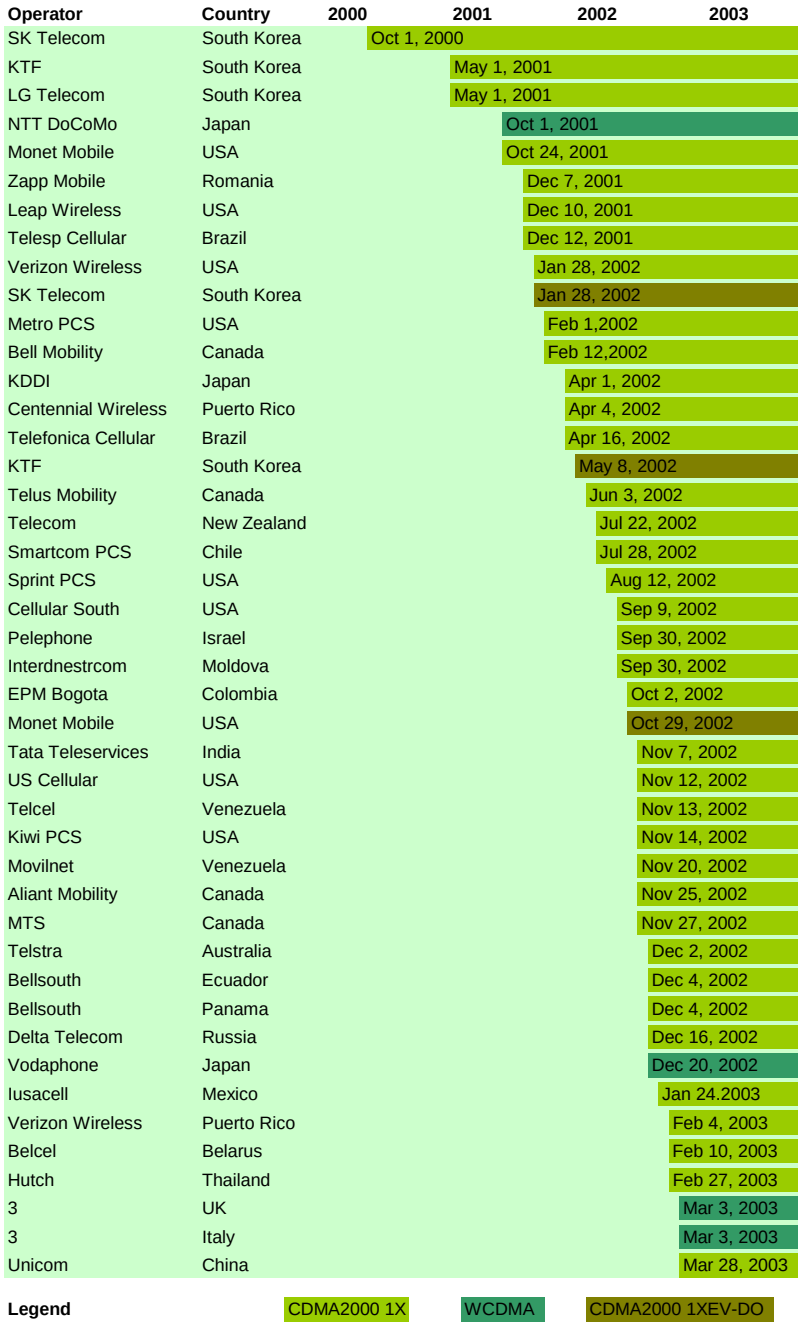


Figure 17: Global 3G Commercial Launches [25]

2.6.8 Mobile Data Services in South Africa

Information Service Providers already exist locally. Companies such as Cointel, Exactmobile, Itouch and Tiscali provide a range of information services. These services include weather, new business ventures, personalised voicemail, competitions, horoscopes, ring tones and many more. The majority of services are, however, accessed by SMS or by a normal telephone call.

Vodacom, the largest of the three mobile operators, launched MMS towards the end of 2002. User education and promotion on MMS is done via regular articles published in their magazine. MMS is accessed via GPRS technology. The operator found an innovative way of involving all subscribers in using MMS even if their mobile phones are not GPRS enabled. A MMS website was created where MMS messages are sent and retrieved. Subscribers with mobile phones that do not have the MMS functionality will receive an SMS with the WEB site name. They can then retrieve their message from the WEB site (via wireline access).

3 Literature Study: Introducing Mobile Data Services Into a Market

3.1 Demarcation of Literature

In Chapter 2, the major advances in telecommunications brought about by technological hardware innovation have been discussed. Future advances in telecommunications and more specifically mobile telecommunications, will be different to the aforementioned. It is expected that the focus will shift away from hardware innovation to software innovation. Focus is anticipated to be on data services, as voice applications have almost reached a point of saturation. Furthermore, the areas of the main data services have only been broadly been defined. Certain aspects of mobile communication need to be studied further. A clear understanding of such aspects and their interrelation must be obtained in order to compile a useful model for introducing MDS into a particular market.

The aforementioned aspects include the following:

- The structure of the market – who are the main stakeholders?
- Relationship between main stakeholders
- Current, as well as future value chain of the mobile market
- Business models envisioned for the market
- Communication needs of users
- How to determine if a mobile data service will be successful
- How to determine opportunities and handle threats in the market
- Study examples of MDS systems that have been implemented in other countries and determine the success factors
- Driving forces in the market

The following main headings describe the key concepts in the literature related to the mentioned subjects.

3.2 Stakeholders in the Mobile Communications Market

The key stakeholders in the South African market are depicted in Figure 18.

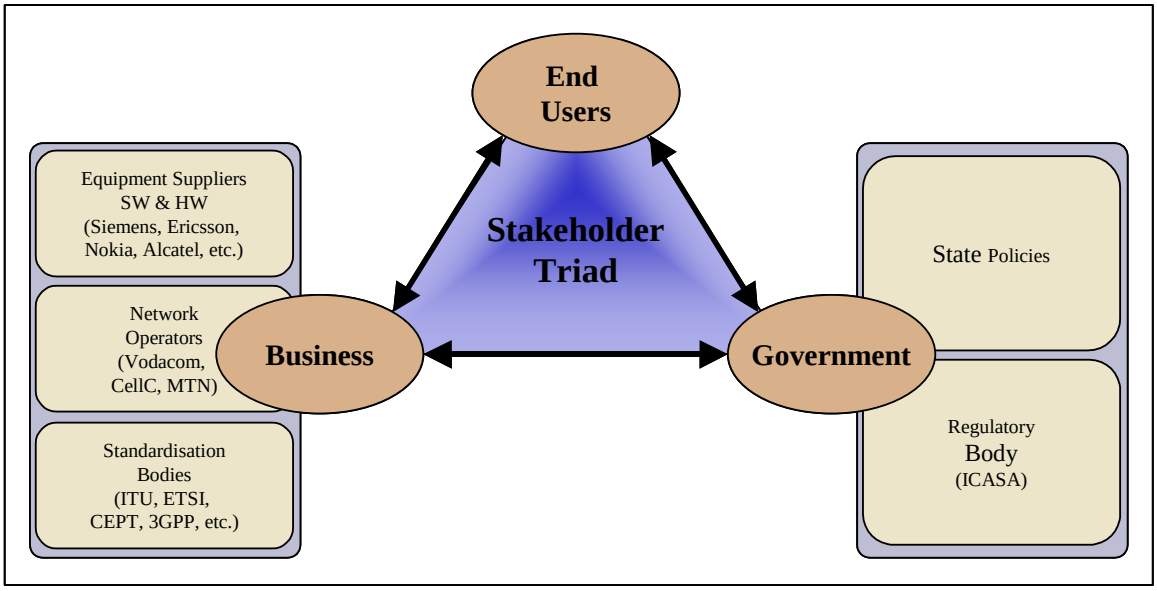


Figure 18: South African mobile industry stakeholder model

End users represent private individuals as well as business users. They are the ones who actually use the technology, services and applications.

The business component of the triad represents a range of sub-components. Equipment suppliers are manufacturers of all equipment and related software. This includes terminals and other components which make up the complete backbone of the mobile communications network. Currently South Africa has three network operators. They are responsible for the day-to-day running and maintenance of the complete mobile networks. The standardisation bodies are the final sub-component in the business component of the stakeholder model. Although these bodies do not have the same functionality as a traditional business, they have been grouped in this component as they

have a significant influence in the business world. They are responsible for defining or deciding on dominant design standards for the mobile industry.

The last component in the triad is government. This element has been split into state policies and the telecommunications regulatory body of South Africa. Although the regulatory body is independent of government, it is still fully funded by government [33].

Components such as ISPs and VANs have not been included in the current model. These and other components are still to form part of the future mobile industry model. The expected additions to the industry will be discussed in a later section of this chapter on value chains of the industry.

3.3 End Users' Communication Needs

In order to determine what services will be popular amongst end users, one needs to pay attention to what fundamental needs they fulfil. In research done by Forrester in the European market, it is stated that three levels of communication exist and that content plays an important role in such communication [21]. These fundamental communication levels are graphically depicted in Figure 19.

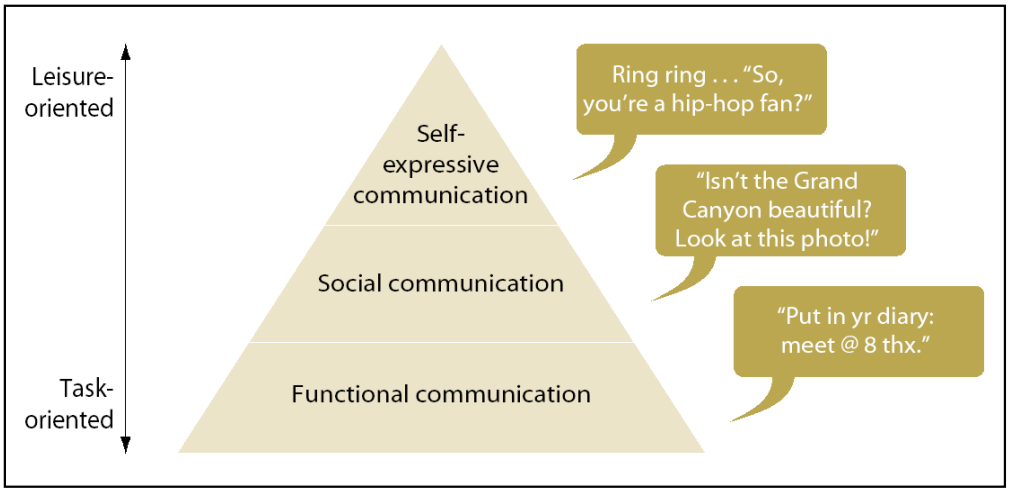


Figure 19: End users' communication needs [20]

3.3.1 Functional Communication

This type of communication takes place during the interaction among people in order to coordinate daily activities. Such activities could include:

- Scheduling of meetings
- Signing up for a pottery class
- Requesting a taxi

The content supplied with such communication would be a personal calendar, a phone book or a radio advertisement.

3.3.2 Social Communication

Examples of this form of communication are the social interaction of people by chatting, which flows from the need for social contact and friendship. Current content services create value by establishing a venue for social interaction for example an online bridge club. Besides playing the game, new people are met through social conversation.

3.3.3 Self-Expressive Communication

The uniqueness of personalities or self-expression is conveyed to the world by this type or level of communication, for example when someone downloads a club-anthem ring tone to his or her mobile phone. This is not so much a purchase of content since it is not for the ear of the private user only. Instead, every time the mobile phone rings, the user is communicating his or her life style and likes or dislikes.

3.4 Determining Successful Communication Services Using the 5M Method

In order to assist the mobile industry in determining what services end users will find useful, some process or method is required. Ahonen and Barrett presents such a method which is called the 5 M's of UMTS service definition [2]. This method consists of five attributes (see Figure 20) according to which a possible service is evaluated. Based on the outcome of the evaluation, a decision can be taken as to the level or probability of usefulness to the end user.

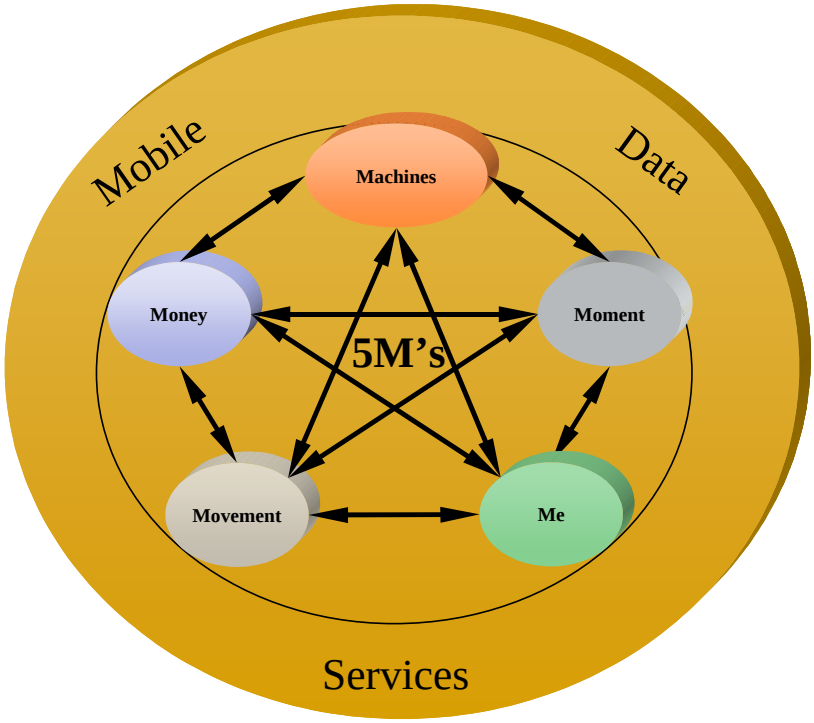


Figure 20: 5M Services Model

3.4.1 Movement Component

Mobile services by nature imply mobility, i.e. unrestricted movement when utilising such services. Mobility is the one aspect that sets these services apart from other services, which are, for example, offered by fixed networks. The expectation of ubiquity of services when travelling abroad is mostly taken for granted by users.

3.4.2 Moment Component

Our world has turned into a world of instant services; we have fast food, instant cameras, 1-hour film development, 15-minute pizza delivery and 2-minute noodles to name but a few. In order to be successful, new communication services must complement this world. The concepts of information-push vs. information-pull become useful with the added dimension of time. Advertising is as an example of these concepts. Information-pull takes place when the user requests a service or information at a specific moment. The user might request information on stores selling specific products on special. Information-push occurs when the user allows permission for advertisements to be sent to their mobile at any moment.

3.4.3 Me Component

As individuals, human beings still need to belong to a community. Needs such as a sense of belonging, being loved, being respected and listened to, are very important. Users want to customise their mobile world, being able to decide what services to use and who to share them with. Understanding this human element can create winning services. The opposite is also true – not understanding this element will lead to no interest being shown in the services. A current example is personalised ring tones for mobile phones.

3.4.4 Money Component

This is the most basic of the elements as the services must generate money. Additionally, the services must be billed otherwise there would be no sense in the operator offering the services. The party who is billed will not always be the user of the services. The user might be billed for information–pull services, but information–push services will most probably be paid for by the sender. With planned new technologies, mobile devices have the potential to create a world without cash. The billing services which are already in place with mobile operators, lend themselves to use by all other new incumbents to the industry. A content provider could bill the user via the mobile network operator for downloading specific content.

3.4.5 Machines Component

In order for any service to be utilised, there has to be mobile terminals to support them. Services that require elaborate graphic displays will, for example, need terminals with large, high-resolution screens. Machines are not limited to mobile terminals; they could also include any other support equipment as required by the service. Additionally, the availability of terminals which operate according to specification does not guarantee the success of the service in question. Services that are marketed to the youth-end of the market, but require high-end terminals, will not prove to be very popular. High-end terminals are those handsets which contain all possible features that the particular handset has to offer. This means that the price of the handset will be more compared to similar handsets with fewer features.

The originators of the 5M method found it to be useful in determining the popularity of services in the UMTS environment.

3.5 Assessment of Threats and Opportunities

Technological innovations present opportunities as well as threats to the company's profitability and in the long term, its survival. Bearing in mind that the mobile communications market consists of many companies, these effects could also be extrapolated to the market as a whole. Consequently, it is important to be able to identify such technological innovations in good time by applying some structured method as opposed to a random investigation. Furthermore, following identification of such innovations, a structured method should also be followed when introducing the innovative technology into a market. The purpose of the model developed by this dissertation, is to present a structured method to identify the critical success factors for the introduction of Mobile Data Services into the South African market. Prior to creating a model for the introduction of technology, a clear understanding of the aspects necessary for conducting a technological assessment of a market is required. This understanding will provide important guidelines to the creation of a model for introducing technology into a market based on components of the assessment.

Du Preez and Pistorius proposed (1999) to use a two-pronged approach for assessing technological threats and opportunities in a market, as can be seen in Figure 21 [15]. A succinct discussion of the Du Preez and Pistorius model follows and will be enhanced in later sections of this chapter with relevant information obtained from additional sources.

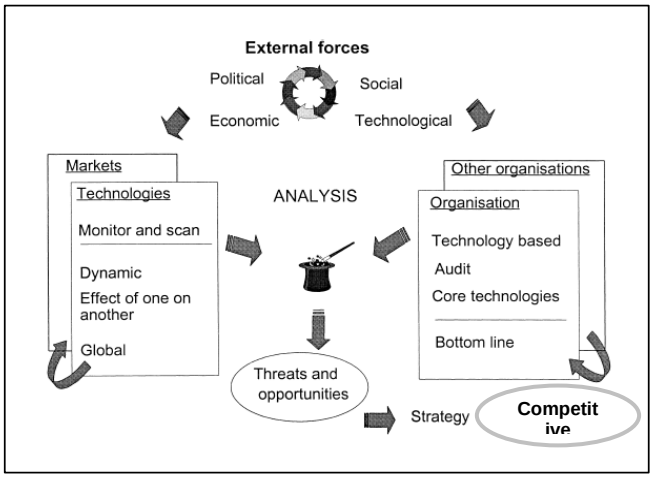


Figure 21: Technological threat and opportunity assessment model [15]

An important component within the Technology dimension is *Monitor and Scan*. Rapidly changing global technological landscapes require monitoring and scanning of relevant technological developments. The Du Preez and Pistorius model binds Technology and Market Trends together in a two dimensional domain seeing that the success of innovation consists of technological and commercial components. The importance of this component lies in the fact that scanning should be done in a broad sense, as paradigm-shifting innovations occasionally emanate from industries other than those currently under observation. This Market Trend and Technology component can also be affected by political, economical and social factors. The model would not be accurate if these trends cannot be translated into technological impacts.

The second part of the model concentrates on the organisation itself and determines potentially influential technological developments. Additional component to the model such as competitors, partners, suppliers and distributors which have a direct influence on the organisation, is also included. In later work, Du Preez and Pistorius analysed the technological threats and opportunities for wireless 2.5G and 3G data services [16]. Since the focus of that analysis was on wireless data services, it is important to scrutinise the methods used and the results thereof as they have a direct input into the model constructed in this dissertation.

3.5.1 Causal Models

Technological progress is affected by generalised uncertainty and more specifically by lack of understanding of the cause-effect relationships which exist in the telecommunications market [15]. The causal model attempts to clarify uncertainty by identifying factors which drive change. Such factors are normally more stable in the short term, which results in a more reliable analysis of the dynamics of technological change. Causal models also provide a unified vision of the technological, social, political and economical forces which affect technological development.

3.5.2 Correlation Models with focus on i-Mode

These models refer to the correlation or relationship existing between technological change and some or other factor(s) such as the number of publications on a specific

subject. Porter states that bibliometrics can be used to "…*measure and interpret scientific and technological advances*" by using "…*counts of publications, patents or citations*…" [46]. An example is the lead-lag correlation that representing a time-based relationship, between experimental demonstrations of a technology and the commercial launch thereof, for instance the wireless data services market in Japan compared to South Africa. A more specific example is the i-Mode service offered by the Japanese operator, NTT DoCoMo. This is the largest mobile operator in Japan and is one of the leading global operators insofar as development of innovative services are concerned. i-Mode is a low speed packet switched protocol, which accumulated 10 million users in the first 18 months after launch [39]. Although the two markets have very different characteristics, some success factors of i-Mode could still be considered [39]:

- Price – i-Mode base subscription is 300 yen (about R19.37 on 13/04/2003) per month with 0.3 yen per packet. [43]
- Ubiquitous service – always available without long setup times to connect
- Handset features – small, inexpensive, feature rich, large screens promoting ease of use
- Numerous applications and services available to i-Mode – content and service providers offer rich content and services due to economic incentives

Some of the Japanese market issues which also contributed to the success of this service are [39]:

- i-Mode is used in "niche times" where commuters use this service while spening time on public transport, especially on the subways [59]. This means that markets with a strong commuting culture (e.g. Germany) will be well suited for the introduction of i-Mode. The opposite is true for markets with a strong automotive culture (e.g. South Africa), until voice activated terminals and services are available.
- Most i-Mode users are in the youth market, using email as the killer application. This is comparable to SMS usage in the GSM markets.

- Fixed vs. wireless Internet access – Japan has a relatively low penetration of wireline Internet access with the majority of subscribers belonging to the mobile networks.

The success of i-Mode in the Japanese market has prompted other operators to jump on the bandwagon. The following operators have also opted for i-Mode:

- Japan – NTT DoCoMo
- Netherlands – KPN Mobile
- Belgium - BASE
- France – Bouygues Telecom
- Germany - EPlus
- Italy – Telecom Italia Mobile
- Taiwan – KG Telecom
- Spain – (planned) Telefonica Movilles Espana

3.5.3 Competitor Analysis

Competitor analysis positions the organisation to best react to possible threats and opportunities with relation to its competitors. This is confirmed by Porter when he states that a company "*…needs to understand its position vis-à-vis its competitors to exploit potential opportunities and to avoid damaging head-to-head competition.*"[46]. Paradigm shifting innovations are unlikely to come from direct competitors, inside the main industry. It is thus essential to analyse potential competitors. In the world of mobile network operators, competition in mobile data services will not only originate from other mobile network operators, but also from device manufactures who now compete for mobile portals. Although mobile network operators have established payment mechanisms, they face potential competition from banks.

Additional competitor analysis can also be done with the Competition Triangle model as suggested by Ahonen [2]. This model consists of three dimensions (see Figure 22):

- Customer Excellence
- Technical Innovator
- Price Leader

A common outcome of competitive situations is the emergence of three dimensions of perceived excellence as assigned by the marketplace based on communication and actions of market incumbents [2]. Furthermore, Ahonen states that in most instances, different market participants will dominate each of the dimensions of competition. In rare cases one participant might dominate two dimensions for a limited period of time. An area called the Zone of Mediocrity, exists between the three dimensions. A market player which operates in this zone has an average performance on all dimensions but excels in none. This is a dangerous position for a market player to operate in a competitive sense.

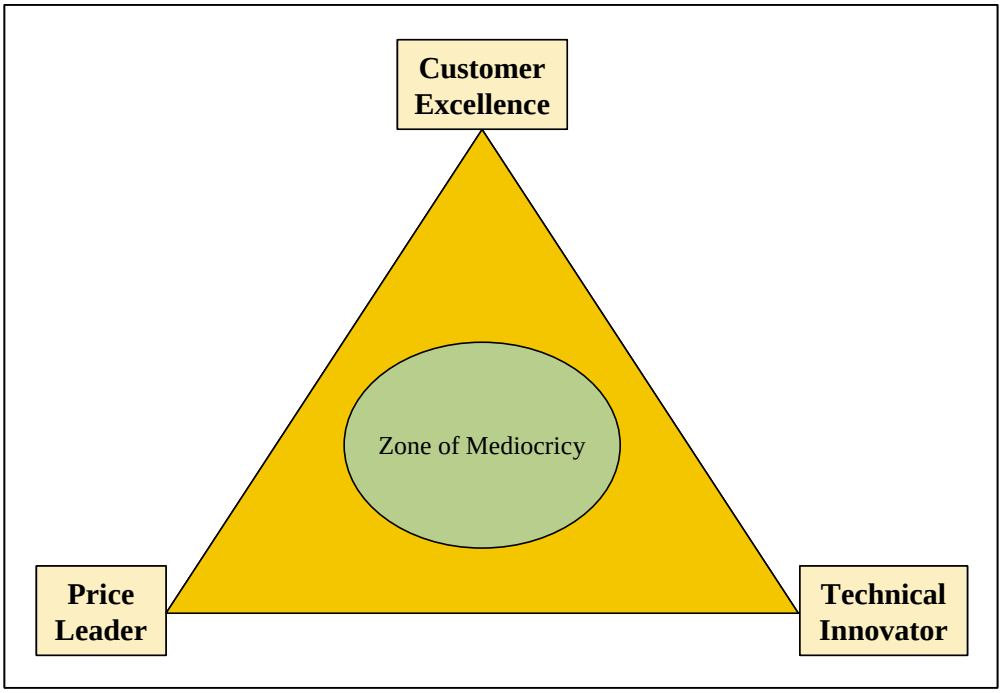


Figure 22: Competition Triangle [2]

3.5.4 Industry and Sector Analysis

The birth of a new industry is often followed by a phase of vertical integration and as the industry matures, this changes into a phase of vertical disintegration. Du Preez and Pistorius uses the example of the automobile industry to demonstrate this point: "*…for example, in the 1920s, Ford acquired forests, mills and rubber plants for the supply of wood and tyres for its vehicles. Over time, this industry has become vertically disintegrated with Bosch, as an example, supplying electronic parts to a range of different manufacturers.*" [16]. Another example can be seen in the mobile industry in South Africa. Mobile network operators have development capabilities for applications and services in-house. When a more mature stage in the industry has been reached, such activities might be outsourced. This is in line with the business models proposed by the UMTS Forum and the i-Mode model used by NTT DoCoMo [20, 66].

3.6 Mobile Industry Value Chain

One of the objectives of the research was to identify a competitive advantage in the relevant markets through the application of a strategic business model. In order to understand the sources of competitive advantage, it is necessary to examine the value chain for the mobile communications industry. Porter confirms this when he states that the value chain can be used as "*a systematic way of examining all the activities a firm performs and how they interact"* in order to analyse "*the sources of competitive advantage*." [48] Additional to the value chain, "*the structure of the mobile data industry will have significant implications for the types of services that are provided, the cost and prices of those services, and in turn the eventual success of the deployment of this new technology*" [34].

3.6.1 Changing Value Chain in the Mobile Industry

A simple indication of the changes that are expected to take place in the value chain of the mobile industry is presented in Figure 23 [63, 65, 67]. Several research reports indicate that the basis for these changes is rooted in the addition of new entrants (e.g. multimedia service providers) to the value chain providing new services (e.g. multimedia content services) [67]. It provides a hint to this industry that its position towards services, content and applications will be different in future. All the areas except Network, will grow and become more prominent. This forecast fits in well with the business models proposed by the UMTS Forum [66].

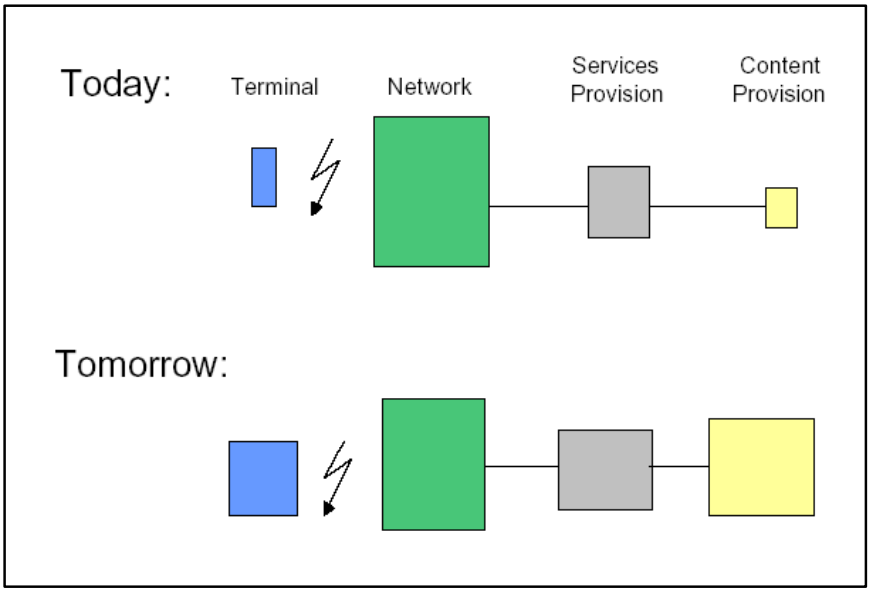


Figure 23: Changing value chain in the mobile industry [67]

3.6.2 3G Value Chain in the European Mobile Market

Maitland provide a more detailed description of a value chain in their discussion on the European mobile data market [34]. Since the mobile data services market could emerge as a result of the convergence of mobile telephony, data communications, and features of the Internet, the new value chain should be built up from elements of value chains from the mobile voice and Internet industries. The simplified value chain of current 2G markets is presented in Figure 24.

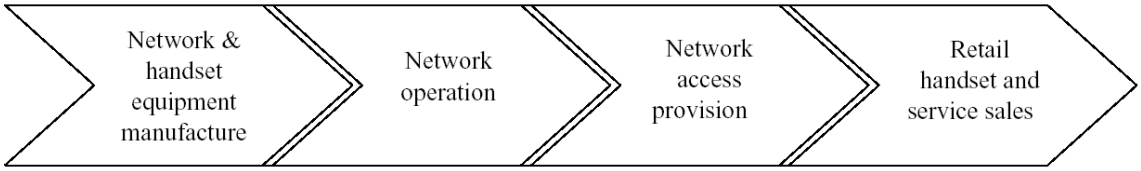


Figure 24: Value chain for 2G mobile telephony [34]

The value chain of the complete Internet industry is very complex. Some of the functions that are important to mobile data services are website hosting services, content and possibly infrastructure provisioning. Due to this complexity the value chain of a sub-sector of the Internet industry, simple dial-up Internet is presented in Figure 25.

Figure 25: Basic dial-up Internet value chain [34]

Simply combining the service-orientated elements of the *Mobile Voice* and *Internet* value chains, results in an inaccurate picture for the provision of Mobile Data Services. The elements of *Application Development* and *Provisioning* must also be considered. Such functionality could be provided by enablers, which are companies that bring together equipment, applications and services [34]. The expected increased importance of such enablers in 3G, are highlighted in the value chain in Figure 26, when they are subdivided into the three main areas. The fact that provisioning and development are explicitly separated for enablers, suggests prospects for niche market portals to develop.

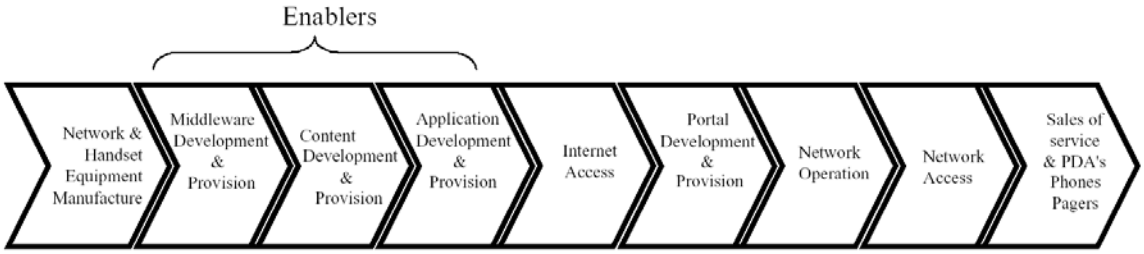


Figure 26: 3G Value Chain [34]

The proposed model by Maitland [34], is supported by the UMTS operator value chain presented by Ahonen and Barrett [2]. As seen in Figure 27, the elements in the traditional industry value chain are becoming much more vague. The traditional roles of incumbents are changing. It is expected that the UMTS operator will expand its domain into new regions of service distribution channels. The capabilities and strategy of the operator will be the determinant factor as to how far this expansion will occur.

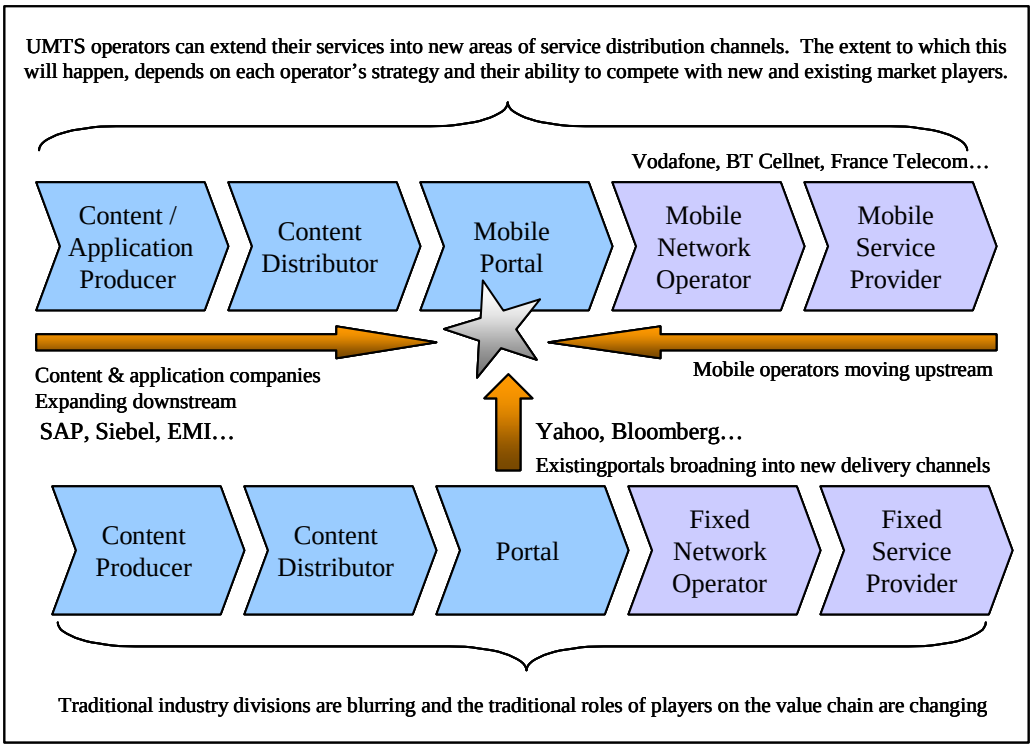


Figure 27: Vertical Integration of Value Chain by UMTS Operators [2]

The rapport between the main stakeholders in this value chain exemplifies the concept of value creation. When focussing on the area of mobile data services, Olla and Patel suggest the concept of a Mobile Data Service Provider (MDSP) as modelled in the UK market in Figure 28 [44].

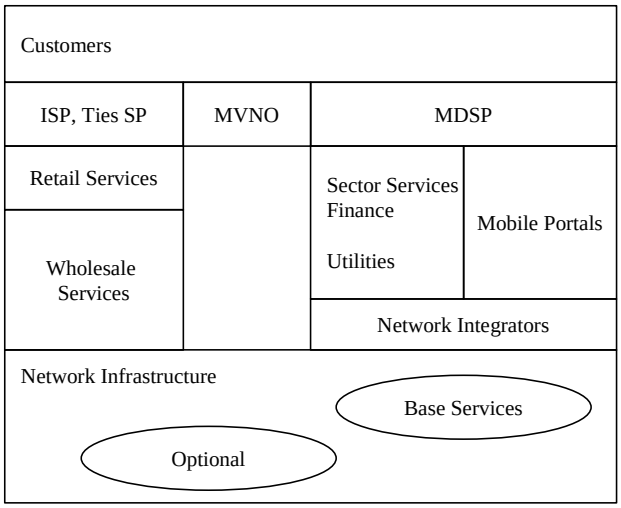


Figure 28: Proposed model of the UK mobile market [44]

They propose that a MDSP could be an existing network operator. Such an operator would provide access to data application for data transmission as well as mobile portals with content providers. This concept is supported by Fife when she describes the primary role of the mobile operator as being that of a coordinator of activities between network suppliers, content providers and others [20]. The concept is modelled in Figure 29.

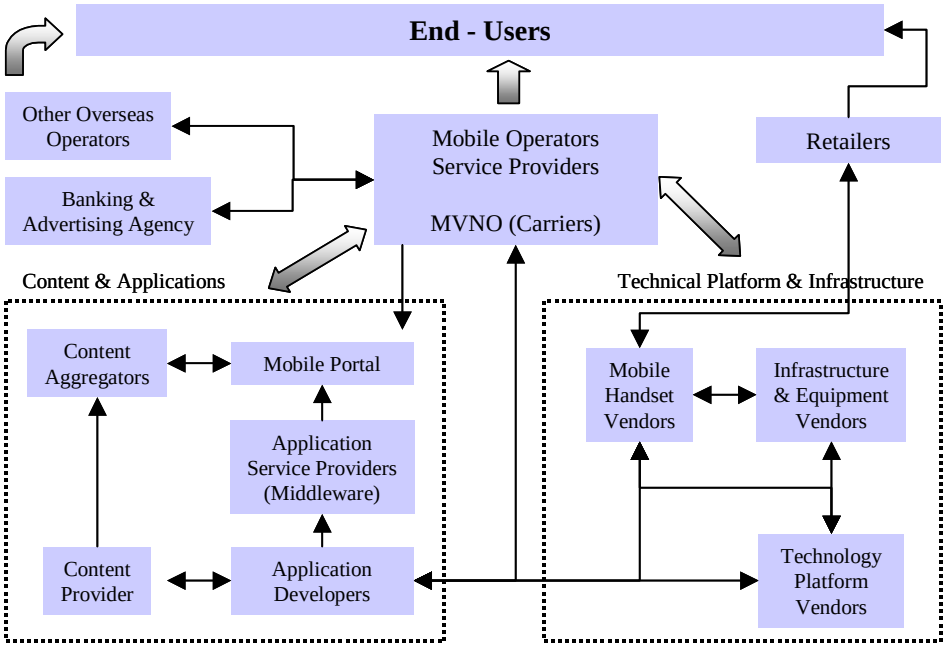


Figure 29: Coordinating Role of Operator in Mobile Industry [20]

The concept of mobile portals is expanded in a following section on UMTS Forum business models.

3.7 Driving Forces in the Mobile Market

Maitland identified the driving forces in the mobile market discussed in this section [34]. Although the mentioned factors are discussed specifically for the market in the Netherlands, it is still of value to this research as the South African mobile market is generally a few years behind the European market.

3.7.1 Economic Factors

It is expected that the financial situation of operators and equipment suppliers will be one of the main economic factors affecting industry growth. This situation can partly be attributed to expansion strategies as a result of increased competition in the 1990s. The high cost of UMTS licences combined with a downturn in the economy, left companies stretched for financial resources. Besides the operators, equipment suppliers have been adversely affected by the resulting downturn in the telecommunications industry. This in turn affects the operators in so far as acquiring finance is concerned. In the past, equipment suppliers assisted operators in acquiring the necessary finance. The present financial situation of equipment suppliers does not allow for such assistance anymore. Furthermore, the ability of equipment suppliers to meet certain delivery dates is now also in doubt. The delivery of equipment could be postponed due to the lack of financial resources to expedite trials and resolving technical problems in the required time span. Also, there is uncertainty as to the revenue streams that will be generated by the proposed new services. The uncertainty stems from doubts whether the technology will be able to support such services and more so the ability to produce the required capacity. The level of demand and profitability of the services also remain unanswered questions, which adds to the financial pressure on operators to recoup the large investments.

Overall economic growth in South Africa is expected to average out at about 3.2% (real GDP growth) over the next few years up to 2007 [37]. The reductions by the South African Reserve Bank in prime lending rate in the past year (2003), combined with expectations of further reductions during the rest of the year, will stimulate economic growth. This will result in individuals having more disposable income available.

There has been a decline in the telecommunications market growth during the past few years. There are various reasons for this down turn in growth, one of which is the fact that Mobile Network Operators (MNOs) in South Africa are not interested in the implementation of 3G networks at present. Industry experts indicated that such networks would not be implemented for at least six years. This means that MNOs have no reason to invest in new network infrastructure for at least six years. Since there are no requirements for more network infrastructure, Vendors are experiencing a decline in revenue from such significant sales. Furthermore, such declines in both sales and the shareholder's profit expectation, leads to decreased budgets, which increase pressure on Vendors to implement cost saving measures.

The fact that the Mobile Data Services (MDS) is still very new to the market and still has an unproven track record increases hesitation for investment. Uncertain revenue streams for Mobile Data Services coupled with micro revenue on sale of such services contributes to the mentioned hesitation. Vodacom devised their WASP model, where they invite external companies to develop Mobile Data Services and then to connect to the Vodacom network to access their subscribers. In effect this means that Vodacom shifts all the risk of new Mobile Data Services to other companies while they benefit from the additional traffic that could be generated on their network.

A factor that provides insight into the economical factors that form part of the driving forces of the market in South Africa is the level of the Socio-economic Infrastructure: This factor provides an indication of the strength of each nation's educational system, mobility of capital, and encouragement of foreign investment [47]. The functioning of a modern, technology based industrial nation requires the support of the social and economic institutions which support and maintain the physical, human, organizational, and economic resources. The Socio-economic Infrastructure level for South Africa has shown notable decline. Figure 30 indicates the levels of Socio-economic Infrastructure in a set of countries.

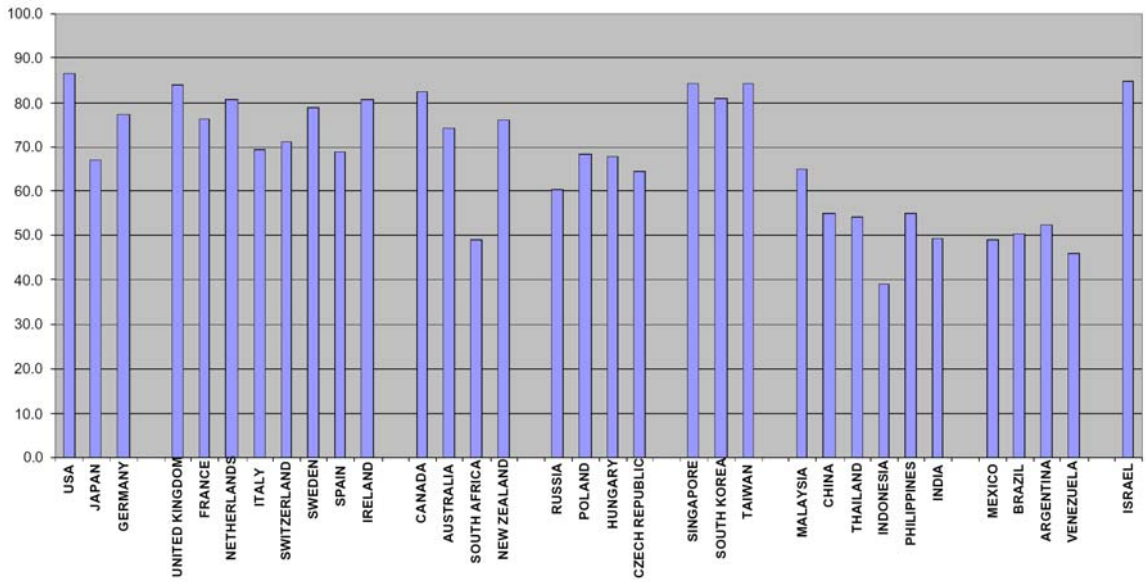


Figure 30: Socio-Economic Infrastructure Countries 2003 [47]

Another measure that sheds light on economical factors is that of the *Technological Infrastructure* in South Africa. The *Technological Infrastructure* is an indication of the ability of a nation to develop, produce and market new technology [47]. Elements to consider under this concept are those of economic investment and social support for technology absorption and utilization. Additional elements are the availability of physical and human capital to develop, produce, and market new technology such as Mobile Data Services. The *Technological Infrastructure* levels for all countries are graphically depicted in Figure 31.

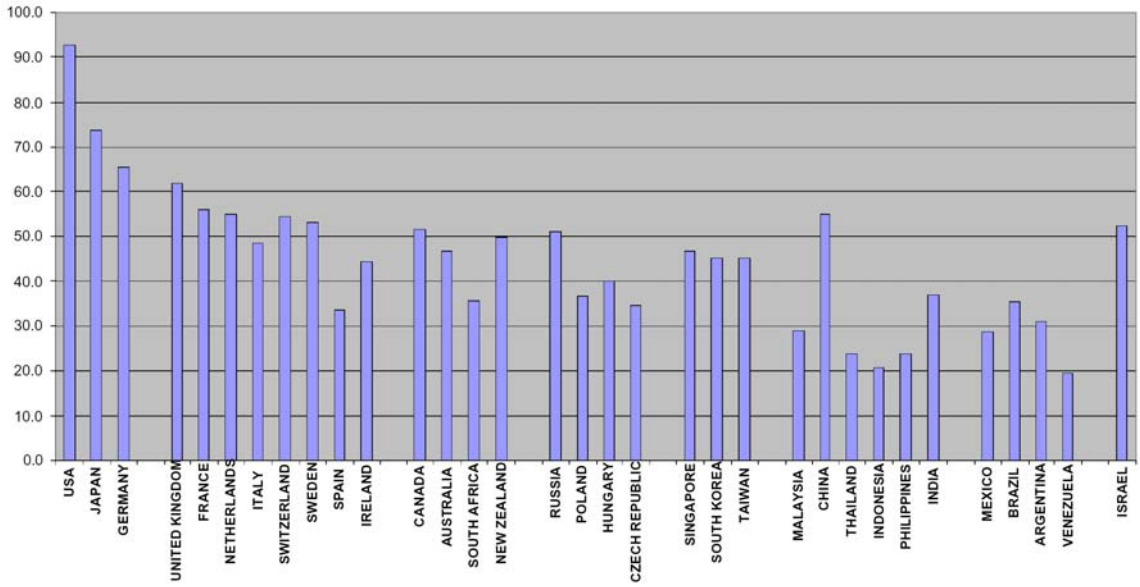


Figure 31: Technological Infrastructure of Countries 2003 [47]

3.7.2 Regulatory Factors

The direction in which the market is heading is to some extent determined by the licensing of spectrum, the timing thereof and the terms and conditions of such licences. Two factors that are expected to play a more dominant role in future are competition policy and access regulation. Market distortions due to complete dominance are corrected by the competition policy. Equipment sharing might lead to circumstances where the thresholds of competition are exceeded. A safeguard that is used in industry to handle such circumstances is the requirement for provision of open access to facilities that prove to be a constraint. This requirement can be used in instances where some operators have complete dominance of critical network elements.

The government has indicted that it will review the telecommunications policy in order to facilitate competition and promote convergence of technology and services. This will be done via the Convergence Bill. Current vertical licensing could be replaced by horizontal licensing. This will enable current restrictions on the market to be lifted or at least alleviated. An example is the provision of Voice over Internet Protocol, which could be licensed separately from normal voice services. The pace of market liberalisation is, however, something that is seen differently by market incumbents.

Current incumbents with large legacy systems will find it more difficult to adapt to changes in licensing regulations. Even relatively new market incumbents would pay close attention to the huge capital investments made in the market. Such incumbents might prefer the current status quo to continue, at least in the short term. This view could be held even stronger by market incumbents who have not joined the market yet and are still in a tendering phase. An argument that could possibly be put forward is that if regulations change in the mean time, the conditions would become different to those existing when such market incumbents were invited to tender for certain contracts. The regulatory body is faced with some problems. Questions have been raised as to its independence since it still reports to the office of the Minister of Communications. Regulatory responsibility is also not solely centralised in ICASA, but shared with the Ministry of Communications. This means that ICASA is in a position to propose regulatory guidelines as long as they are in line with the current political vision. The regulator is also seen to have a resource-intensive regulatory framework. This is not so much in monetary terms but in terms of skills and power vested in the regulator. The regulator has experienced a high staff turnover, which means that the skills and administrative capacity is lacking in order to maintain stability and effectiveness within the regulator. The telecommunications legal framework is vague and very open for interpretation, which allows for operators to continue challenging rulings made by ICASA. The sustainability of the telecommunications sector is greatly impacted by the policy choices made by government. The way in which government plans to generate revenues from new licences will have a direct impact on the demographics of the market. Once-off licence fees will lead to a smaller and thus more restricted market. A more open market with vibrant competition could be engineered by funding of universal services while earning revenue from tax over the longer term generates sustainable continuous revenue [71].

3.7.3 Technical Factors

The aforementioned two factors are essential elements in understanding the model of market forces, but ultimately development of the market relies on the success of technology. As seen in Figure 32 certain key factors constitute the technical driver. New technology and more specifically, UMTS, are ground breaking and thus hold technical challenges in the successful deployment of such technology. The composition of the technology requires more radio cell sites, which in itself poses additional complexity in the planning of such sites. Tools, which will enable planning of such events, are still in development. Due to the enormous investments required to deploy UMTS, it would be worthwhile to explore cost saving options. One such option that presents itself is sharing of certain network elements among different network operators. This option is, however, faced with the technical challenge of network equipment interoperability. Additionally, a high level of quality, which in this instance refers to capacity, must be maintained by mobile data services. The usual known problems experienced in signal propagation from the terminal to the base station will have to be solved or minimised to an acceptable level of quality.

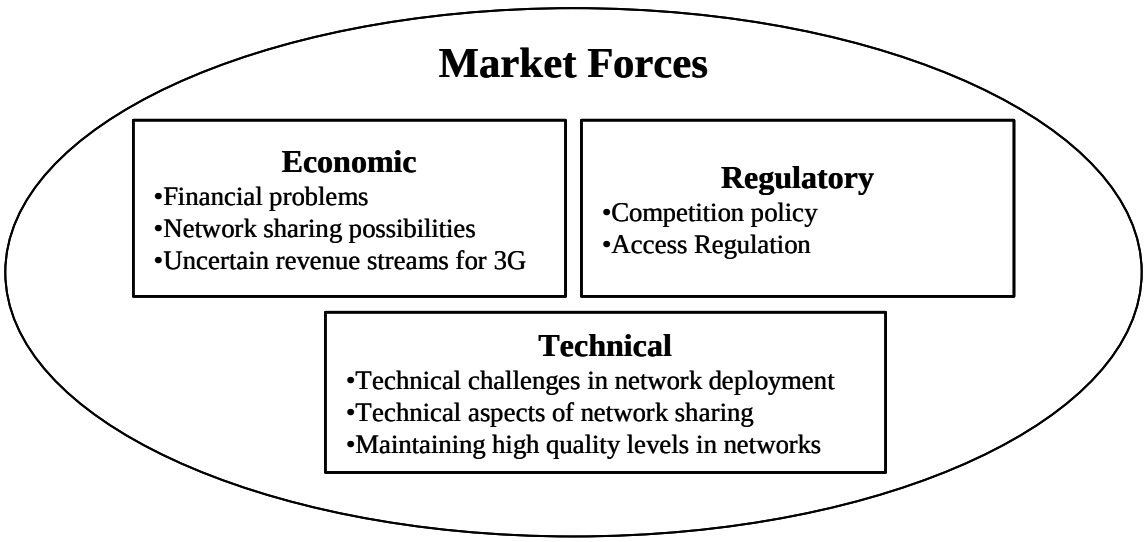


Figure 32: Market forces in Dutch mobile industry [34]

One of the more recent technological indicators of the possible outcome of the introduction of Mobile Data Services was that of Wireless Application Protocol. This

technology was not utilised as expected by the end users. Reasons for this negative occurrence vary depending on the point of view (place in the value chain) of industry experts. WASPs mention that the marketing of WAP was a disaster in the way that technology was marketed to end users instead of the services offered by technology. The general consensus is that end users of technology are not interested in the technology itself but only in the value it can bring to them, i.e. the services. A more technical view on the success of WAP is the argument from some Vendors that access speeds of WAP was very low. This was a result of WAP being transported on a Circuit Switched Data bearer instead of on a Package Orientated bearer such as GPRS.

Industry experts believe that the success of GPRS in the market will determine the interest of Mobile Network Operators in UMTS technology. GPRS, although not a new technology in South Africa, has still not conclusively proven its success in the market.

Should the uptake of Mobile Data services by End Users be high, it will result in a higher strain on the current network infrastructure. The higher strain on radio resources could result in quality problems of the link between the Mobile Device and the Mobile Network. Lower levels of quality are more easily forgiven by voice services as is the case for data services. A loss in some bits during the download could render the data useless. Mobile Network Operators have already experienced additional quality problems from the limited amount of spectrum that is available in the 900MHz band. The introduction of the third MNO and the use of the 1800MHz band alleviated this problem in some ways through sharing of the 1800MHz band by some MNOs. The remaining levels of interference as a result of tight frequency re-use patterns could also provide technical problems to the deployment of Mobile Data Services to some areas.

The *National Orientation* of South Africa, which is the level at which the country is taking action to achieve technological competitiveness provides additional insight into the technical driving forces active in South Africa [47]. The level of *National Orientation* in South Africa is comparable to that found in other emerging economies such as in Brazil and Mexico. The fact that it is comparable does not mean that is acceptable as it is still relatively low compared to other countries. The *National Orientation* of all countries is graphically depicted in Figure 33.

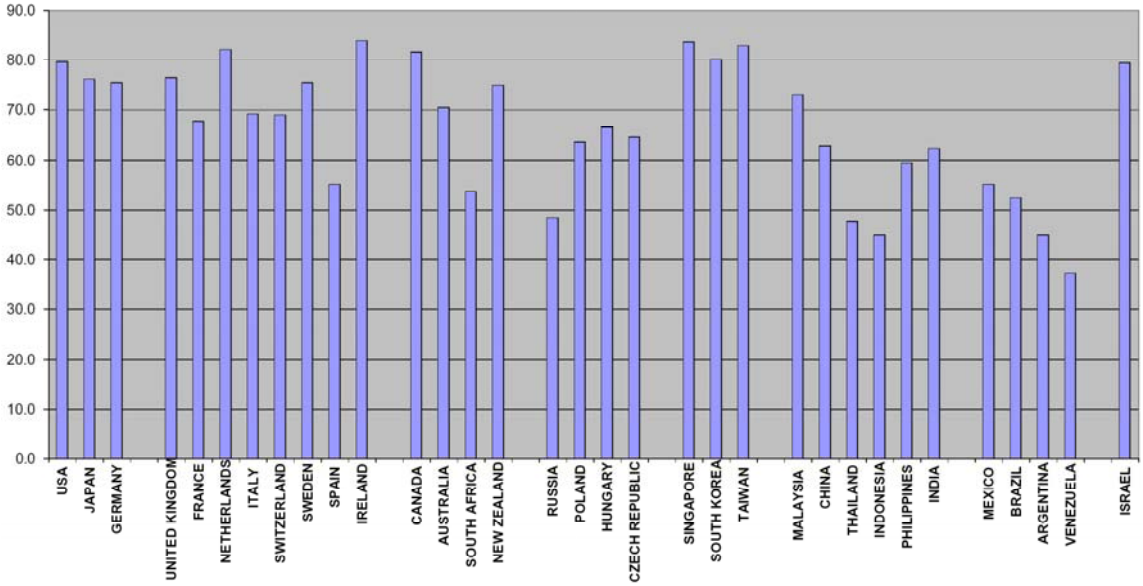


Figure 33: National Orientation of Countries 2003 [47]

3.8 Analysis of Relationships amongst Industry Incumbents

The purpose of analysing the relationships that exist in the industry is to create an understanding of the dynamics of the industry. Once this is better understood, possible opportunities and threats can be identified for the company to exploit. The links between the company and other market incumbents, as well as the linkages between the competitors and other companies are analysed. Such linkages can consist of simple relationships such as buyer and supplier or more complicated relationships such as equity based agreements.

In an effort to have maximum control over cost and quality, a company would ideally carry out all activities in the industry value chain. This is, however, not possible and companies must strive to setup relationships with other companies in the industry value chain in order to create a stream of competencies. This is referred to as *Value Clustering* [4]. *Value Clustering* happens when a company seizes an opportunity in the market by employing a company strength. The company might, however, have a weakness in the specific area where a strength is required. The company then utilizes the strength of another company (in the specific area) in order to seize the opportunity. *Value Clustering* differs from Vertical Integration in the sense that involved companies

stay independent of each other in terms of ownership and line of business. The correct setup of relationships within a set of companies could provide the competitive advantage required to become market leaders.

Besides the impact of new technology, the relationships that exist among market incumbents are important to understand when contemplating entry into the market. Figure 34 graphically depicts the main aspects of such relationships to be discussed. Maitland, Bauer and Westerveld derived the indicated relationships for the mobile market in the Netherlands [34]. The main incumbents discussed in this section are:

- Network Operator (NO)
- Application Service Provider (ASP)
- Content Provider (CP)
- Internet Service Provider (ISP)
- Mobile Internet Service Provider (MISP)
- Mobile Virtual Network Operator (MVNO)

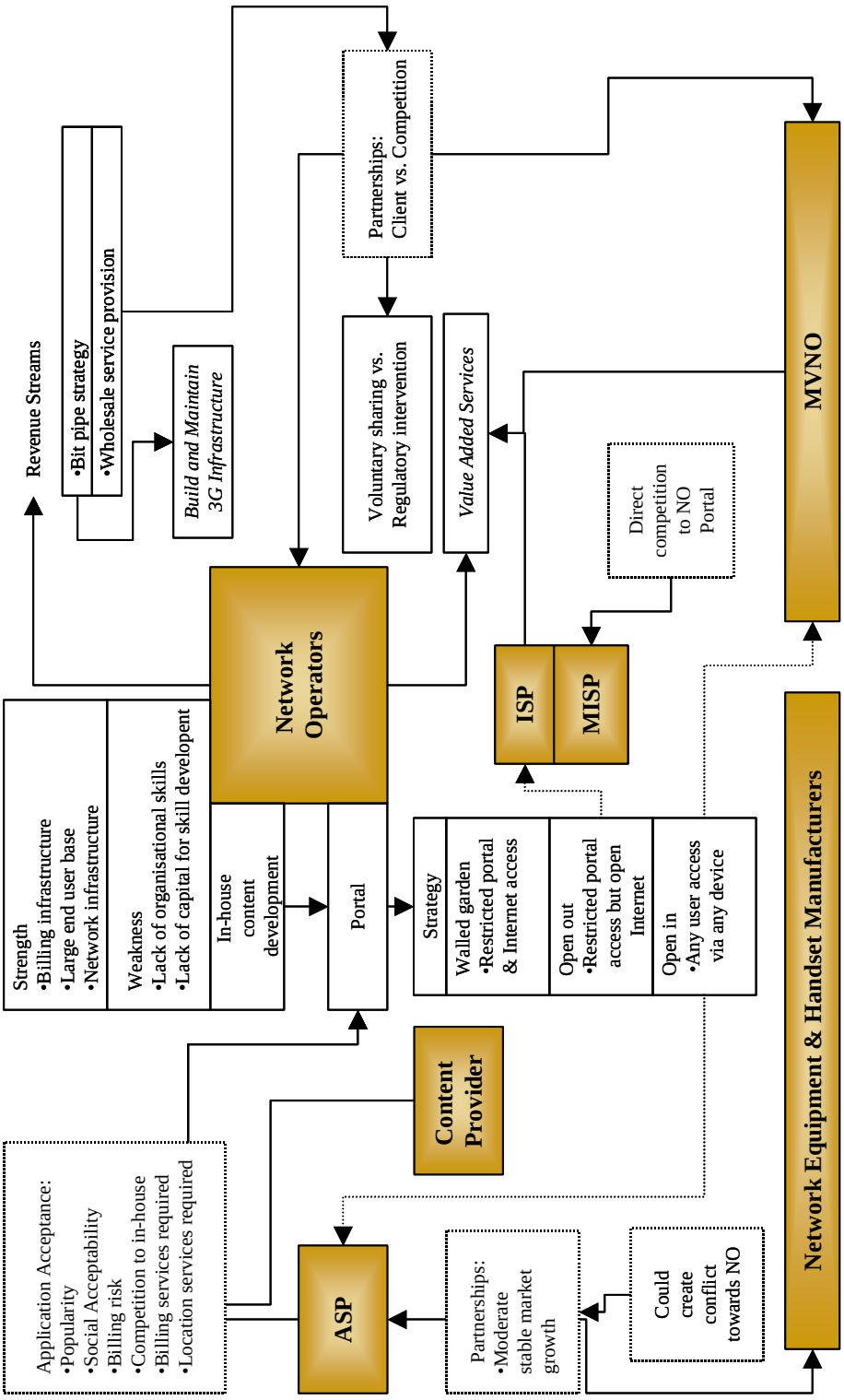


Figure 34: Relationships among market incumbents [compiled from 34]

Main issues that arise when examining current and future relations among the incumbents, are those of the influence on certain incumbents by certain portal strategies followed by the Network Operator. Additionally, the effect of partnerships among some incumbents on others is also discussed. Network Operators are the central point of connection for current incumbents in the market. This position will stay very much the same in the near future. The Network Operator still provides access to the backbone of the mobile network of communication. Operators have in their favour an established billing infrastructure and a large user base. On the other hand, they are not equipped for some of the challenges posed by changes in composition of mobile communication market participants. Besides this lack of organisational skills, their financial state will make it very difficult for them to attain such skills.

A source of contention in future will be the concept of a mobile portal. This portal, which can also be seen as a "gate to the internet" will offer considerable power to the keeper. The operator seems to be in the best position to offer this functionality. The operator can make up the composition of the portal with in-house development of applications or can allow Application Service Providers and Content Providers to fulfil this role. The acceptance of such applications will depend on several factors. The popularity and social acceptability of the application as well as the level of risk involved with billing, or if billing services are at all required, are important considerations. Additionally, the fact that external applications could offer competition to in-house developed applications will also play a role in the decision of the operator when contemplating partnerships with Application Service Providers and Content Providers.

The strategy that the Network Operator will follow will have different effects on particular market incumbents. Application Service Providers will favour the Open-in strategy, where customers from any network are allowed to access the portal from any type of device. Internet Service Providers would rather favour the Open-out approach, as this would allow users to bypass the portal of the Network Operator and connect directly to that of the Internet Service Provider. The walled garden approach only allows users to access content on the portal of the Network Operator, thereby restricting them from wider Internet access.

When entering the Value Added Services market, the Network Operator enters into direct competition with Internet Service Providers (and Mobile Internet Service

Providers) and Mobile Virtual Network Operators. This raises conflicts in especially the relationship between the operator and the Mobile Virtual Network Operators. The issue of client vs. competition needs to be resolved by the Network Operator. By sharing its network with the Mobile Virtual Network Operator, the Network Operator benefits by gaining from the wholesale service provision. On the other hand if the Network Operator refuses to share its network, it could face regulatory intervention. The Network Operator might also decide to pursue a different revenue stream in which it limits its involvement to the building and maintaining of network infrastructure.

Equipment suppliers prefer a moderate but stable market growth. In order to support this strategy, which is, equipment driven, they enter into partnerships with application developers. The partnership can cause conflict with some Network Operators, who do not pursue the revenue stream of the bit-pipe strategy. A bit-pipe strategy means that the MNO only concentrates on providing network access.

3.9 Examining Existing Business Models

Existing business models are the products of analysis which have already been completed by companies and institutions within the industry. It is thus sensible to take note of such information when creating a business model for the introduction of Mobile Data Services in South Africa.

Business models by the Universal Mobile Telephone System Forum

The first three business models were created around the 3G services expected to be most popular amongst users. The aim was to create a "*…framework for categorising and studying the majority of near-term 3G services.*" [66]. The final three models "*…deal with Charging, Billing and Payment Views on 3G Business Models*" [68]. By defining the probable models with relation to payment, related revenue streams can also be exposed.

3.9.1 Mobile Internet Service Provider

This model comprises only of services from an Internet Service Provider (ISP), which provides Internet Protocol network access, and is also referred to as the **Access Focussed** approach. The model is similar to the traditional role of the operator as an access and transport provider. The difference is that the Mobile ISP extends the functionality of the traditional ISP. The provider has a direct relationship with subscribers although typically no billing or content aggregation services are provided. It does this by dealing with roaming users while offering its own mobile Internet services to users on a wireless portal platform. The Mobile ISP can be an existing mobile network operator or a Mobile Virtual Network Operator from the mobile or fixed Internet industry. Revenues are derived from subscription and airtime. The model is aimed at work-at-home professionals and others in sales and marketing as well as families of all age groups. The subscribers are already familiar with the Internet and know what information is available, as well as how and where to locate it. This also implies that users will expect at least the same functionality and speed as they are used to with fixed Internet access. Such subscribers are referred to as being **Internet-**

centric. It addresses anywhere, anytime access to information with the most popular activities being news, email, research, purchases and games. Additionally it contributes to higher productivity and greater information access to mobile workers.

3.9.2 Mobile Portal

The UMTS Forum defines a portal as "… *an entry point to a wealth of information and value added services. Portals can be personalised and are Internet/Intranet-based with browser user interfaces. Portals will deliver content according to the device's characteristics and user's needs*." [67]. This model is also referred to as the **Portal Focussed** approach. A mobile portal is provided including own as well as partner access to content. This means that a Mobile Portal provider provides access to the mobile network and the IP network similar to the **Access Focussed** provider. The Mobile Portal model is different in the sense that its services include access to selected partner content. Such a provider will have the required application platforms available as well as third-party billing. This model involves the mobile ISP (or traditional ISP) in the provisioning and distribution of content. The exact relationship as well as revenue sharing between such parties is uncertain. Revenue is derived from subscription, airtime, transaction fees and advertising. The model, also referred to as being **Mobility-centric**, is aimed at the youth market as well as to people in their middle age. Since their use of the service will be concentrated on voice applications, their requirements for high speed Internet access will be lower compared to the **Internet-centric** users. It focuses on the need to access specific types of information (e.g. financial). The most popular activities are games, news, communicating and purchases. Users of the Customised Infotainment services will be offered the added value of content which is customised to their preferences, interests and location.

Figure 35 indicates a mapping of the three business models to services mentioned in the previous chapter.

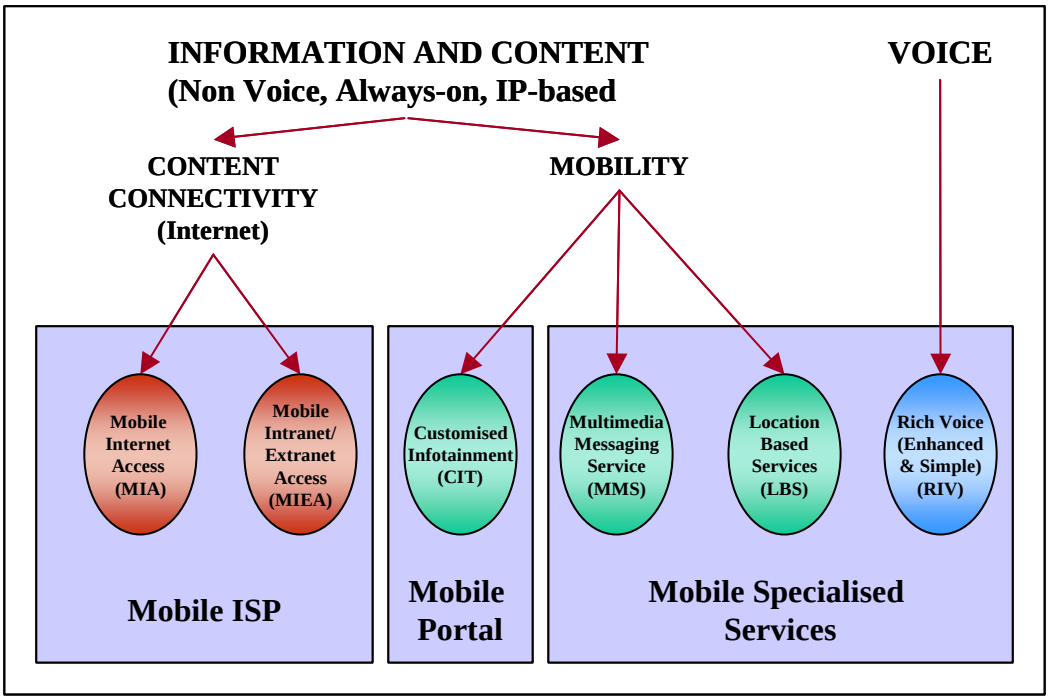


Figure 35: Business Model Framework and Relationship to 3G Services [66]

Three major segments (Content Connectivity / Internet, Mobility and Voice) of mobile subscribers are modelled for the purpose of market potential demonstration, although in actual fact there is no clear separation between such segments. The Content Connectivity (Internet) segment will migrate from the existing fixed line subscriber base only if equal services are available with comparable prices [66]. The Mobile ISP model will offer normal Internet access as well as intra / extranet access. The Mobility segment derives its support from the existing mobile subscriber base. Users will adopt data services although they will not demand full Internet access capabilities. Both the Mobile Portal and Mobile Specialised Services models are applicable to this segment.

3.9.3 Mobile Specialised Services

This model is targeted at a niche market, such as teenagers using Mobile Multimedia Services (MMS). This group is neither Internet nor telephony-based. Only the Mobile Specialised Services model is applicable to this segment. The model is aimed at various age groups. The first is young adults who grew up with the Internet. Their needs around a community of specific interest will be the main social contact. Main activities in this area will be instant messaging used for communication. The second age group is varied according to the service provided. The main needs fulfilled in this particular area will be that of specific location-based information on users' demand. The final age group will be older and more affluent, yet being increasingly younger and falling into the lower income part of the population. Needs such as voice access anytime and anywhere are addressed with the main activity being communication. A specific service set is customised to such a market. Revenue is derived from airtime, subscription and messaging fees. Service providers can offer these services from an **Access** or **Portal Focussed** approach. Figure 36 indicates the different business approaches and the role of other market stakeholders that could be fulfilled in the 3G value chain.

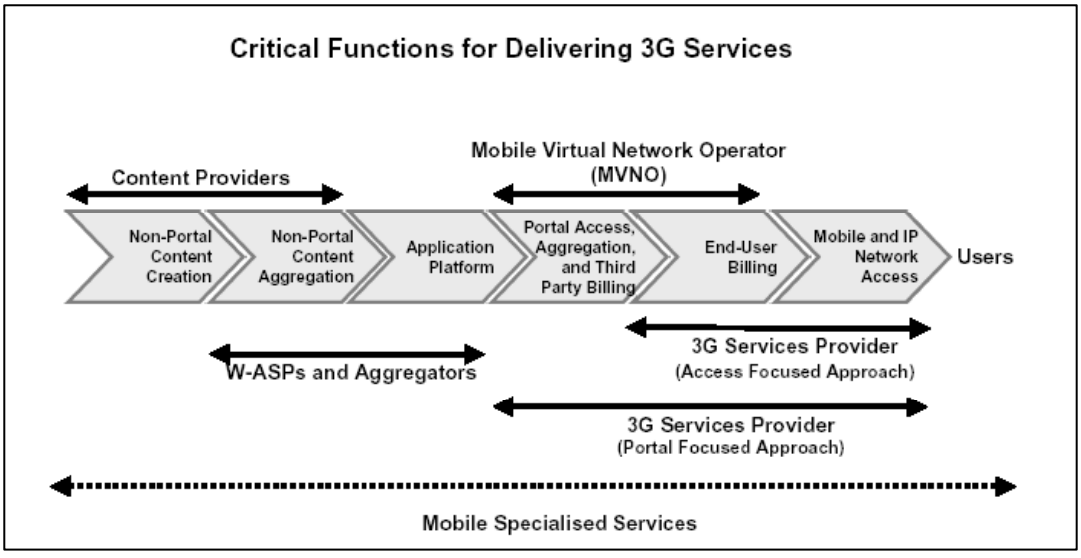


Figure 36: Mapping of Business Models, Services & Devices [66]

3.9.4 Network Operator Centric

An organisation that follows this model will have a strong network operator background in the telecommunications industry. Billing, collection and customer care infrastructure will already be in place in the organisation. The operator would expand business by providing the services of a mobile portal to customers, but without including content in their direct business. As shown in Figure 37, a direct relationship exists between the customer and the operator. The operator determines prices and current billing and collection infrastructure is utilised. Content can be bought from external providers or developed in-house if the capabilities exist. Operators who need to retain customers and increase ARPU will use this model. Services such as MMS, LBS and RIV will typically be offered.

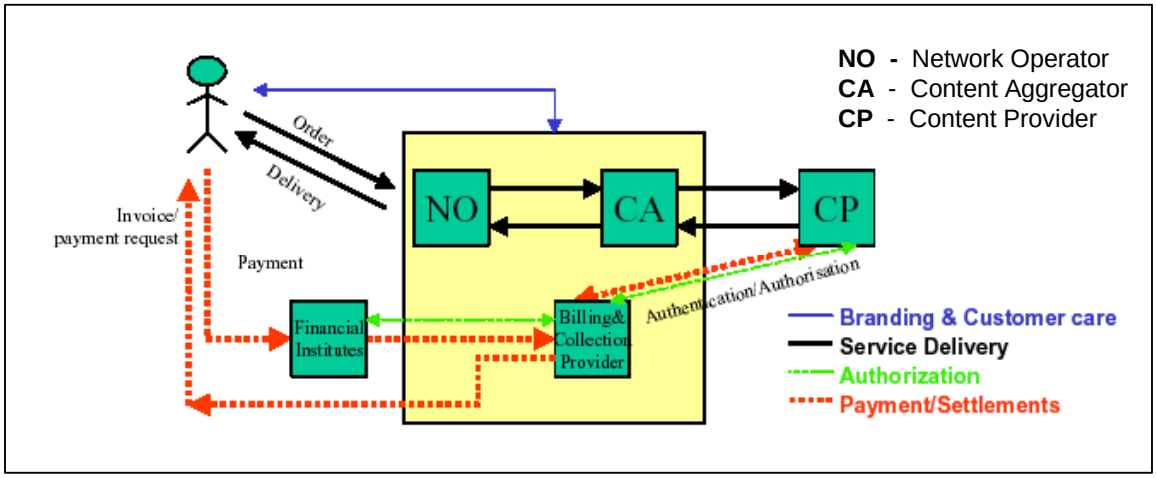


Figure 37: Network Operator Centric Business Model [68]

3.9.5 Content Aggregator Centric

Organisations following this model would have to set up their own billing and collection infrastructure. They should already have some well-established brand name. Such organisations could be from the Internet access service provision market outside the area of telecommunications. A variant of the Content Aggregator Centric model is known as the Mobile Virtual Network Operator (MVNO) model. This model will not only provide access to services via a mobile portal but also value added services additional to access provisioning which includes authentication, security and payment

functionalities. Figure 38 demonstrates that end users have a continued relationship with the network operator, while also having direct contact with the content aggregator. The content aggregator determines the price of content and access charges paid to the network operator. Settlements of accounts will be determined by agreements between the relevant parties. The network operator could, for example, be a central point for accounting. Services that could be associated with this model could be customised infotainment.

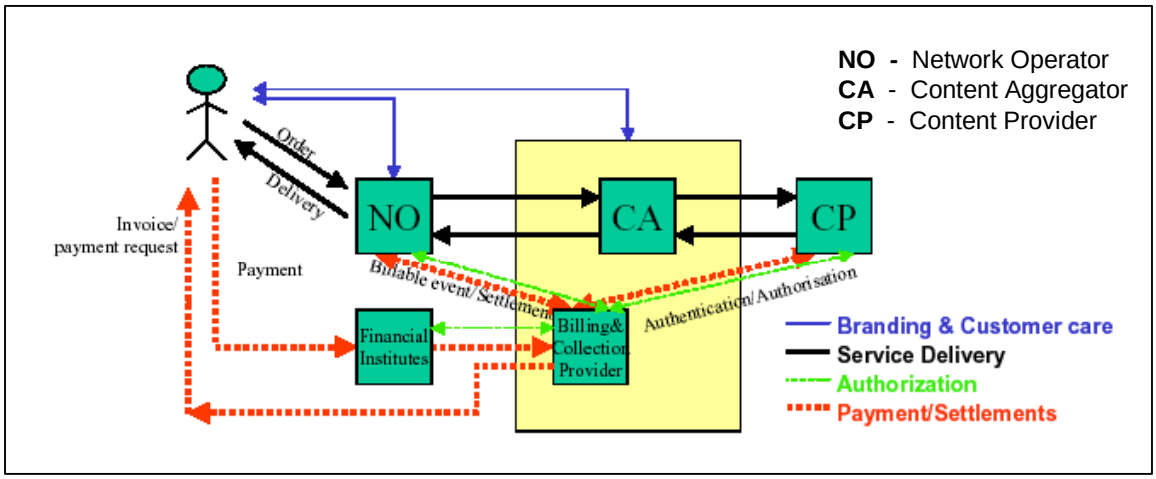


Figure 38: Content Aggregator Centric Business Model [68]

3.9.6 Content Provider Centric

Organisations using this model could be developers or distributors of content. Although this model and the aforementioned model are similar, the difference is two fold. Firstly, the content aggregator would have agreements with several different content providers. Secondly, the content provider could build up a considerable portfolio and thereby align itself to a specific network operator. When in this position, the content provider could grow into the role of a content aggregator. The organisation has created a mobile portal in order to add more value to the business in the industry. The focus of this organisation will still be on content, but direct dealings with the customer is required in order to build loyalty. Due to the diversity in services, it is expected that customers will deal with many different content providers. Furthermore, it is expected that such transaction costs will be quite low. As with the aforementioned model, billing and

collection infrastructure must be set up by the content provider. Figure 39 indicates that payment transactions will take place from the content provider directly towards the end user and the network operator. Services that could be offered by this model include mobile Internet access and mobile intra and extranet access.

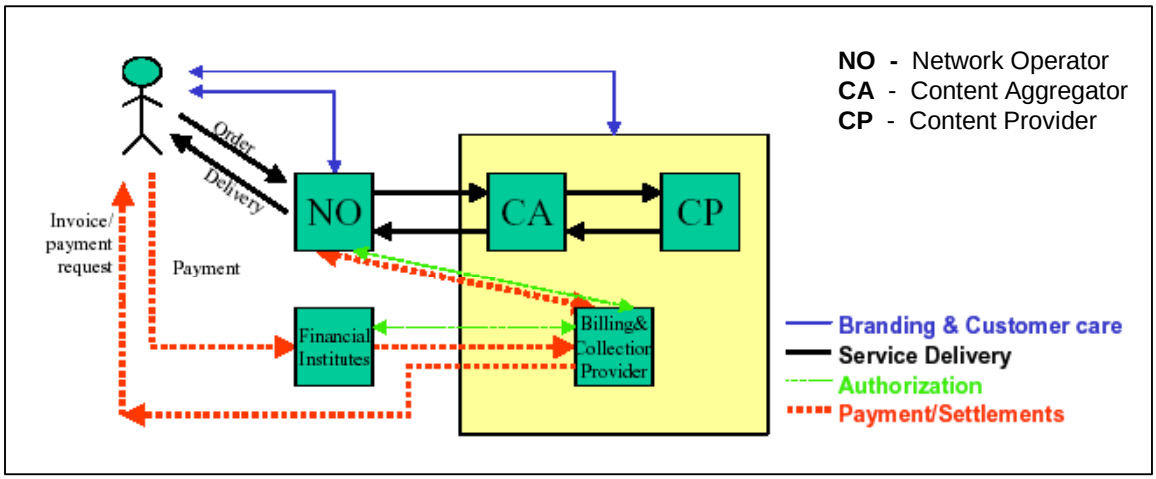


Figure 39: Content Provider Centric Business Model [68]

Business models by the "Telecom Outlook Report on Wireless"

This report was compiled from a survey (2002) which was distributed to international senior-level executives and representatives from academia, government and consulting companies. It covered some of the prominent issues in wireless technology, business models, services and applications [20]. Four possible business models were identified and are discussed below.

3.9.7 Subscription Based Model

Mobile subscriptions are expected to make up for declining Average Revenue Per User (ARPU) levels due to expected increases in such subscriptions. Content and services can be brought to users via subscriptions, which have already proven to be a profitable modus operandi. In order to boost innovative content, service providers should form partnerships with mobile operators and content providers. The viability of the subscription-based model is verified by the iMode service offered by Japan's largest

mobile operator, NTT DoCoMo. The 30 million users pay only for subscription to iMode sites. The mobile operator only earns 9% commission, while the content providers earn the bulk of the revenue. This model allows cost reductions to the mobile operator in areas such as marketing, customer service and billing. This trend, might lead to continuous downward pressures for pricing, which means a continued reduction in revenue. Nevertheless, this model was rated to be the most viable of all four.

3.9.8 Mobile Virtual Network Operator Model

The principal focus of this model is to combine a well-known brand name (e.g. Virgin & Sprint) with an existing mobile operator in order to provide content to subscribers. Industry experts rated this model low on probability of success.

3.9.9 Advertising Based Model

Currently the potential for advertisement through mobile devices is lower than through normal computers. Additionally, questions are raised regarding the amount of wireless purchases. Insufficient purchases will not make economic sense to advertisers. The relation between rewards vs. investment does not seem favourable to the advertising industry. Additional potential problems regarding subscriber resistance to advertising seems to be real. Subscribers will find advertising arduous when responsible for the cost of data to be downloaded. Positive applications of advertising include competitions and promotions, which might be received better by subscribers. Survey participants rated the viability of this model very low.

3.9.10 Community Based Model

This model goes beyond the geographic community as far as regional and even global networks are conscerned. Such models are based on specific purposes or needs. Applications include entertainment, recreation, information exchange and uses in government, health care and education. The viability of this model was also rated very low according to industry experts.

Table 6, below summarises aspects of the mentioned business models.

Model	**Associated Service**	**Application**	**Note**
Mobile Internet Service Provider	MIEA	Provision of mobile internet access	Existing mobile network operator or a Mobile Virtual Network Operator from the mobile or fixed Internet industry
Mobile Portal	CIT	Games, news, communicating and purchases	Provides access to the mobile network and the IP network
Mobile Specialized Services	MMS LBS RIV	Instant messaging & location based information based on user demand	Niche market focused
Network Operator Centric	MMS LBS RIV	Mobile portal without content; billing infrastructure in place	Network operator background
Content Aggregator Centric	CIT	Access to service via mobile portal	Well established brand name / Existing ISPs
Content Provider Centric	MIEA	Content Provision	Model to be used by distributors or developers of content
Subscriber Based Model	CIT	Content & Service Provision	Emphasis of service provision to existing subscriptions
Mobile Virtual Network Operator	CIT	Similar to Mobile Network Operator	Combination of well known brand name with existing mobile operator
Advertising Based Model	MMS	Competitions and promotions	Consumers should not pay for download of advertisement data
Community Based Model	CIT MMS	Based on specific community need or purpose	Entertainment, recreation, information exchange and uses in government, health care and education

Table 6: Summary of existing business models

3.10 Need for a New and Improved Customised Business Model

The successful introduction of a new product must be preceded by careful analysis of the market conditions. The new product and more specifically, the new technology in this case is Mobile Data Services. The market conditions refer to the core elements of influence which exit in the market, which determine the eventual outcome of the product introduction. Such elements formed the key components of the literature study. Analysis of such elements leads to propositions that are made based on dynamics in relationships among elements.

This chapter is focussed on mobile markets outside Africa. Most information is based on European and Japanese mobile communication markets, which are more mature than African markets. Based on size, worth and age, the South African mobile communications market can be viewed as arguably the most similar African market compared to overseas markets in Europe and Japan. It is also a generally accepted fact that the South African mobile communications market is lagging European markets with regards to the introduction of the latest technology.

Due to variations in elements such as demographics, market behaviour towards the introduction of new technology could be very different than is expected in Europe for example. Existing business models have been setup with certain assumptions pertaining to the more mature mobile communications markets in place. Although this might be the case, some of the concepts presented in such business models might still be useful for application in a developing economy with more specific reference to the South African market.

When used as a tool, the business model's strength lies in the ability to plan and focus "*…on how all the elements of the system fit onto a working whole*" [35]. A business model on its own might not be good enough to ensure success. This means that by simply including technological components in the business model, the chances of successfully introducing Mobile Data Services into the market is not maximised. The term business model differs from the term strategy in the sense that it is a system indicating how the pieces of a business fit together. The business model does, however, not "*…factor in one critical dimension of performance: competition*" [35]. Part of a strategy is to describe how the company will deal with competitors by being better and thus different. Berry stresses that in order to gain comparative competitive advantage

"*…firms need to manage technology strategically*" [5]. It is anticipated that by incorporating strategic components into a business model, the critical success factors for introducing Mobile Data Services into a developing economy, can be determined by defining the individual elements of the system, and their interrelationships as well as depicting how a company can be better than its competitors by being different.

The vertically integrated state of the South African mobile communications market will change as it matures. Such changes will also bring about transformation in the structure of the industry. This is another important element of influence in the market that is not included in business models with specific reference to developing economies.

A gap thus exists with regards to a recipe or methodology on how to go about when contemplating the introduction of MDS in an emerging economy. This is especially valid in the emerging South African economy where a new Mobile Data market is emerging within an established mobile industry. This is graphically illustrated in Figure 40.

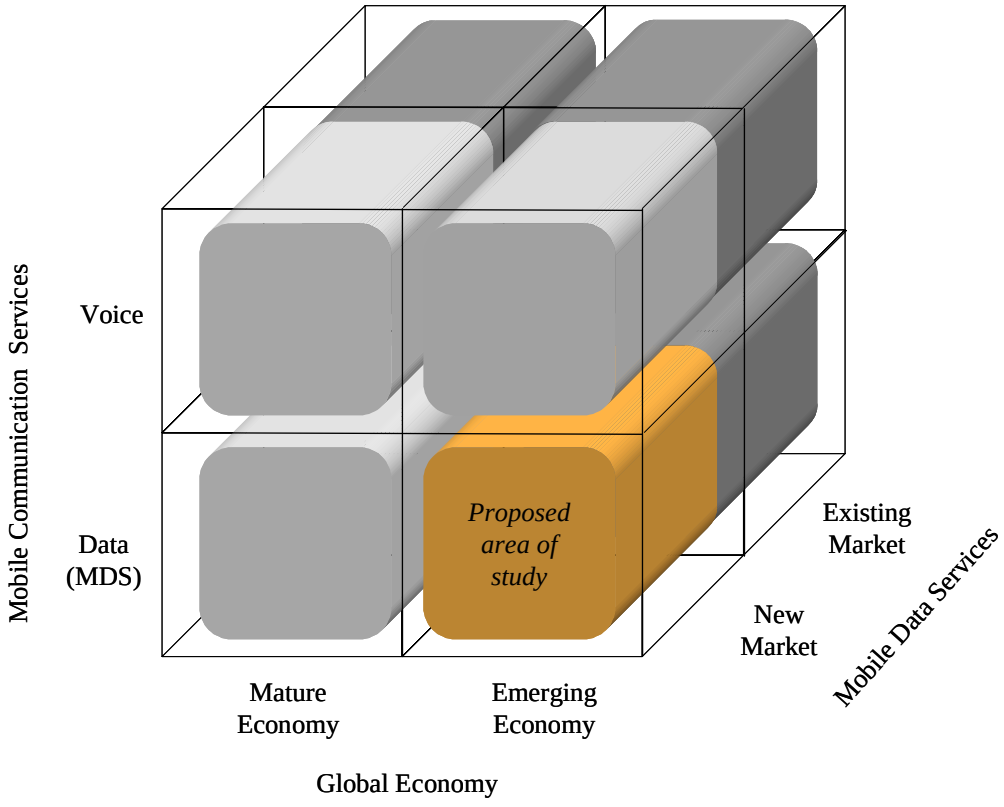


Figure 40: Area of study: MDS in an Emerging Economy

3.11 Conclusions

Existing business models have been setup for mobile data service markets in developed economies. Since the dynamics of such economies differ to those of an emerging economy, it is plausible that the existing models might not maximise the success of introducing MDS into an emerging economy. The results of analysis of key aspects within the developing economy and the relevant industry therein, by means of a customised model based on existing models, would maximise the chances of success of MDS introduction.

It is generally implied that MDS is introduced to markets as a subset of 3G, and more specifically UMTS networks. This is not an irrefutable fact, and could possibly be exploited with existing 2.5G technologies.

Certain core elements of influence exist in a market that, if correctly identified and properly addressed, could ensure the success of the introduction of mobile data services to that market.

It is not sufficient to only define how a business should identify and address core elements of influence in a market when introducing a new product. An aspect of strategy must be incorporated in order to address competition in the market.

4 Mobile Data Services Industry Survey

4.1 Rationale of the Industry Survey

The purpose of the industry survey was to provide insightful information regarding the telecommunications industry perspective on Mobile Data Services. This information could be used in the development of the Mobile Data Services business model. The information gathered was focussed around the following key concepts [7, 31, 36, 40]:

- Industry Stakeholders
- Industry Stakeholder Relationships
- Industry Value Chain
- Driving Forces in the Industry
- Mobile Data Services
- Business Models in the Industry

4.2 Survey Instruments

The instruments of this industry survey comprised two elements:

- Electronic Survey
- Field Interviews with Industry Experts

Questions contained within the Web based survey were setup in sections according to the six key concepts mentioned above. The questions in each section were specifically tailored to generate answers that would provide insight into the practical nature of each concept as seen by the telecommunications industry. The number of respondents who answered the electronic survey was 373. The industry-focussed interviews were conducted with seven key industry leaders in the South African telecommunications industry, which consists of approximately ten core industry leaders.

The purpose of conducting specialist interviews was to be able to compare the opinion of industry leaders with responses obtained from the electronic survey. The interviews

were conducted on the basis of the same questionnaire which was published on a prominent South African ICT website. Appendix A: Survey Questionnaire and Appendix B: Interview Questionnaire Answer Sheet indicates the questionnaire templates which were utilised. Appendix C: Details on ITWEB, the company that published the questionnaire on their website.

4.3 Data Analysis and Presentation

Results of the questionnaires are presented followed by results of the field interviews. The data analyses for both results are presented in five groups according to the six key concepts mentioned earlier. The results of the electronic survey and field interviews are discussed within the key concepts indicated earlier.

4.4 Electronic Survey Results

4.4.1 Industry Stakeholders

Figure 41 represents the composition of the type of organisation that participated in the electronic survey. The figure indicates that Software Application Developers constituted the majority of respondents from a single group with 26%, followed by Vendors with 12%. Companies listed under the label of Other totalled 32% of respondents and were grouped under a single heading since the organisation type of responses were so varied that it was impractical to plot graphically.

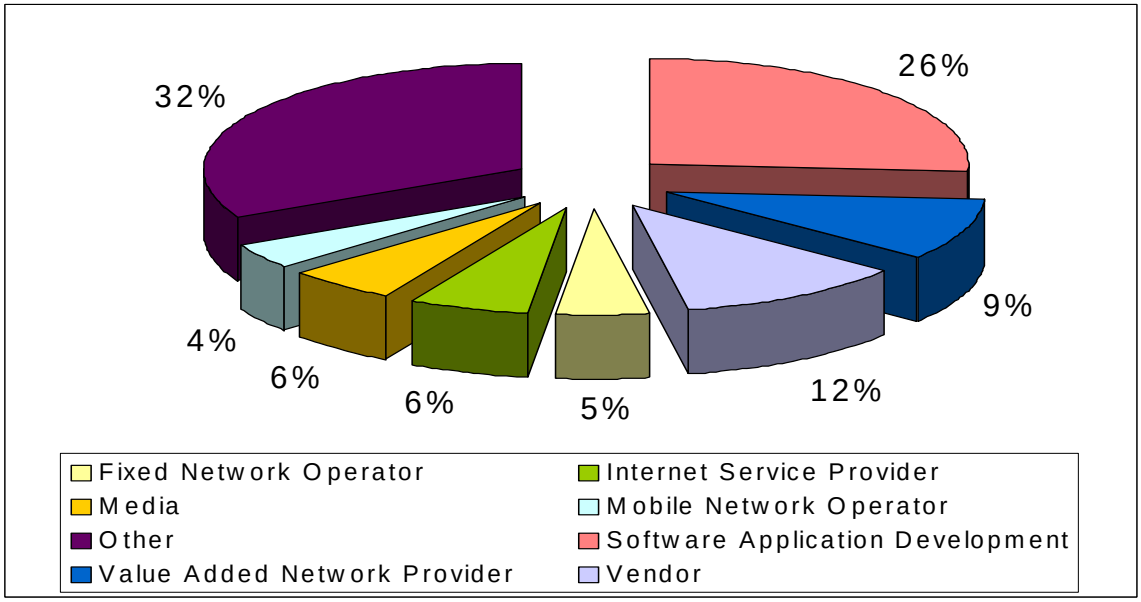


Figure 41: Electronic Survey: Type of organisation

Figure 42 represents the composition of the primary function of respondents within their organisations. This figure indicates that 33% of respondents fulfilled a Strategic role and 33% fulfilled a Technical role. The rest of the respondents consisted mainly of Sales (15%) and Management (16%) functions.

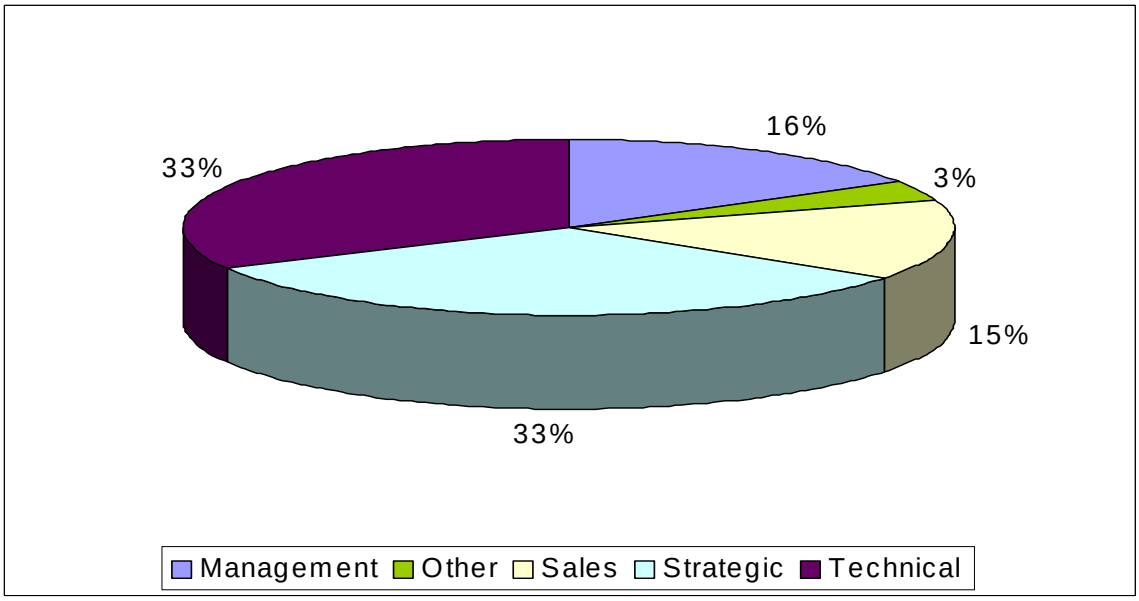


Figure 42: Electronic Survey: Primary function of respondent in organisation

The next question in the survey attempted to establish whether the respondents were of the opinion that their organisation would participate in the delivery of MDS within the next three years. The fact that most respondents performed a strategic as well as a technical function in their organisations, gave support to the expected accuracy of answers on the expected future participation in MDS delivery. The result was further enhanced by additional data from the previous question indicating the organisation type. It was thus possible to determine whether a respondent from a particular type of organisation had a specific opinion on the subject. In other words, it was possible to determine who the main industry stakeholders would be with regards to MDS delivery.

Figure 43 indicates that respondents from MNOs (e.g. Vodacom, MTN, CellC) and VANPs (Cointel, Exactmobile, Itouch, etc.) had definitive opinions that such

organisations would participate in the delivery of MDS within the next 3 years. A possible explanation for this phenomenon could be that these types of organisations are positioned nearest to the delivery and application of the new technology in the current value chain and should be at the forefront of new technology. Although the remainder of respondents also indicated that their organizations would participate in MDS delivery, their opinions were less decisive. The fact that these opinions had a wider spread could be related to the infancy stage of MDS technology deployment.

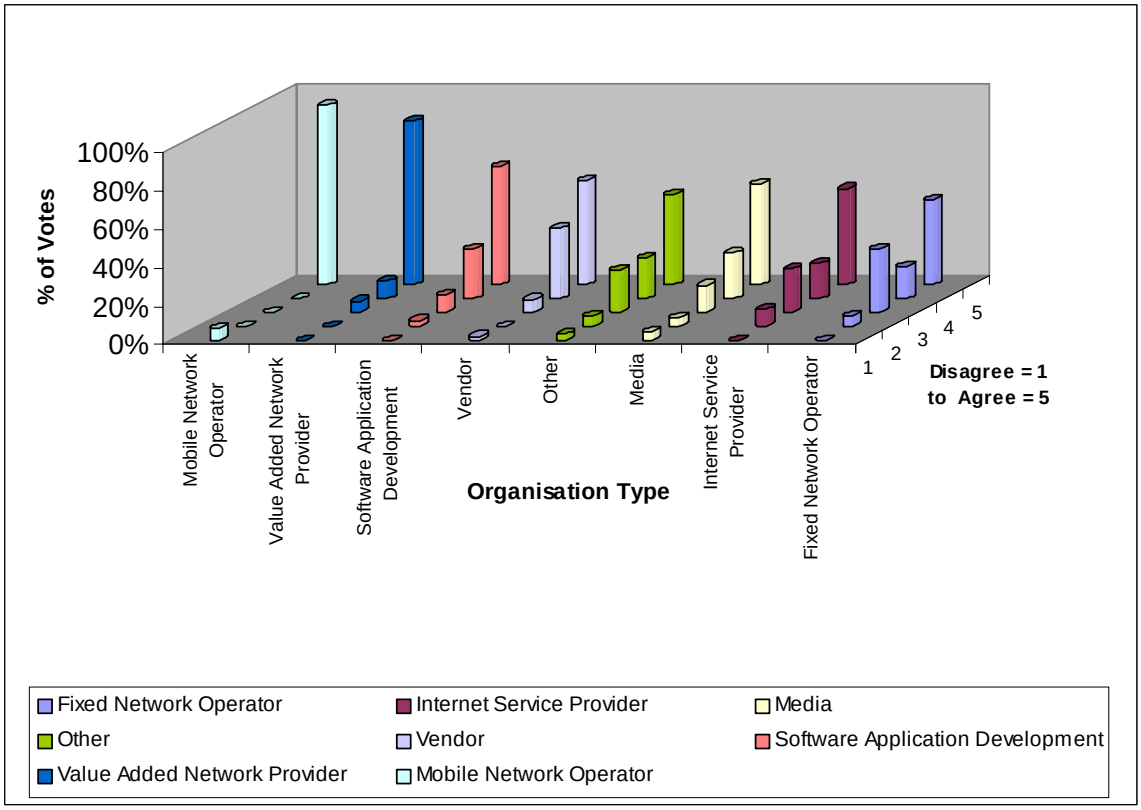


Figure 43: Electronic Survey: Will your company participate in some form of MDS delivery within the next 3 years?

4.4.2 Industry Stakeholder Relationships

The majority of respondents (75%) agreed that there would indeed be changes in the current industry relationships as a result of the deployment of MDS (Figure 44). Even stronger agreement by respondents (87%) existed on the fact the strategic partnerships would be formed as a result of the deployment of MDS (Figure 45). The fact that the expected changes in industry relationships are closely related to new strategic partnerships strengthens the concept of increased *Value Clustering* within the market. Increased *Value Clustering* activities also hint at the changes to be expected in the industry value chain. New entrants and changing relationships could be predicted and thus exploited.

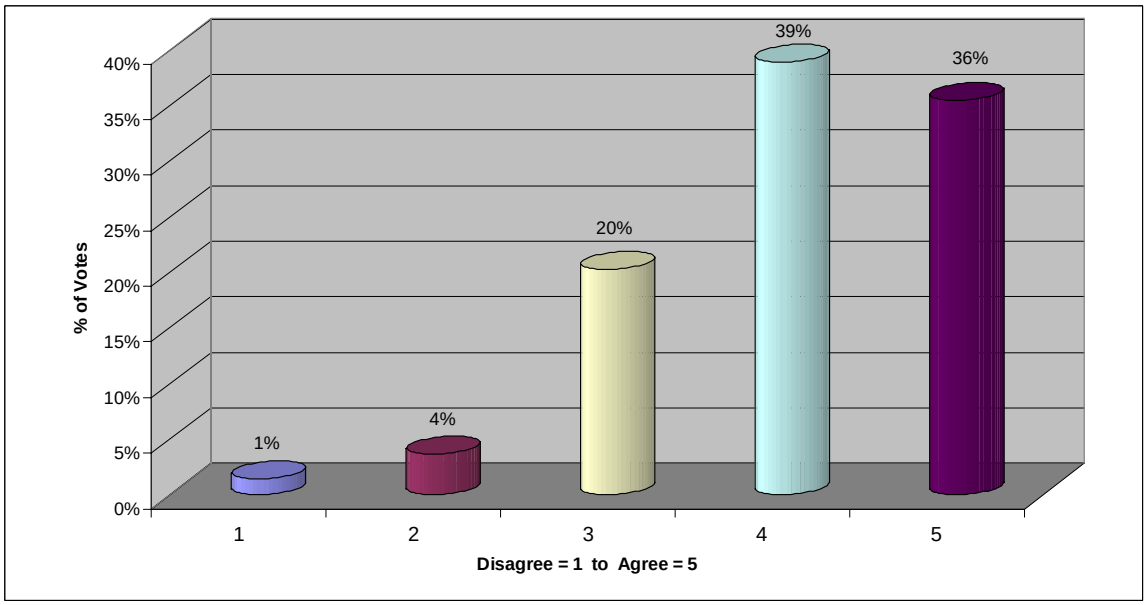


Figure 44: Electronic Survey: Will Industry Relationships Change with MDS Deployment?

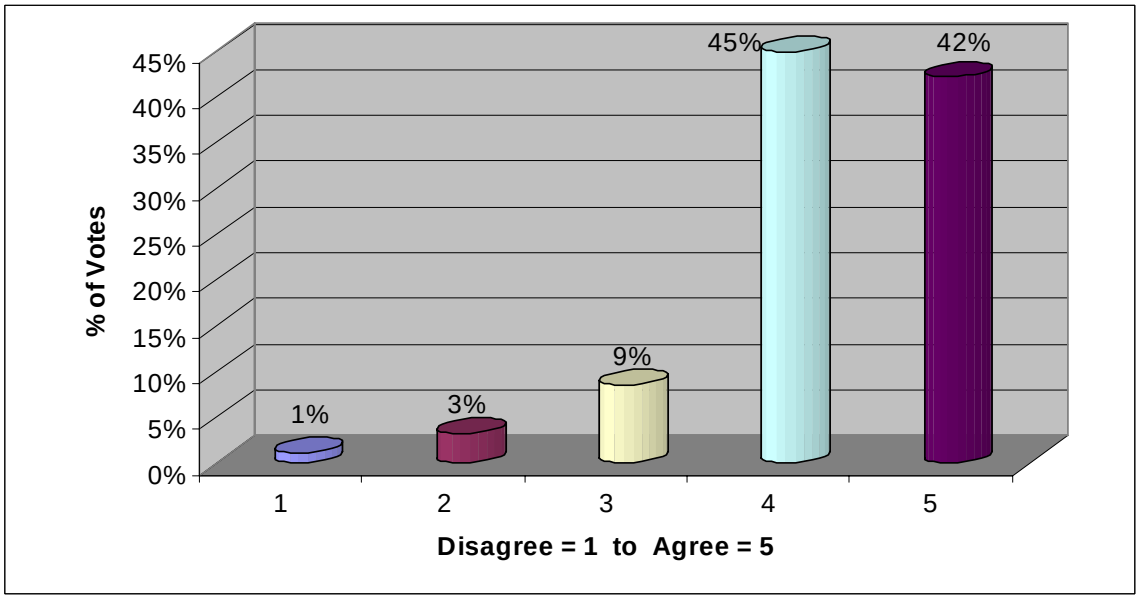


Figure 45: Electronic Survey: Will Strategic Partnerships be formed with MDS Deployment?

4.4.3 Industry Value Chain

Respondents were in strong agreement (81%) that the structure of the current value chain would not remain the same with the introduction of Mobile Data Service in the market (Figure 46).

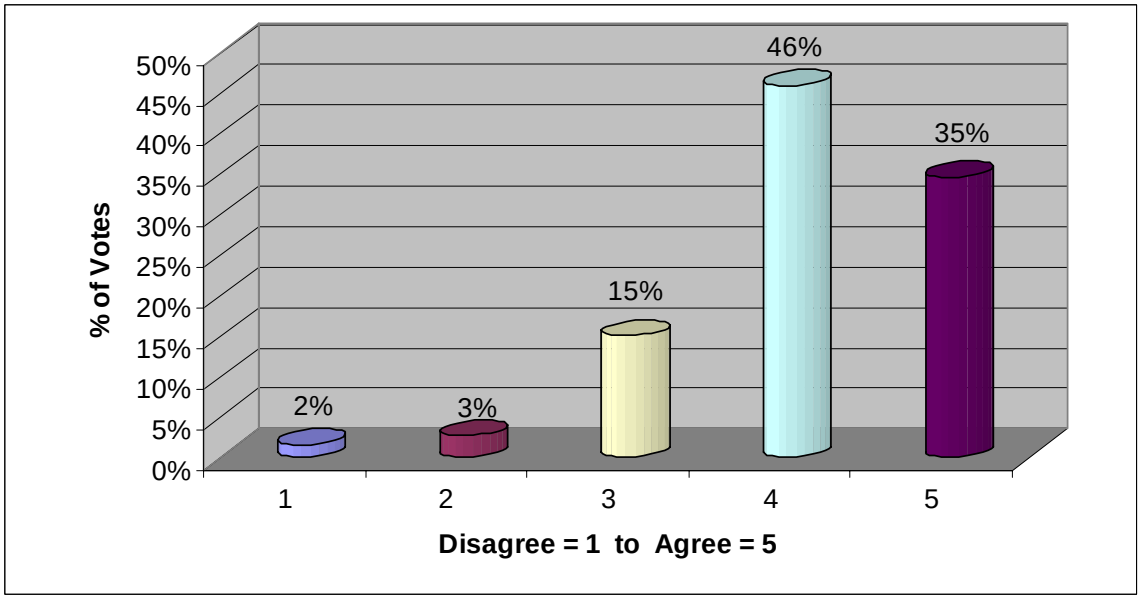


Figure 46: Electronic Survey: Will there be Additions to the Value Chain?

4.4.4 Driving Forces in the Industry

The influence of affordability on the deployment of MDS was explored by a question regarding the effect of the distribution of income in South Africa on MDS deployment. The spread of wealth across the population was explored in earlier chapters which indicated a high inequality in distribution. Respondents indicated a definite expectation (with 68% agreement) that the distribution of income in South Africa would have an effect on the deployment of MDS (Figure 47). MDS is still relatively expensive to use. Based on the fact that income is extremely unevenly spread, it means that a limited market exists for MDS. MDS in its current state could thus realistically only be deployed to a very focussed part of the market with a higher disposable income level.

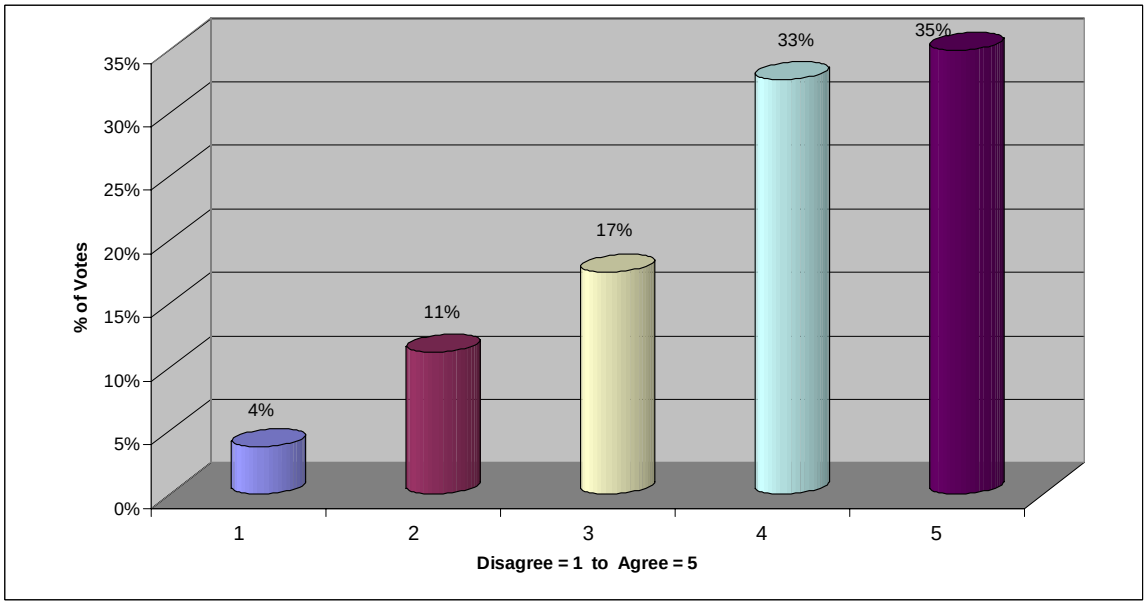


Figure 47: Electronic Survey: Effect of Income Distribution on MDS Deployment.

4.4.5 Mobile Data Services

Most respondents (80%) indicated that they expect 3G networks to be implemented in South Africa within the next six years (Figure 48). The majority of respondents indicated that the preferred way to access the corporate intranet would be via a mobile device instead of a fixed computer (Figure 49). Respondents indicated Convenience as the most appealing characteristic of MDS to the consumer (Figure 50).

Infrastructure cost (34%) was indicated by respondents as being the most restricting factor to the deployment of MDS (Figure 51). Corporate Applications (32%) and Internet Access (31%) were listed as the most popular application of MDS (Figure 52). Respondents expected that Mobility (43%) and E-Mail Access (30%) would be the main reasons for the use of Mobile Internet (Figure 53). The validity of these reasons would carry more weight if the relevant parties were devoted users of the Internet. The frequency of respondent Internet usage was an overwhelming (84%) “Several times a day” (Figure 54).

From the mentioned results it seems that the industry expected that corporate users, as opposed to private users, would mostly use MDS. It can again be argued that since the technology is still in an infancy stage, early perceptions on the use thereof would be biased towards business.

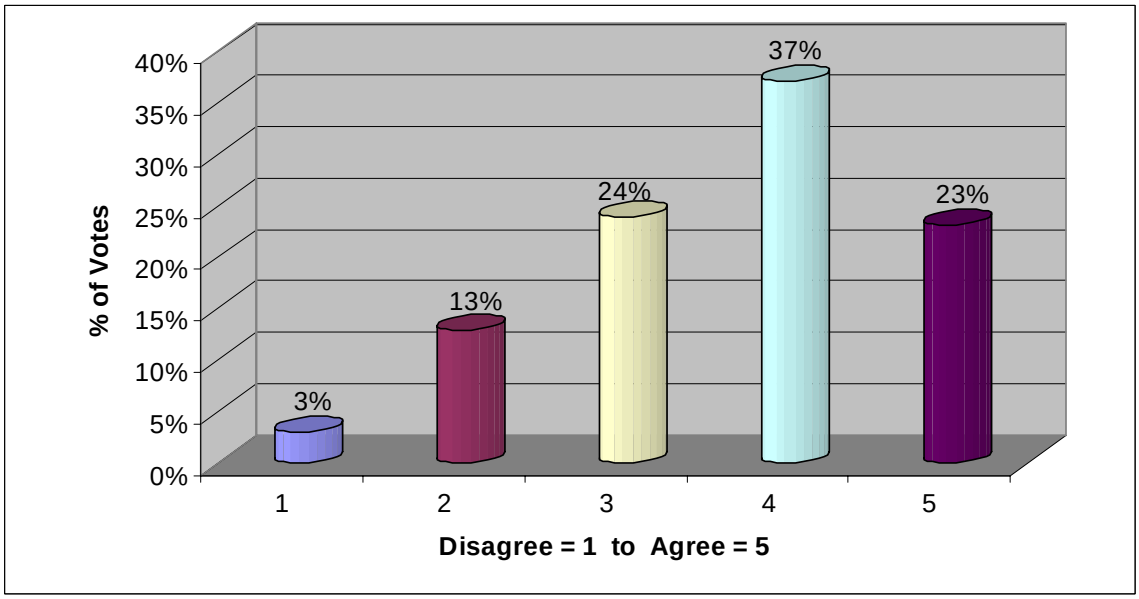


Figure 48: Electronic Survey: 3G networks will be deployed in South Africa within the next 6 years

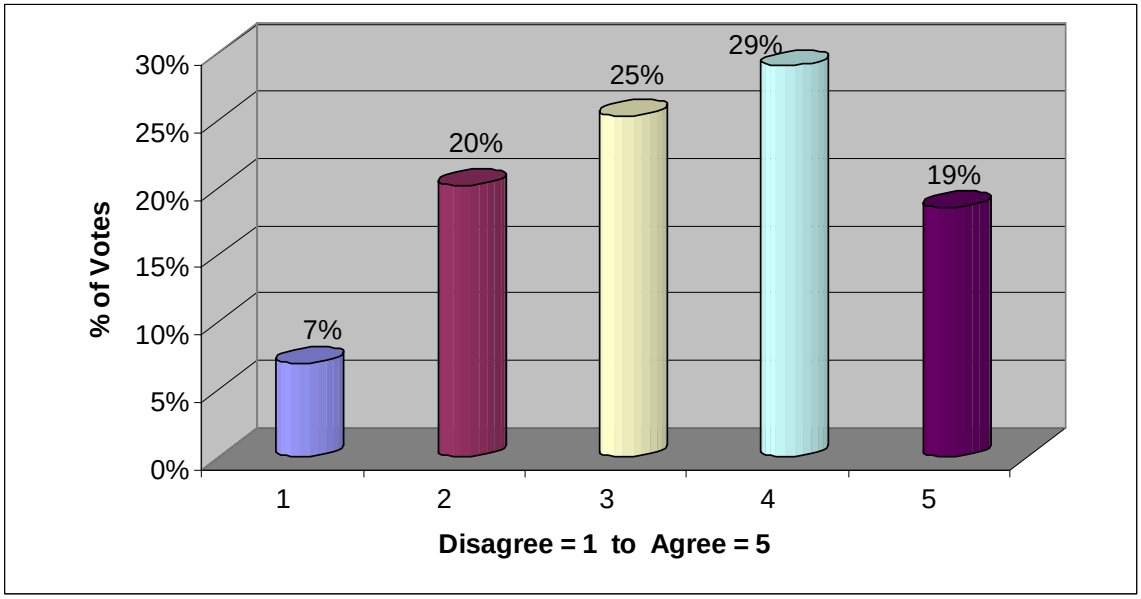


Figure 49: Electronic Survey: The preferred way to Access Corporate Intranet will be via mobile device

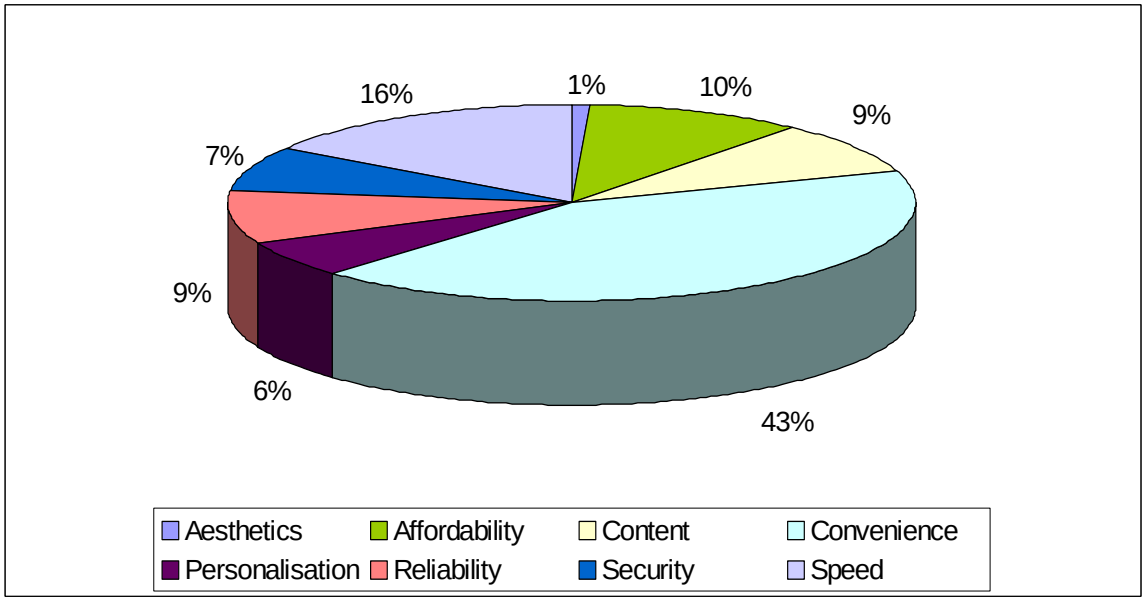


Figure 50: Electronic Survey: Most Appealing MDS Characteristic to Consumer

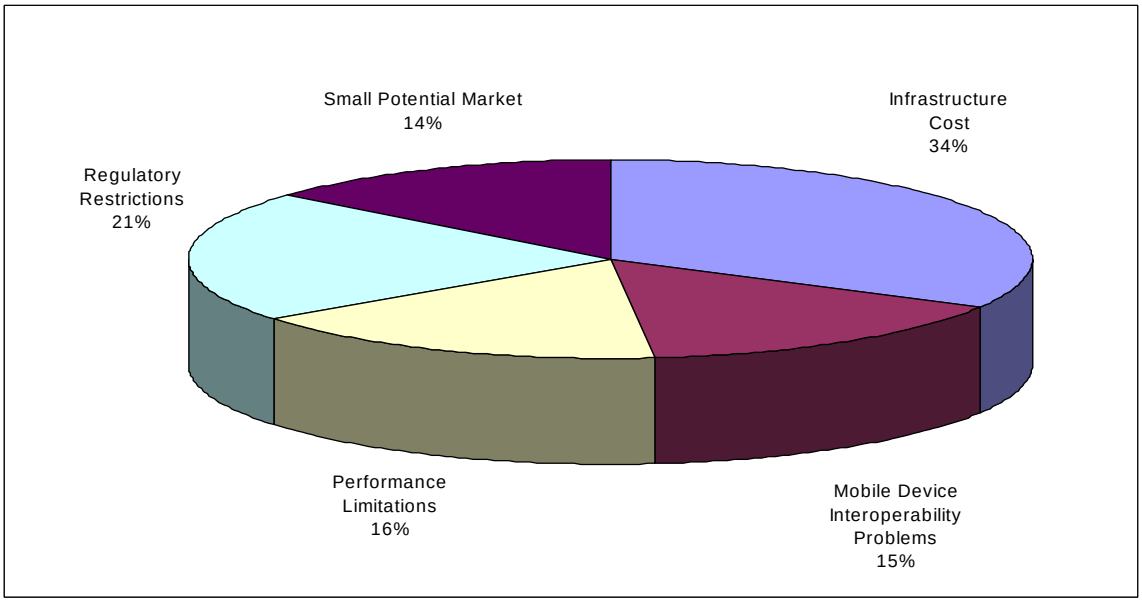


Figure 51: Electronic Survey: Most Restricting Factor for MDS Deployment

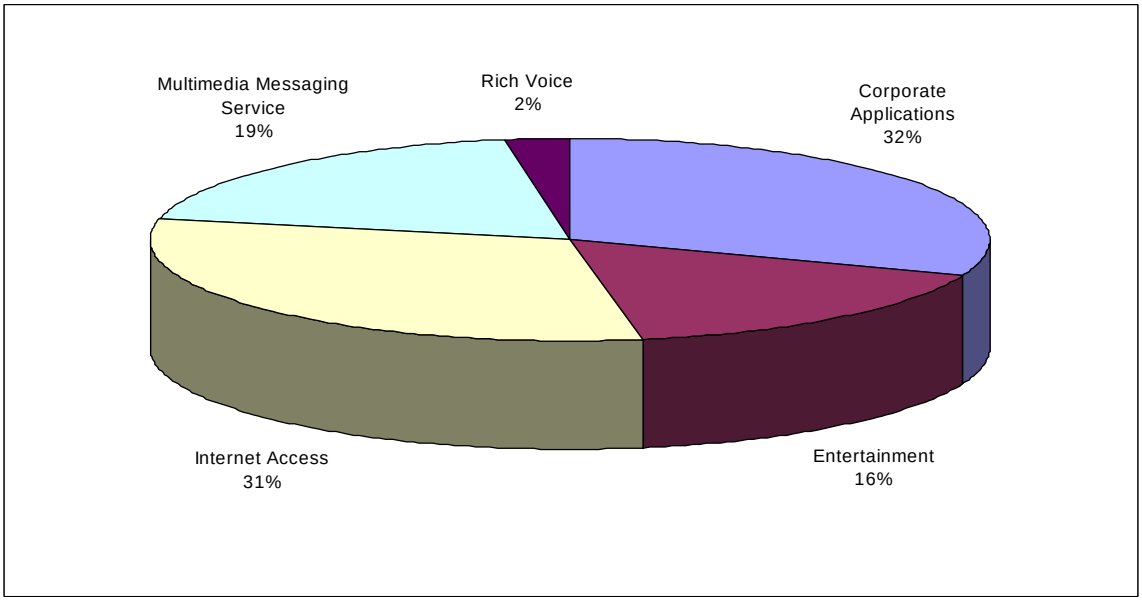


Figure 52: Electronic Survey: Most Popular MDS Service

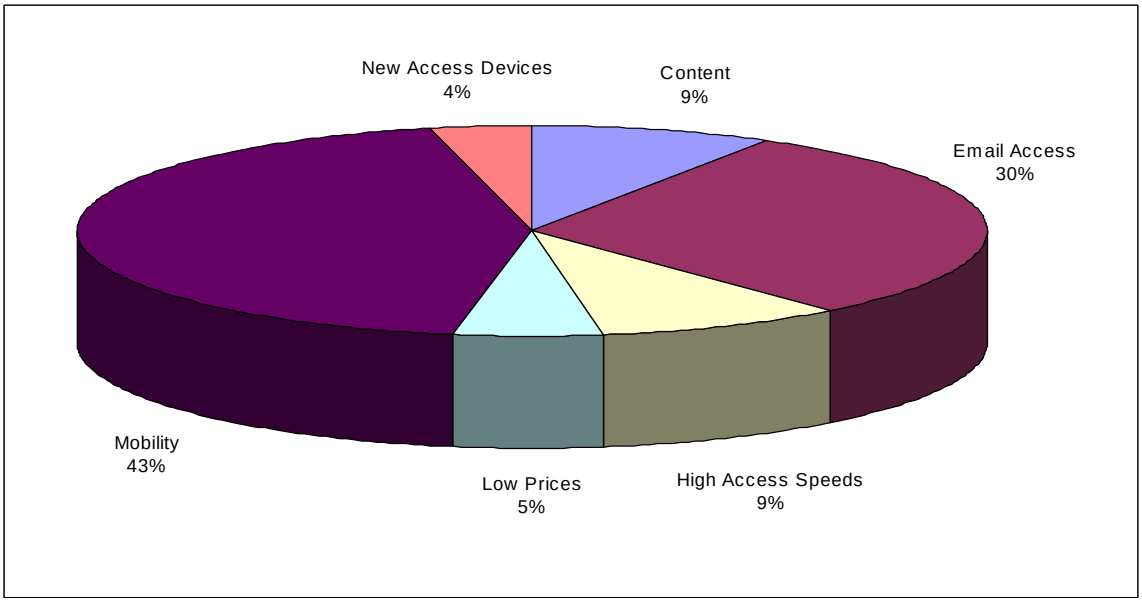


Figure 53: Electronic Survey: Why Use Mobile Internet?

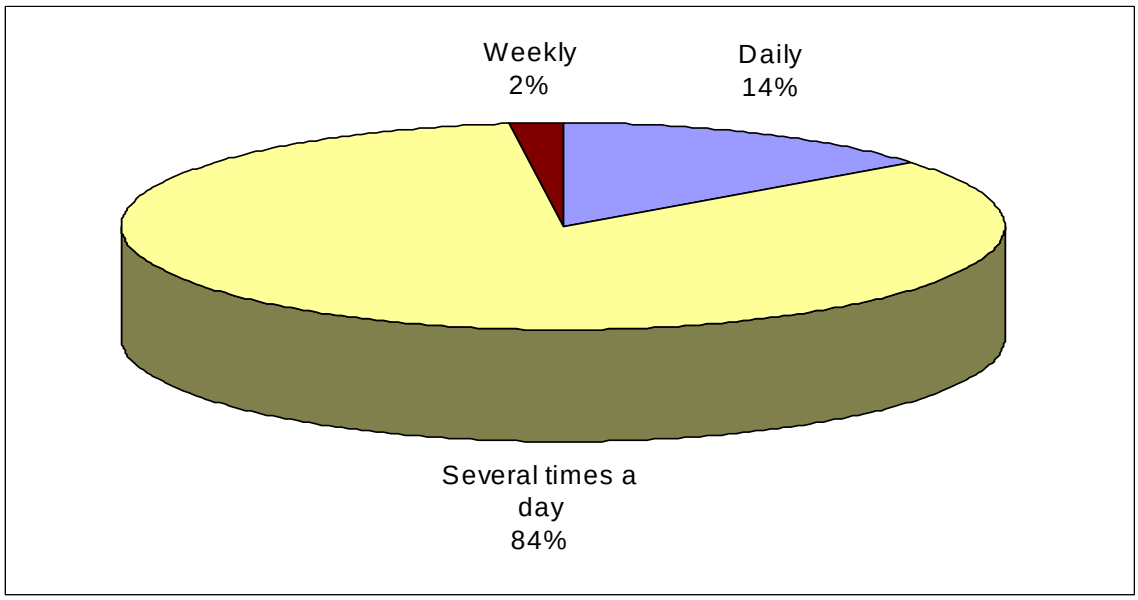


Figure 54: Electronic Survey: How often do you make use of the Internet?

4.4.6 Business Models in the Industry

As seen from Figure 55, respondents agree (52%) that Content Development should form part of the core business of the Mobile Network Operator. A similar number of respondents (48%) had the opposite opinion. This means that there is uncertainty in the industry with regards to which business model the Mobile Network Operator (MNO) should pursue. In order to gain a deeper understanding of the possible significance of this result, another data field must to be considered in conjunction with the data presented.

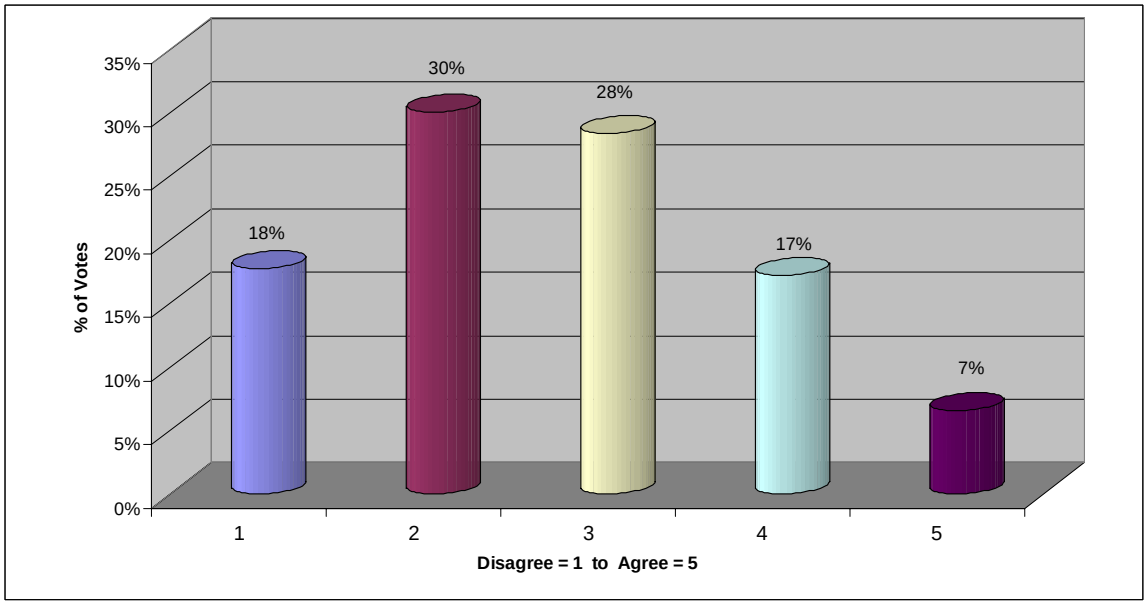


Figure 55: Electronic Survey: Will MNOs also be Content Developers?

The results obtained from Figure 55 are broken down in Figure 56 in more detail to indicate the point of view (Type of Organisation) from which the respondents answered the question. It was expected that certain types of organisations (e.g. MNO) would offer more definitive responses to the question since they would be expected to have a clear vision of their role and position within the market. The responses were, however, surprisingly evenly spread amongst all organisations and opinions. This could signify that there is currently no clear vision and strategy in industry as to future roles with regards to specific focussed functions such as Content Development.

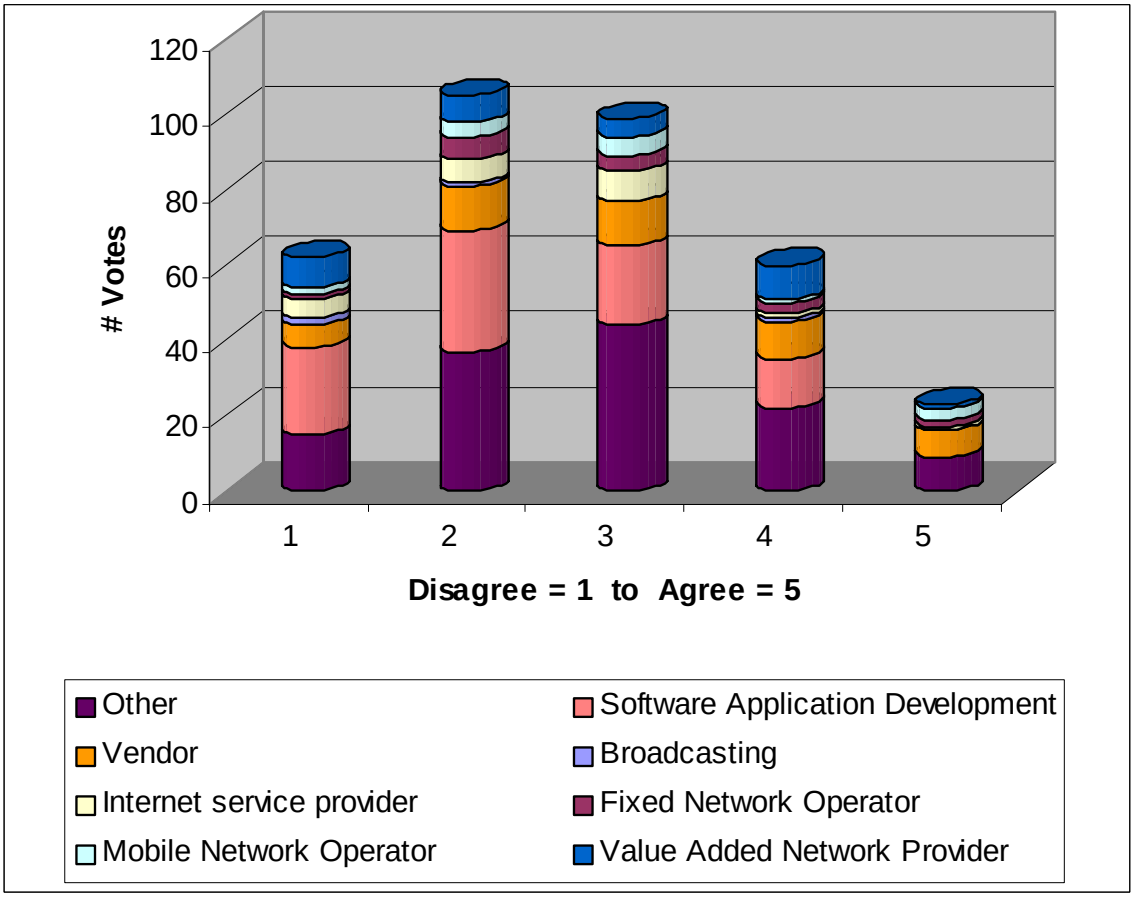


Figure 56: Electronic Survey: Will MNOs also be Content Developers (breakdown)?

It can be seen from Figure 57 that respondents (60%) expected Mobile Portals to follow an open portal strategy. This means that all mobile devices will be able to access all mobile portals. The result indicated the expectation that access in the market would not be monopolised, but would be conducive to an open market policy. The fact that the MNO still holds the key to network access renders the open portal strategy rather subjective. This fact could possibly be balanced out by the bit-pipe strategy of the MNO.

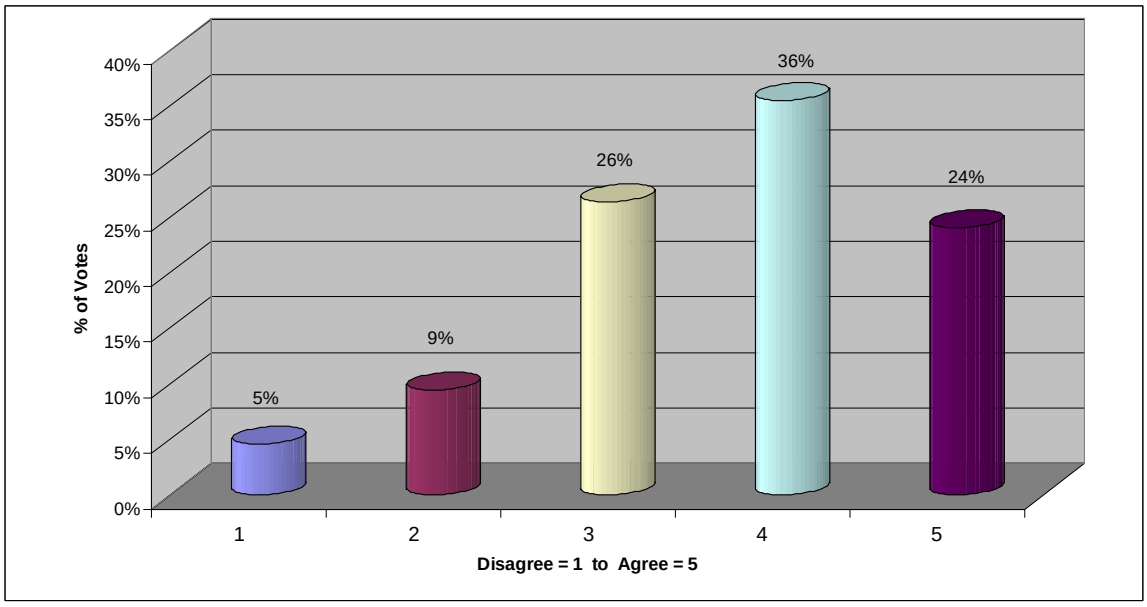


Figure 57: Electronic Survey: Will Portals follow an Open-Access Strategy?

Figure 58 indicates that respondents (53%) expected that MNOs would not only focus on providing network access, but would also take part in the delivery of MDS. Respondents (54%) also indicated in Figure 59 that MNOs could fulfil the role of an ISP. These responses hint at the fact that there is no single focussed strategy to be followed, but rather a hybrid strategy, which is driven by opportunities rather than core competencies and traditional lines of business.

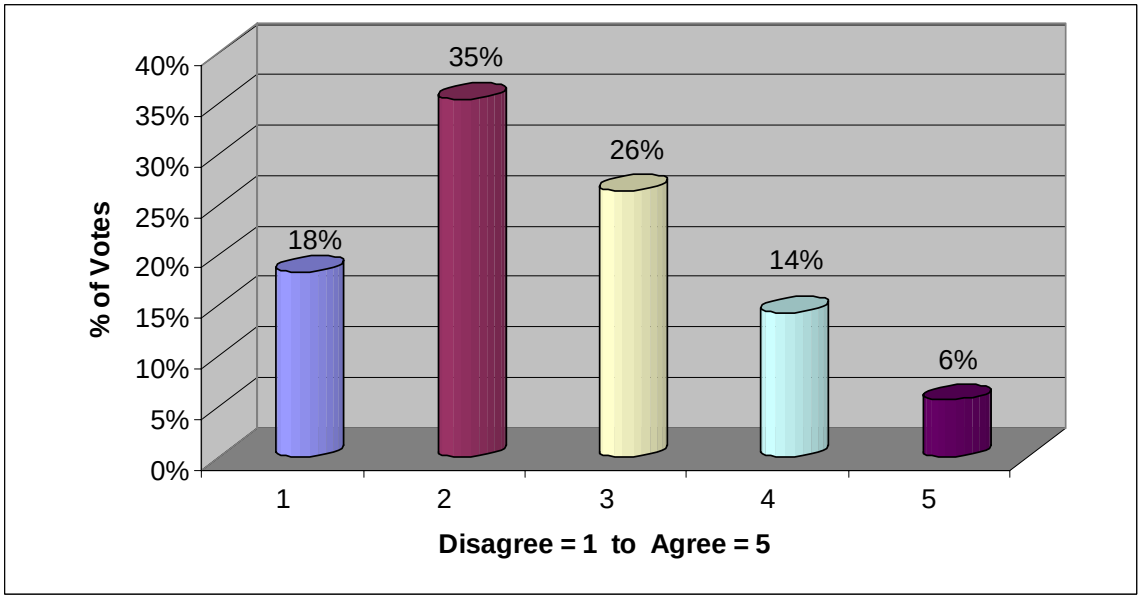


Figure 58: Electronic Survey: Bit-pipe Strategy for MNO?

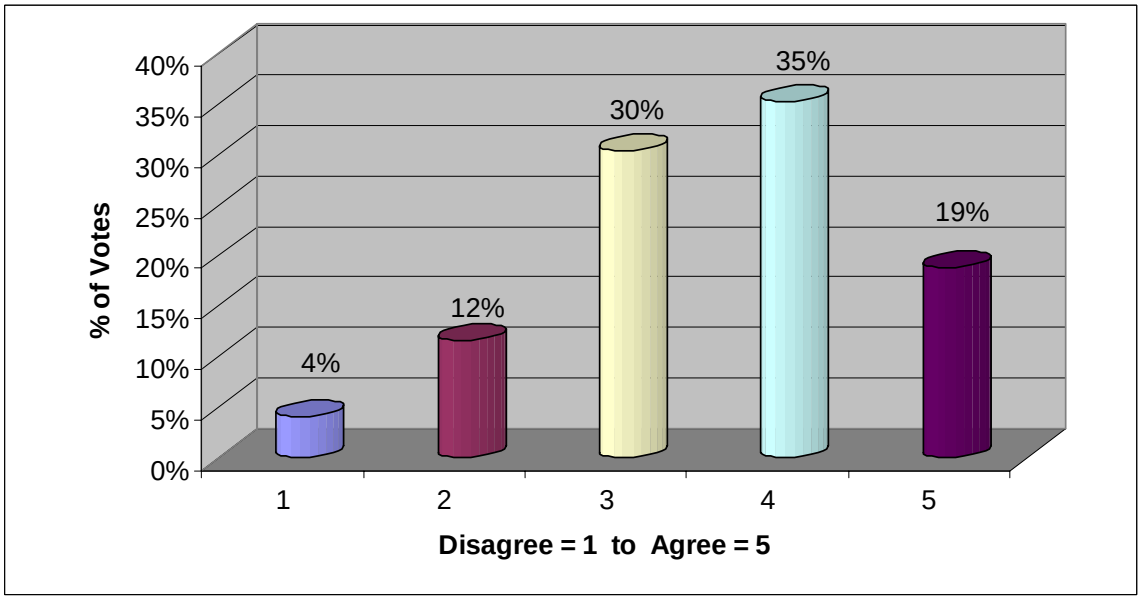


Figure 59: Electronic Survey: Will the MNO also be an ISP?

4.4.7 Electronic Survey Conclusions

Software Application Developers constitute the largest share of the industry shareholders. Stakeholders closer to the delivery and application of new technology in the current value chain have more definitive opinions on the future of MDS. MDS is in the infancy stage of its deployment in industry.

Value Clustering will be increasingly applied in the deployment of MDS. The concept of *Value Clustering* is not a phenomenon specific to MDS but rather a characteristic of a new way of conducting business in telecommunications. As a result of the deployment of MDS the structure of the current value chain will be enhanced with new market entrants.

Due to the uneven level of income distribution in South Africa, MDS in its current format could only be deployed to a very focussed part of the market with a higher level of income.

There are definitive characteristics, factors and applications that will constitute a successful Mobile Data Service in the South African market. This emphasizes the need for an appropriate analysis of Mobile Data Services prior to the choice and introduction of such services.

There is currently no clear vision or strategy in industry on the future roles of specialised functions such a Content Development. Furthermore, it seems that there will be no single strategy to be followed in the deployment of MDS, but rather a hybrid strategy, driven by opportunities rather than core competencies and traditional lines of business.

4.5 Field Interview Results

4.5.1 Industry Stakeholders

Participants in the field interviews were relatively evenly distributed amongst four types of organisations, which were MNOs, Vendors, ISPs and Value Added Network Providers (Figure 60). This distribution was selected in order to obtain opinions from respondents regarding the main industry players. The primary function of the participants (71%) was Management (Figure 61). All participants were of the opinion that their organisation would participate in the delivery of MDS within the next three years (Figure 62). Respondents also mentioned that their organisations were already actively pursuing opportunities related to MDS.

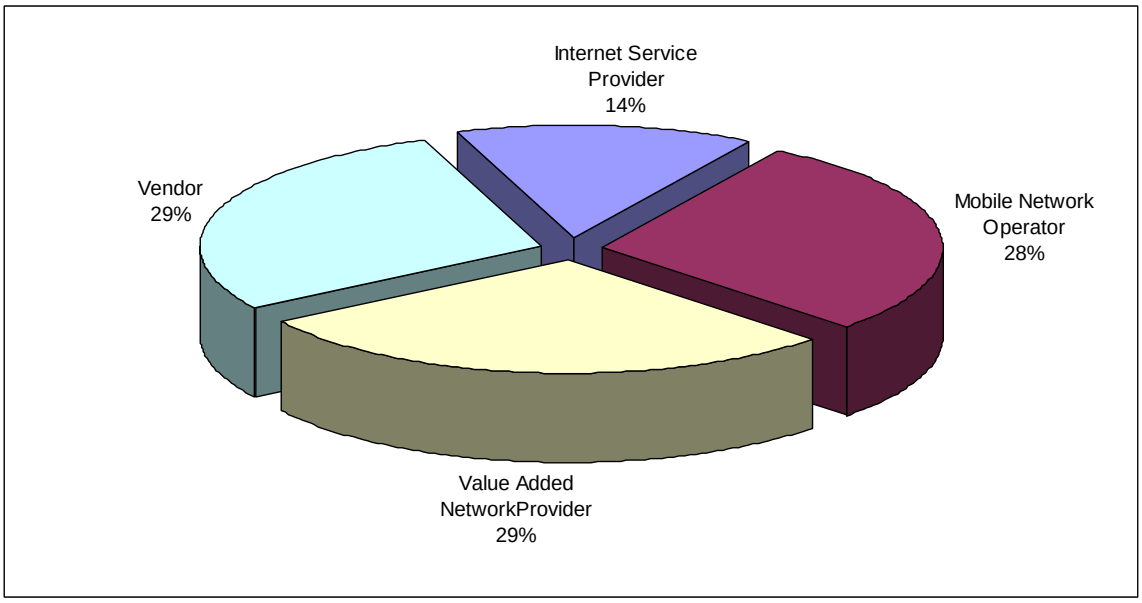


Figure 60: Field Interviews: Type of organisation?

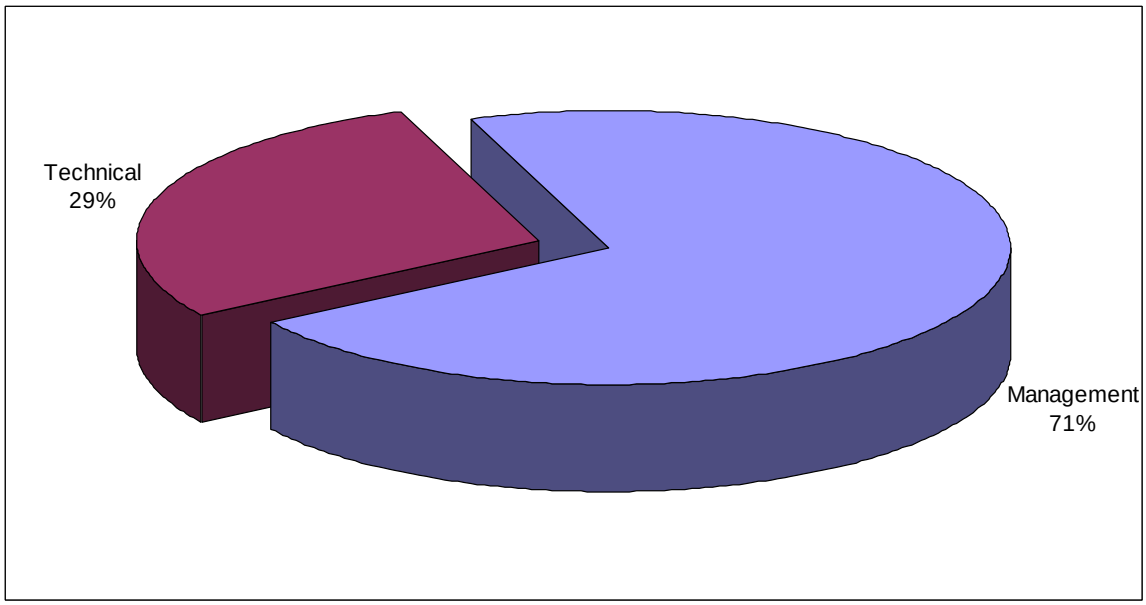


Figure 61: Field Interviews: Primary function in organisation?

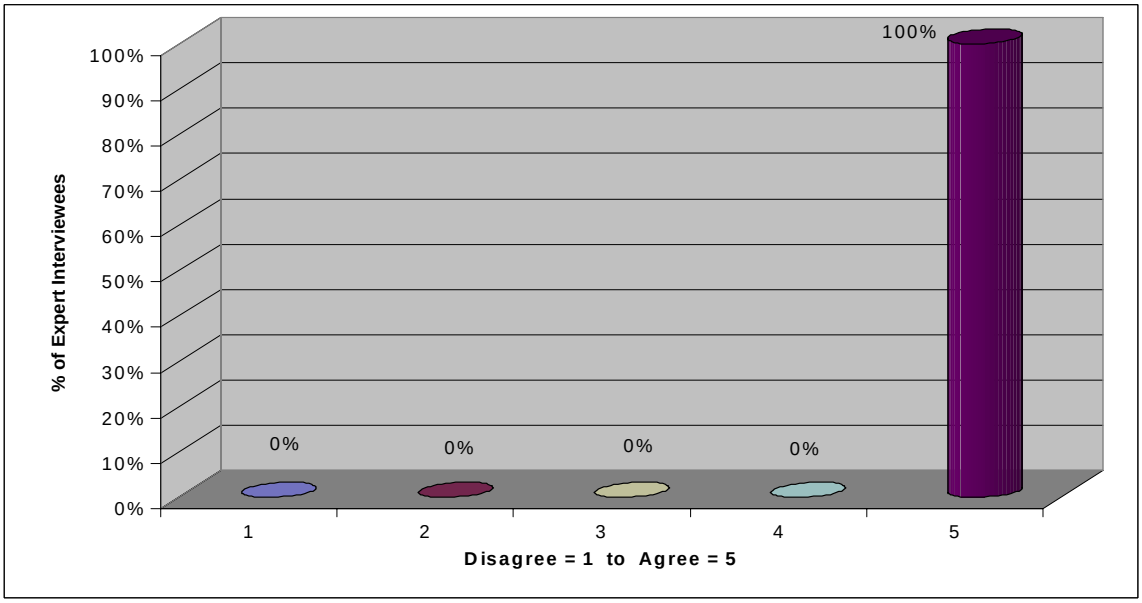


Figure 62: Field Interviews: Will your company participate in some form of MDS delivery within the next 3 years?

4.5.2 Industry Stakeholder Relationships

Participants in the field interviews agreed (72%) that there would be changes in the current industry relationships (Figure 63). Strong agreement also existed (86%) amongst participants on the fact that strategic partnerships would be formed as a result of the deployment of MDS (Figure 64). The future role of strategic partnerships in delivering MDS is clearly emphasised by the results. In general, companies would not attempt to offer MDS in isolation but rather combine core competencies in a complimentary way in order to be competitive.

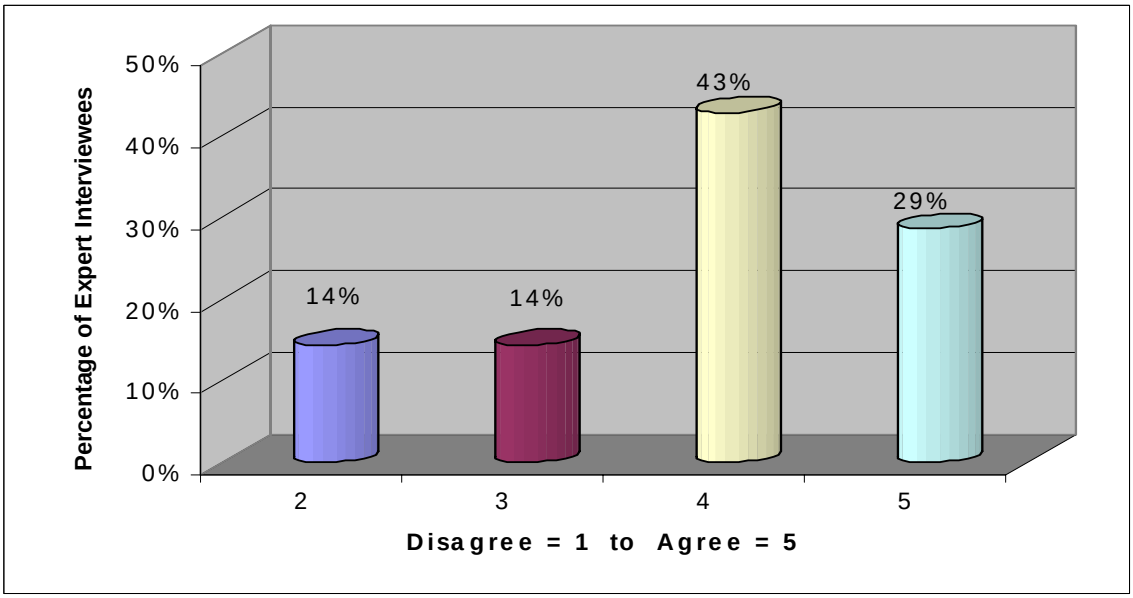


Figure 63: Field Interviews: Will Industry Relationships Change with MDS Deployment?

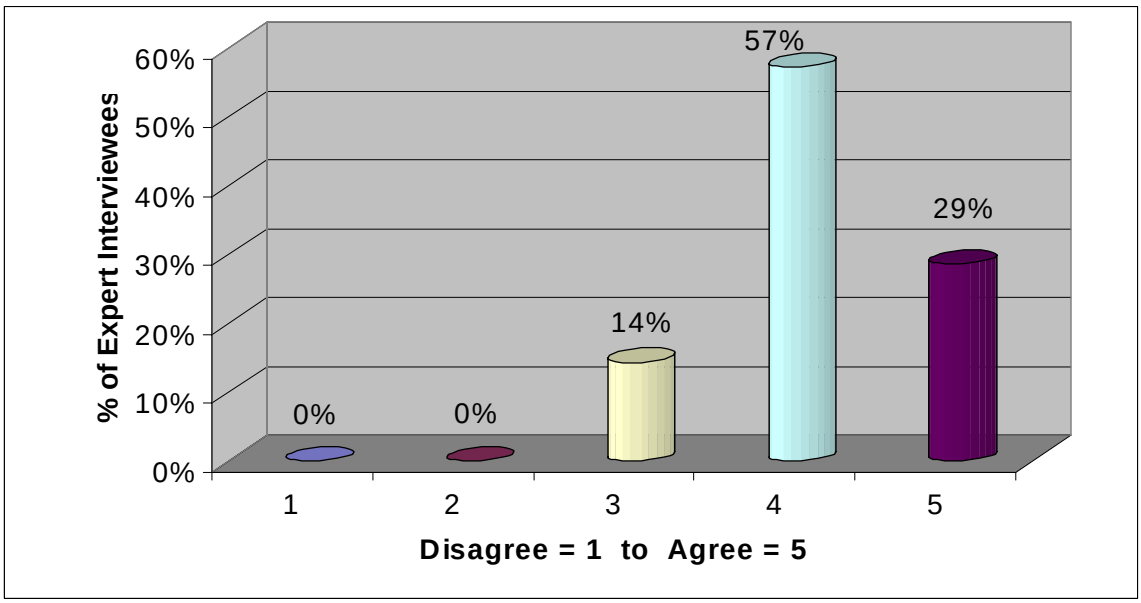


Figure 64: Field Interviews: Will Strategic Partnerships be formed with MDS Deployment?

4.5.3 Industry Value Chain

Participants in the field interviews were in agreement (86%) that the structure of the current value chain would not remain the same with the introduction of Mobile Data Service in the market (Figure 65).

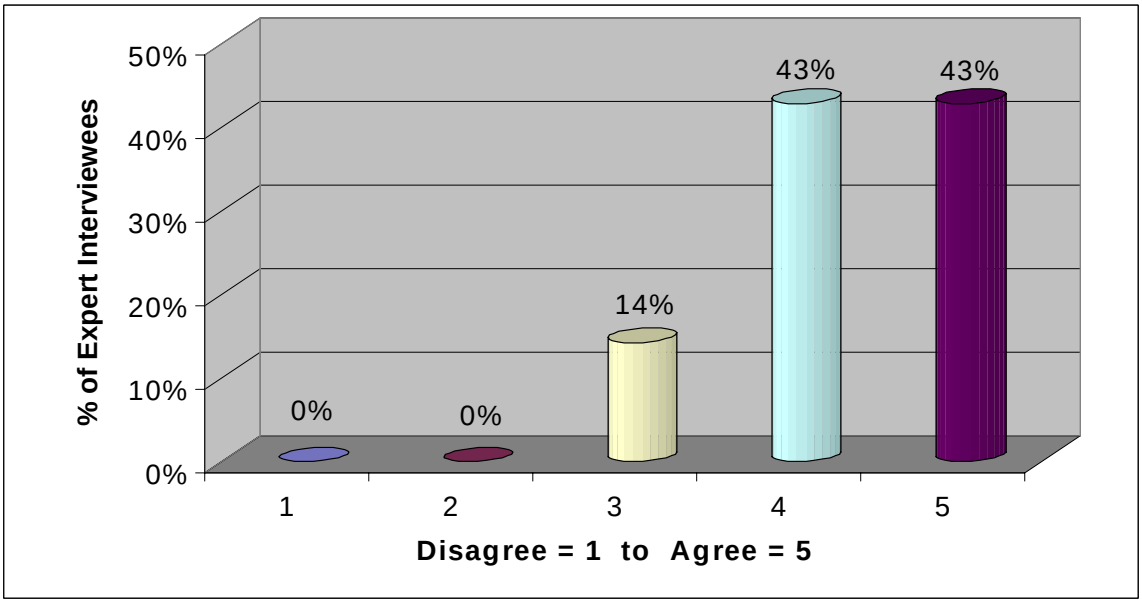


Figure 65: Field Interviews: Will there be Additions to the Value Chain?

4.5.4 Driving Forces in the Industry

Participants (58%) in the field interviews indicated that the distribution of income would have an effect on the deployment of MDS (Figure 66). Although no participants responded negatively to the question, 43% were not sure whether the distribution of income would adversely affect the deployment of MDS. Whether the distorted distribution of income and thus the availability of disposable income would limit the target market, would depend on the usefulness of services to users.

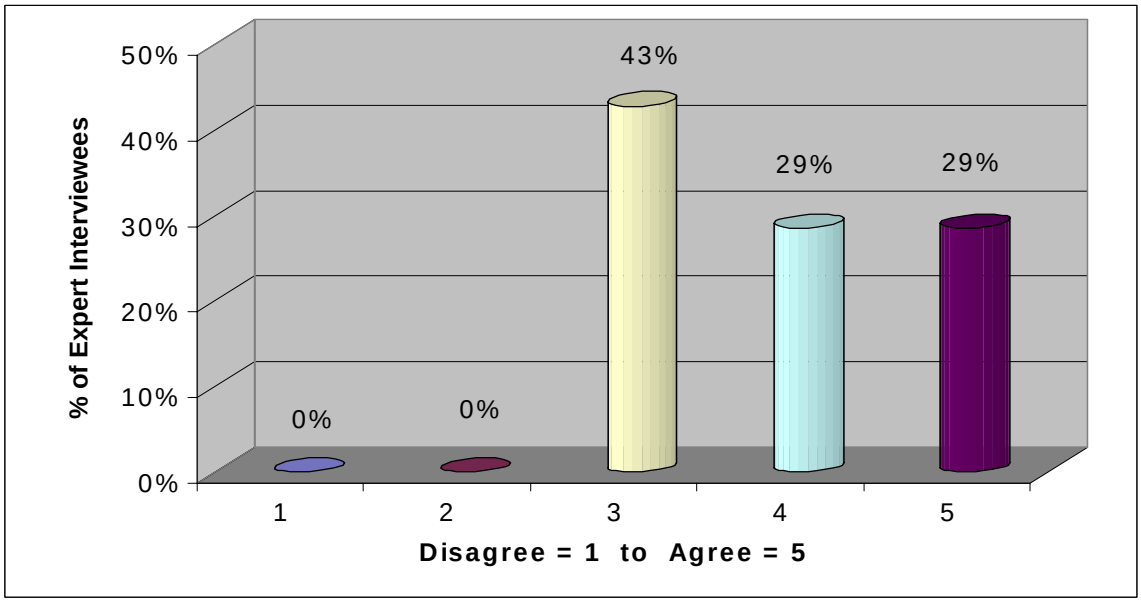


Figure 66: Field Interviews: Effect of Income Distribution on MDS Deployment

4.5.5 Mobile Data Services

Participants in the field interviews indicated a spread of opinion on whether 3G networks would be deployed within the next six years in South Africa. Peaks in opinion were found to be either negative or indecisive on the subject (Figure 67). The relative spread of opinion combined with the low number of respondents interviewed, did not lend itself to conclusive deductions regarding the outcome of this response. Participants (57%) did not expect that the preferred method of access to corporate Intranet would, in future, be via a mobile device as opposed to a fixed PC (Figure 68).

Content was seen as the single most appealing characteristic (71%) of a Mobile Data Service to consumers. Another factor that goes hand in hand with MDS popularity is Affordability (29%). Figure 69 indicates the relation in popularity between the two factors. A small market potential was seen as the single most restricting factor (58%) for the deployment of Mobile Data Services in South Africa (Figure 70). As can be seen from Figure 71, Entertainment was rated by participants as the service expected to be most popular (72%) amongst consumers. Multimedia Messaging Service was mostly selected as a service being secondary in popularity.

Figure 72 presents the four reasons (Mobility, Content, High Access Speeds, Email Access) as seen by participants, for the use of Mobile Internet. The validity of reasons for using MIA as mentioned by participants, would carry more weight if the relevant parties were devoted users of the Internet. The response from relevant parties to the frequency of their Internet usage was an overwhelming (86%) “Several times a day” as seen from Figure 73.

The results of the abovementioned responses, indicates a bias towards the private consumer with regards to the majority users of MDS.

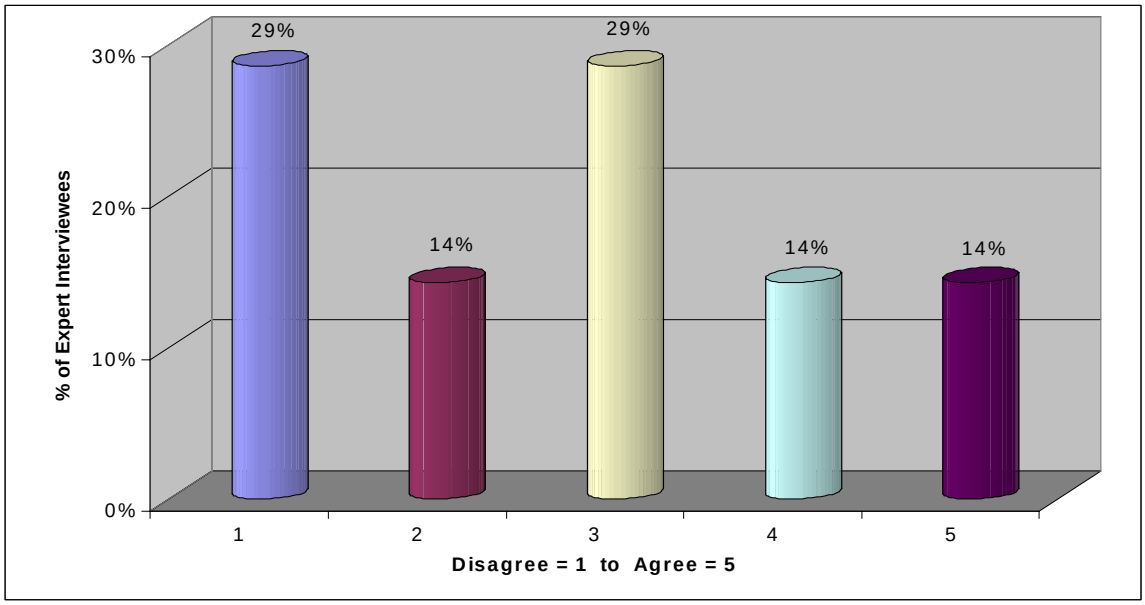


Figure 67: Field Interviews: 3G networks will be deployed in South Africa within the next 6 years

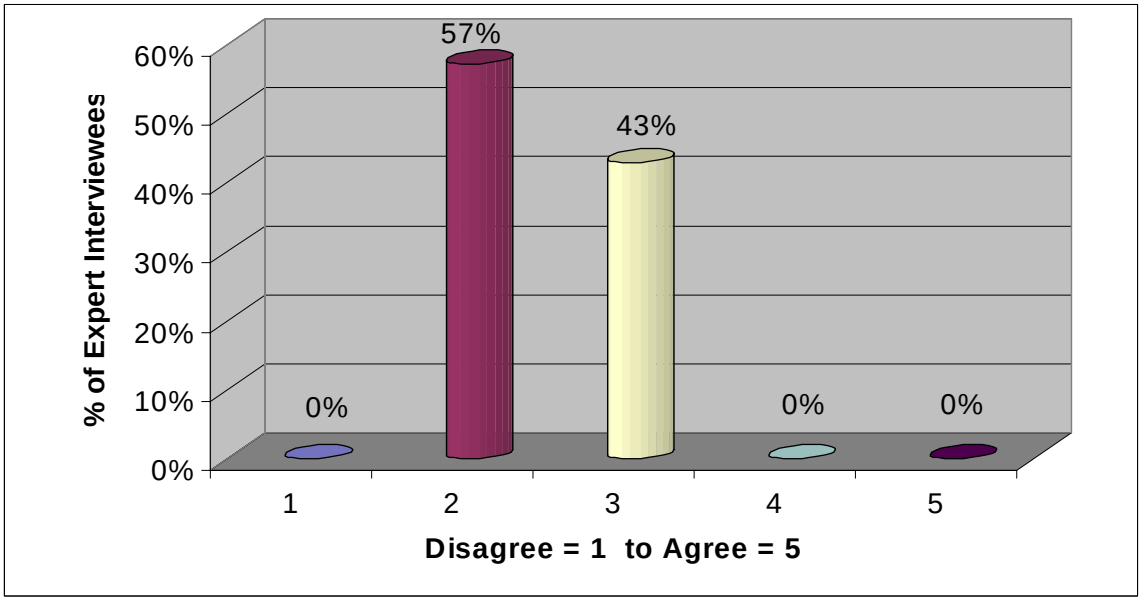


Figure 68: Field Interviews: Preferred way to Access Corporate Intranet via mobile device

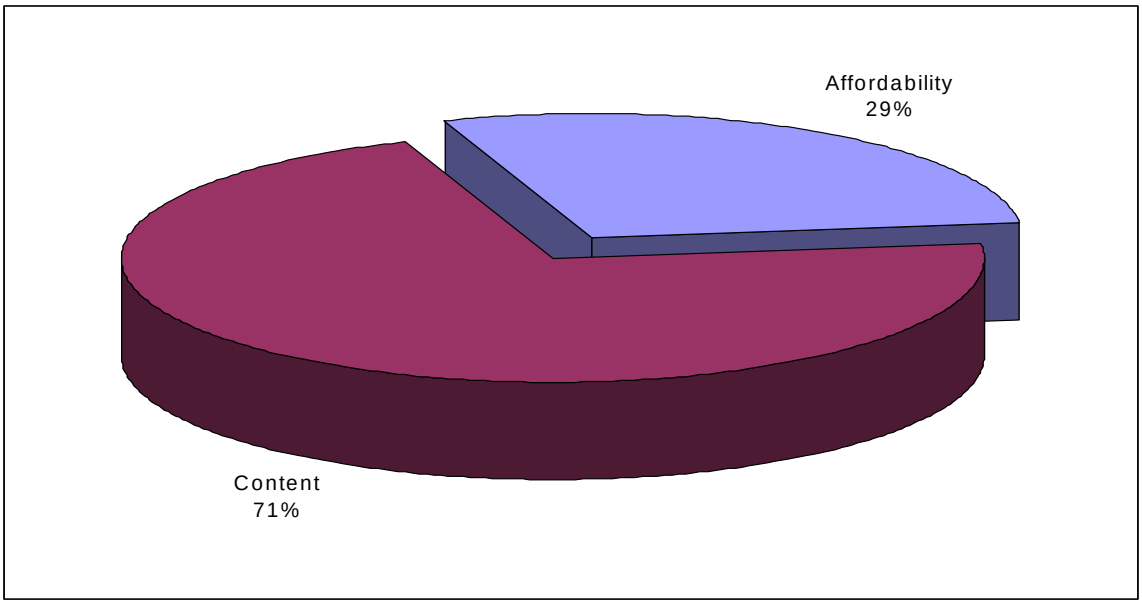


Figure 69: Field Interviews: Most Appealing MDS Characteristic to Consumer

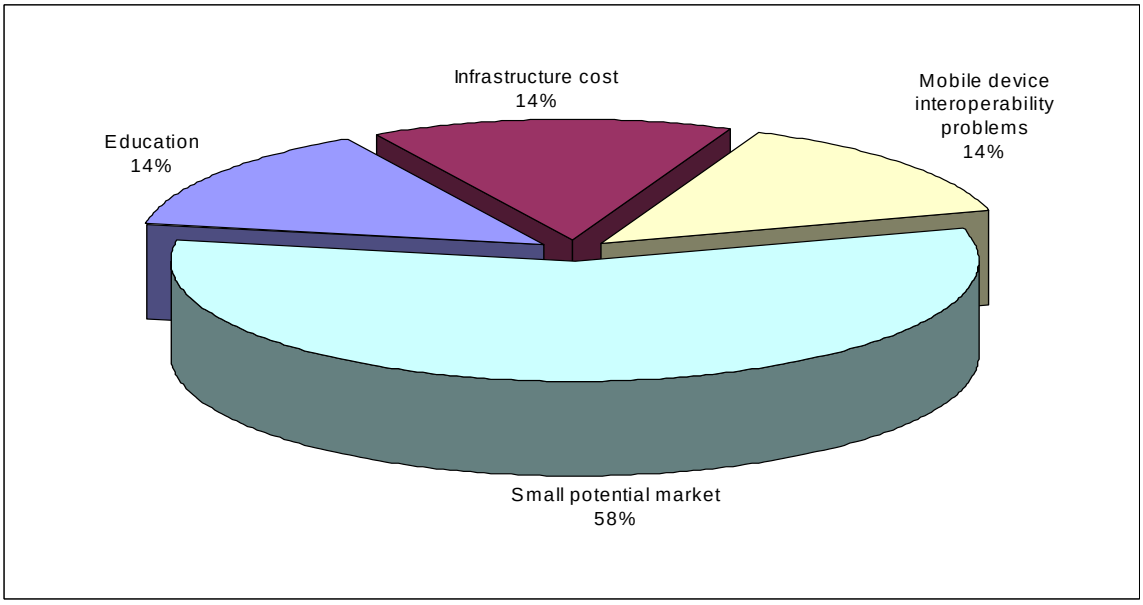


Figure 70: Field Interviews: Most Restricting Factor for MDS Deployment

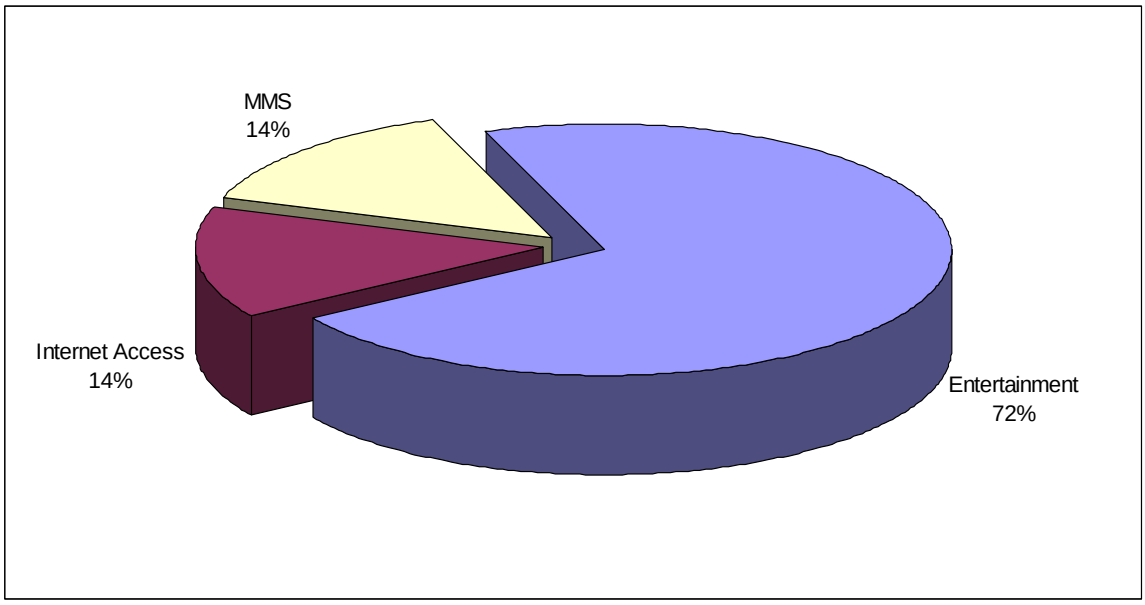


Figure 71: Field Interviews: Most Popular MDS Service

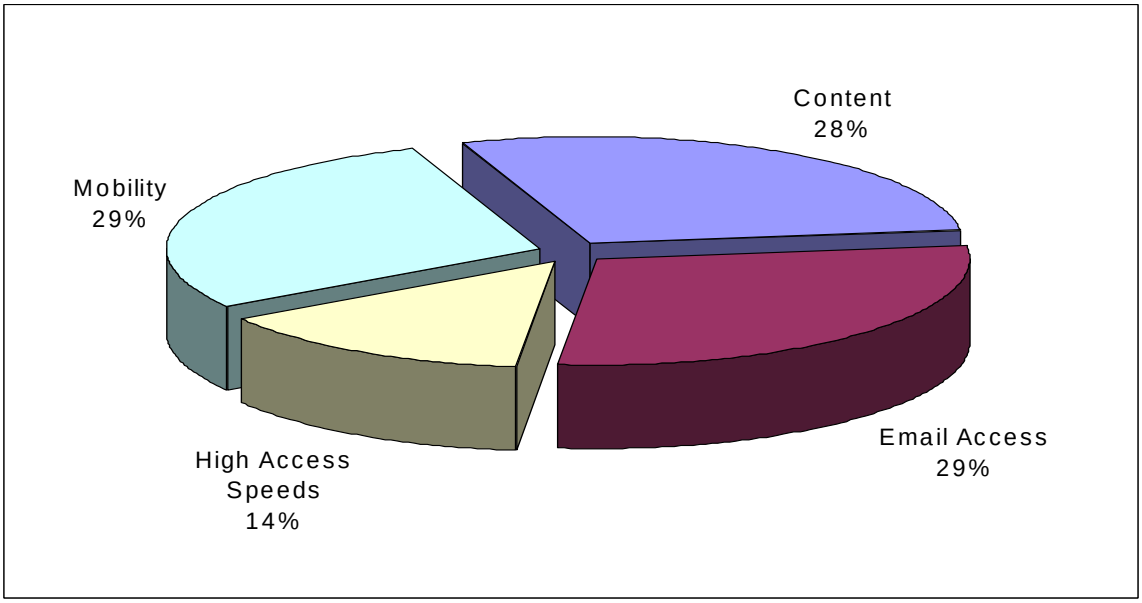


Figure 72: Field Interviews: Why Use Mobile Internet?

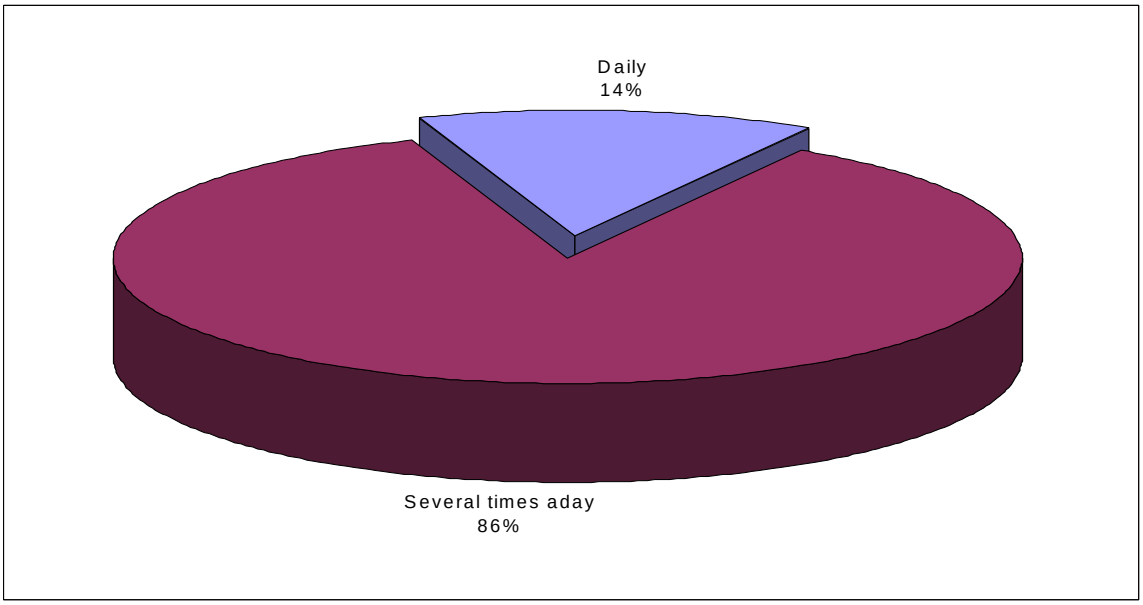


Figure 73: Field Interviews: How often do you make use of the Internet?

4.5.6 Business Models in the Industry

Participants (100%) in the field interviews agreed that Content Development would not form part of the core business of the Mobile Network Operator as seen in Figure 74. Participants (71%) indicated, as seen in Figure 75, that they expect Mobile Portals to follow an open portal strategy. A bit-pipe strategy means that the MNO only concentrates on providing network access. The fact that the bit-pipe strategy is not followed by all MNOs was confirmed by the opinion of participants when they indicated a middle-of-the-road answer to the statement on a bit-pipe strategy as seen in Figure 76. Participants indicated a spread of opinion on whether the ISP function would be separated from the MNO function (Figure 77).

These responses indicated that there was no single strategy to be followed by market players. Instead the spread of opinion points to the fact that strategy would rather be opportunity driven. This means that opportunities could also be exploited via other companies when such opportunities require core competencies that fall outside the core competencies of the opportunity owner.

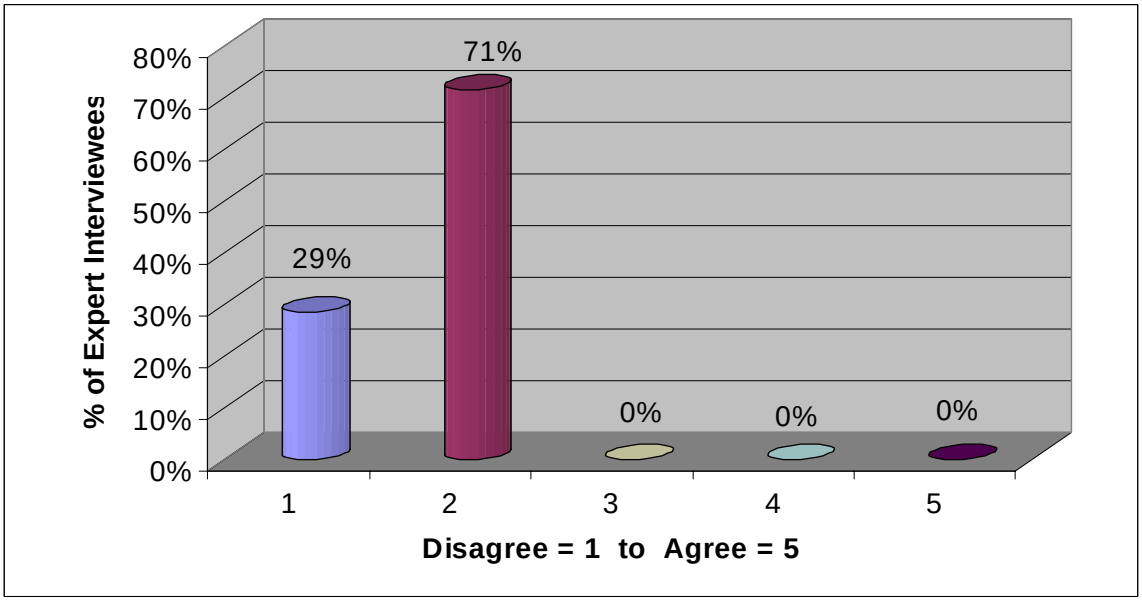


Figure 74: Field Interviews: Will MNOs also be Content Developers?

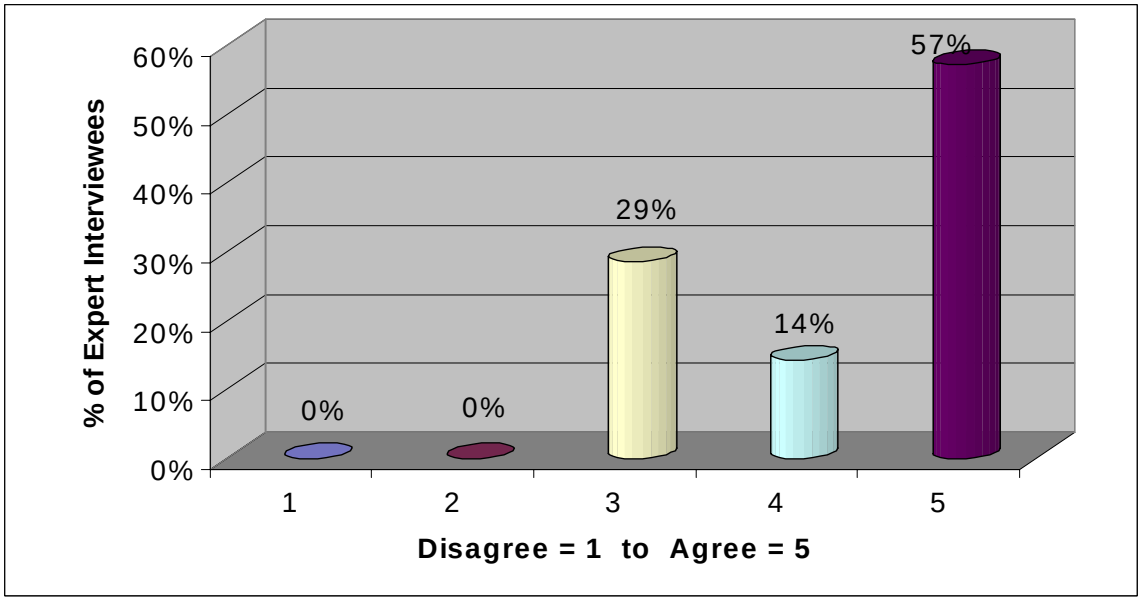


Figure 75: Field Interviews: Will Portals follow an Open-Access Strategy?

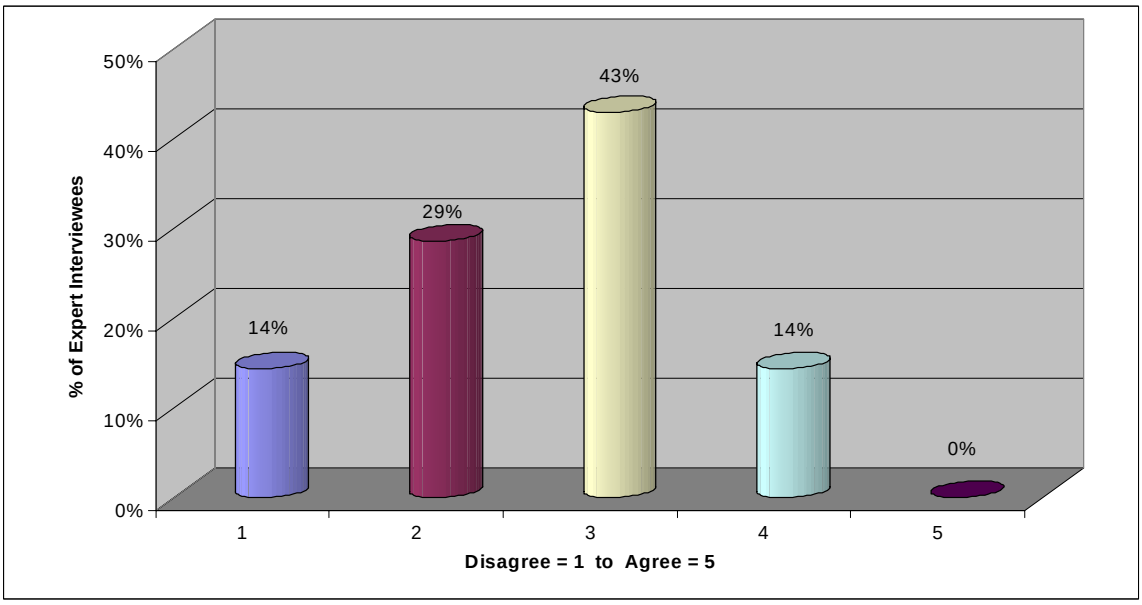


Figure 76: Field Interviews: Bit-pipe Strategy for MNO?

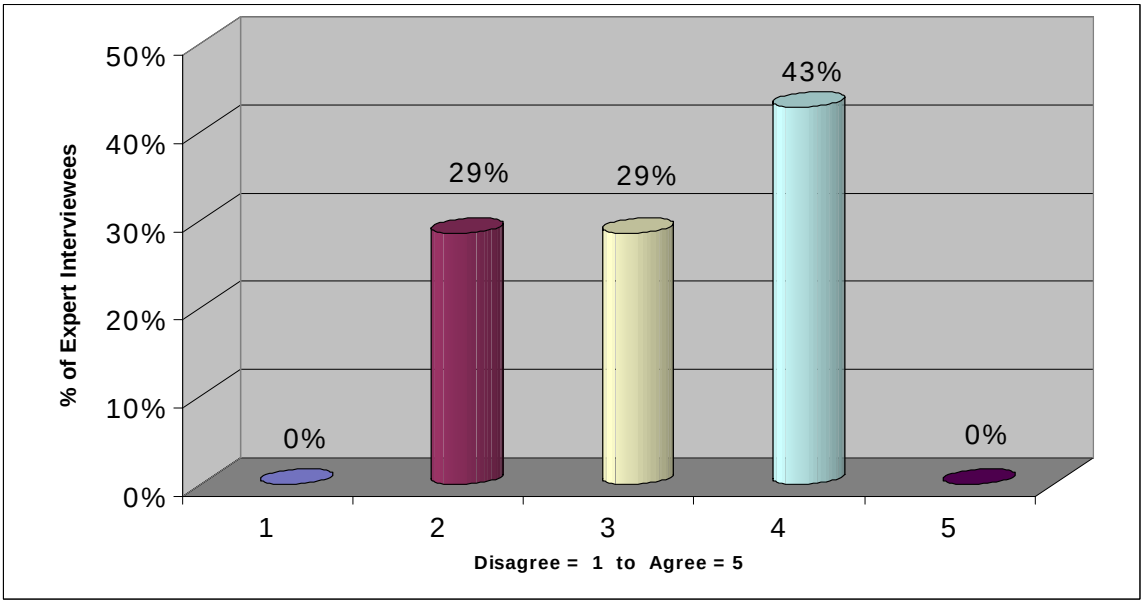


Figure 77: Field Interviews: Will the MNO also be an ISP?

4.5.7 Field Interview Conclusions

The main stakeholders in the South African market are already pursuing opportunities in Mobile Data Services (MDS). Stakeholders will not attempt to offer MDS in isolation but combine core competencies in order to be competitive. This underlines the practice of *Value Clustering* in industry.

The structure of the current value chain will change as a result of the deployment of MDS and be enhanced by new stakeholders. Figure 78 indicates a plausible scenario for the expected structure of the future wireless value chain. Although industries in the value chain are formally modelled in demarcated blocks, reality dictates that an intricate diffusion of functions will exist.

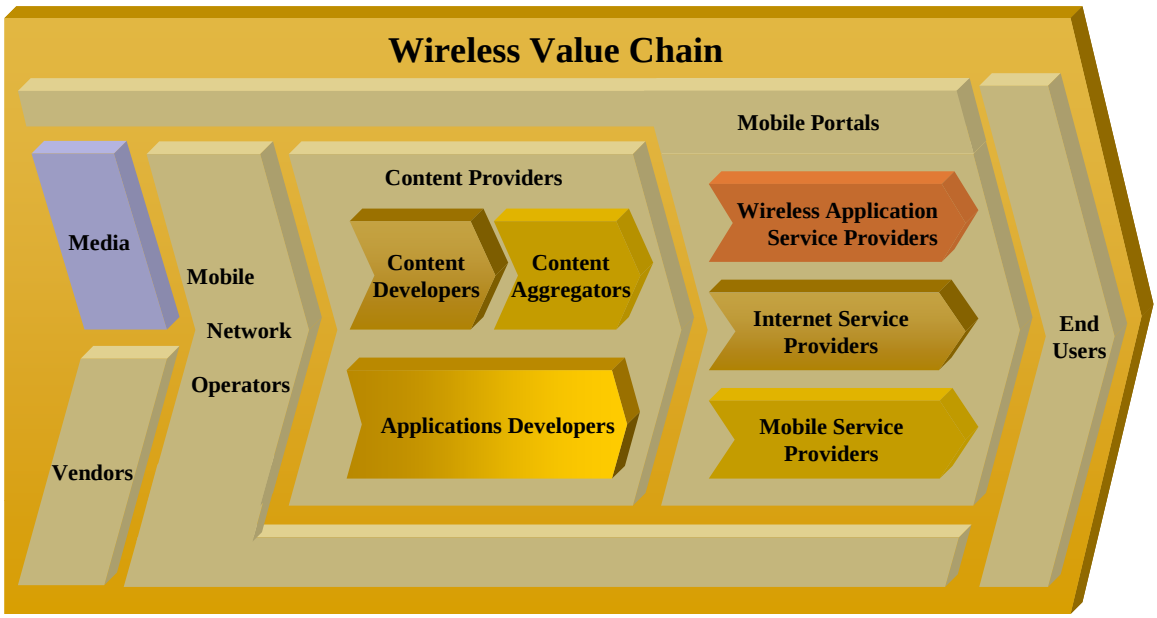


Figure 78: Future Wireless Value Chain

The effect of the uneven distribution of income in South Africa on the deployment of MDS is not certain.

Various characteristics, factors and applications will contribute to the success of the deployment of MDS. Business vs. private use of MDS was identified as additional aspects of influence on MDS deployment.

There is no single strategy to be followed in the deployment of MDS, but strategies that are employed will be opportunity driven. Opportunities could be exploited via other companies when such opportunities require core competencies that fall outside the core competencies of the opportunity owner.

4.6 Comprehensive Electronic Survey and Field Interview Conclusions

The comprehensive conclusions are presented in the same six key concept format as was used to structure the industry survey. The six key concepts used are the following:

- Industry Stakeholders
- Industry Stakeholder Relationships
- Industry Value Chain
- Driving Forces in the Industry
- Mobile Data Services
- Business Models in the Industry

The electronic survey and industry field interviews were conducted in order to provide insightful information regarding the telecommunications industry's perspective on Mobile Data Services (MDS). The information gathered will be used in the development of the Mobile Data Services business model.

4.6.1 Industry Stakeholders

Stakeholders involved with 2G technologies in the current telecommunications industry value chain are more likely to participate in the delivery of MDS. This is due to their vast experience and extensive investment in the traditional lines of business. From the survey, it is clear that based on respondents, Software Application Developers forms a large part (26%) of the telecommunications industry as opposed to the more traditional Mobile Network Operators (4%). New stakeholders in the telecommunications industry add further dimensions to the industry value chain by means of non-traditional technology and perspective on the industry, which will lead to instances of disruptive innovation in the telecommunications industry.

4.6.2 Industry Stakeholder Relationships

The practice of *Value Clustering* will be applied as a strategy to gain the competitive edge in the telecommunications industry. This allows for the convergence of values of different stakeholders depending on their technological competencies to take advantage

of opportunities in the market. *Value Clustering* also confirms the mature state of the mobile telecommunications market as it moves from a state of vertical integration towards horizontal integration. From the research it is evident that a change in the value chain / market structure will occur due to MDS deployment which will lead to a shift in the industry power base. Companies must be acutely aware of this shift in order to align their business with the most suitable industry partners.

4.6.3 Industry Value Chain

The structure of the future telecommunications industry value chain will become more complex with new non-traditional stakeholders joining the market. Due to this added complexity, a brief period of uncertainty will exist until all stakeholders determined their strategy based value chain footprint. Strategies involving *Value Clustering* will result in a diffusion of functions within the industry value chain. A comprehensive understanding of the structure of the future telecommunications industry business value chain is required in order to select the best partners when pursuing the practice of *Value Clustering*.

4.6.4 Driving Forces in the Industry

The unequal spread of wealth in South Africa coupled with the fact that MDS is currently relatively expensive to use, means that there is a limited market for the introduction of MDS. This indicates a niche, low volume target market for MDS deployment initially geared towards the private individual but later also aimed at corporate users. Overall consideration of the research elevates a more powerful core driving force of MDS revenue generation, which is “usefulness” of the service.

4.6.5 Mobile Data Services

Convenience will be the most appealing characteristic with Corporate Applications and Internet access seen as the most popular applications in MDS. The survey indicates corporate users as opposed to private users to initially be the main users of MDS. Industry experts oppose this point of view, indicating the majority users of MDS as private users. It is expected that as with an early MDS such as SMS, the majority users

will be private with corporate applications of MDS following in due course. Additionally the infancy stage of the technology lends support to business use rather than private use.

4.6.6 Business Models in the Industry

The research indicates that currently no single focussed strategy or business model exist to deploy MDS in the market. A hybrid strategy, which is driven by market demands rather than core competencies and traditional lines of business will be pursued. Although this hybrid strategy is focused on seizing all opportunities, it remains balanced by high levels of risk involved in MDS delivery. This means that the decision and method of exploiting an opportunity would be directly related to the level of risk involved. *Value Clustering* will be employed as a strategy to mitigate the opportunity risk to all stakeholders, thus allowing more opportunities to be converted into successful business ventures.

Strategic Business Model for the Introduction of MDS in the South African Market

4.7 Introduction to the Strategic Business Model

It is evident from earlier chapters that the exploitation of traditional voice services offered in the mobile telecommunications market is reaching saturation levels. This means that the growth in revenue experienced by this sector will also decline since voice services constitute the current core business. Furthermore, it was indicated that the average revenue per user is declining. The industry expectation is that this decline in revenue will be replaced by increased revenue from data services. More specifically, Mobile Data Services are expected to fulfil this role.

In order to successfully implement any new technology in a market a structured method or business model is required. Some of the business models offered in the literature study focus on providing a "…*framework for categorising and studying the majority of near-term 3G services*." [66]. Others "…*deal with Charging, Billing and Payment Views on 3G Business Models*." [68]. The *technological opportunity and threat assessment method* focuses on the identification of emerging technologies and the anticipation of technological change. Furthermore, it evaluates the core components of technological development with its impact on the organization within the wireless data communication area [15]. This method is thus more generic in nature and does not provide the focus required by this dissertation.

The new proposed strategic business model is intended to provide a structured method for identifying the critical success factors for introducing Mobile Data Services into the emerging economy of South Africa. The model is unique in the sense that it provides a vehicle for the introduction of next generation services into an environment where no 3G networks exist. The focus is on a very specific existing technology, Mobile Data Services, which is introduced into specific market conditions (emerging economy). Since the focus of this research, and thus the model, is on the technological aspects of Mobile Data Services, the model does not account for impacts that this might have on a

specific company. The model benefits the industry in that it allows companies which make up the industry to evaluate and strategise on the business case for the introduction of a new technology to the market. By conducting this in a structured non-random way, they increase their chances of being successful in a new business venture.

From earlier chapters it is clear that certain concepts need to be evaluated and understood in order to provide insight into the critical success factors required for the introduction of Mobile Data Service into the South African market. These concepts constitute the components that will be used to create the model. The vital concepts are:

- Industry Stakeholders
- Stakeholder Relationships
- Industry Value Chain
- Driving Forces in Industry
- Mobile Data Services (the technology)
- Existing Business Models

4.8 Industry Stakeholders

The success of any implementation depends on the business collaboration of all key stakeholders. The purpose of the analysis of this component is to identify who are the most significant market players in the telecommunications industry. The quality of this analysis is important as it forms the basis for further analysis of the remainder of the components of the business model. The different stakeholders should be listed according to their current role in the market for example, Mobile Network Operator, Regulatory body, etc. As a next step, the names of the individual companies fulfilling the aforementioned roles should be included to expand the initial list. An example of the listing of market stakeholders with their roles and related companies can be seen in Figure 79.

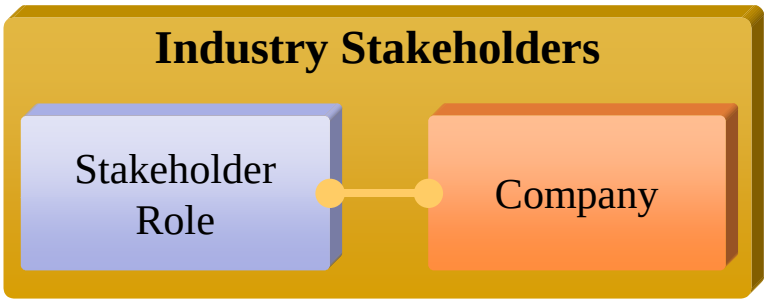


Figure 79: Stakeholder Map

The identification of the individual stakeholders is the first step in the process of understanding the dynamics of the market. Each stakeholder has a unique function to fulfil in the market. This unique function has a direct influence on the interaction that takes place between stakeholders. Once the functions of the most significant stakeholders are understood, the next step will be to examine the interaction that takes place among such stakeholders. This is done in the following component of the Business Model by focussing on the different relationships that exist in the industry.

4.9 Stakeholder Relationships

The purpose of analysing the relationships within the industry is to create an understanding of the dynamics of the industry. Although the main focus is to map out current relationships, that which is not mapped must also be very clear. In other words the mapping of relationships indicates existing as well as non-existing relationships, which could be used to indicate gaps (opportunities) in the market. Relationships can consist of simple relationships between such as buyer and supplier or more complicated relationships such as equity based agreements. To maintain clarity in the analysis, the relevant relationships must be diagrammed, in order to assist in the analysis of industry relationships by presenting a graphical presentation of such relationships. An Industry Relations Map can be created for this purpose. Figure 80 illustrates an example of an Industry Relations Map layout.

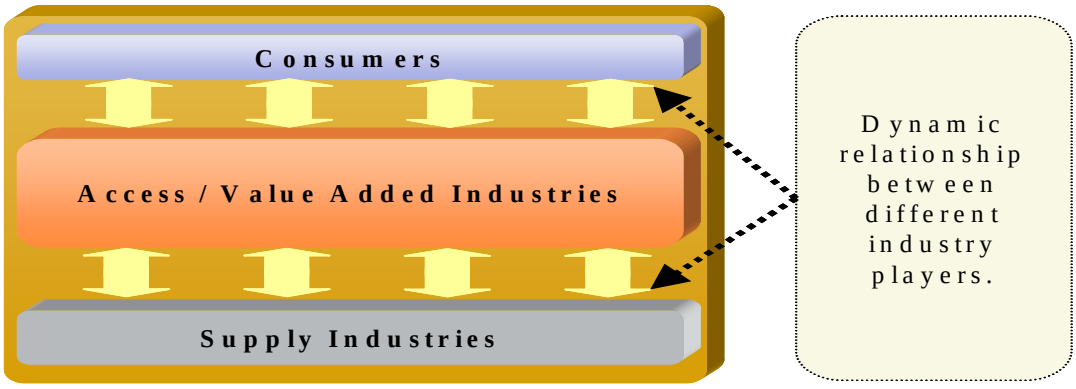


Figure 80: Industry Relations Map

The stakeholders should be grouped according to the three main macro functions in the market. These are the supply industries, the value added industries and the consumers. At this point in the analysis it should become increasingly clear that the Industry Relations Map bears a close resemblance to a vertical version of the traditional horizontal industry value chain. This realisation is explored in the following component of the business model.

4.10 Industry Value Chain

A tool made popular by Porter, called the Value Chain Analysis will be used to analyse what value is added by the different business functions in the industry [48]. This tool elevates the source of competitiveness within the industry, thus enabling business models / technology strategies for a specific company to be focussed on such areas. The value chain of the industry under consideration consists of companies providing core technologies / services and the consumers of such services. A generic high-level value chain can be seen in Figure 81.

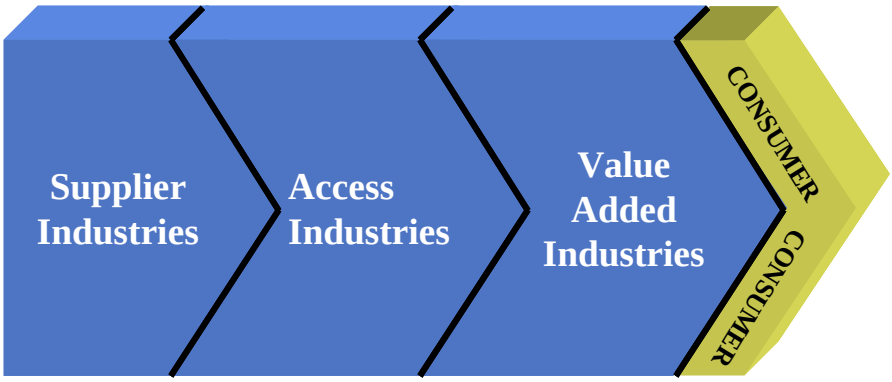


Figure 81: Generic Industry Value Chain

The analysis of this component of the model consists of generating the value chain for the industry as it is structured at the present moment. The following step would be to generate the future value chain of the industry. This would be done based on an expected industry structure at some predetermined point in time. The result is that a current and future snapshot of the industry value chain will be visible. This allows for comparisons to be made between the current and future value chains, which will enable companies to draw conclusions, which could expose a possible competitive advantage within the current or future market.

4.11 Driving Forces in the Industry

The dynamics of a market cannot fully be understood by only analysing the industry value chain. Additional to the market players, their different roles in the market and the resulting relationships among them, certain external forces also contribute to shape the market. Such forces are analysed in terms of three elements, which are Economic, Regulatory and Technical factors.

Economic factors are analysed both from an industry specific point of view as well as a more global point of view. The industry specific point of view includes issues existing specifically within the industry, for example the financial state of Mobile Network Operators or Vendors, which could in turn affect equipment delivery times. Global factors such as the state of the economy, which includes both the global and local economies, are analysed. More specifically issues such as the inflation rate and relevant effects (increased disposable income) must be explored.

Regulatory factors can be analysed in terms of competition policy and access regulation. Competition policy should aim at creating a balance amongst companies in the market in so far as their dominance in various areas is concerned. Possible restrictions that if lifted will create market opportunities, can be identified and exploited. Access regulation could possibly also be applied to stimulate competition in the market, for example the restrictions which apply to access of Voice Over Internet Protocol in the fixed line industry. Lifting of such restrictions could present possible opportunities for new companies in the Mobile Data Services market.

Technical factors are arguably the most important of the three. Issues such as the availability of specific technology (e.g. Global Positioning System in mobile devices) required for the delivery of certain services (e.g. Location Based Services) can be examined. Furthermore, the interoperability of equipment could also be examined more closely. Quality within the network could have a strong influence on the provision of Mobile Data Services. As a result, the ability of technology to deliver the required levels of quality could be examined.

4.12 Component Interface

Since the components mentioned thus far, are closely related, it is important to understand the construction of such relations. Figure 82 graphically illustrates the relations among the relevant components. A list of Stakeholders is used to compile the Industry Map. This map depicts the different relationships between all stakeholders and serves a dual functionality. It creates understanding of the dynamics within the industry and also exposes any gaps in the industry, which can be exploited as opportunities. The completed Industry Map can be used to create the Industry Value Chain by rotating it through 90^0. Finally the Driving Forces are examined which again have an influence on the industry as well as on the resulting effects thereof.

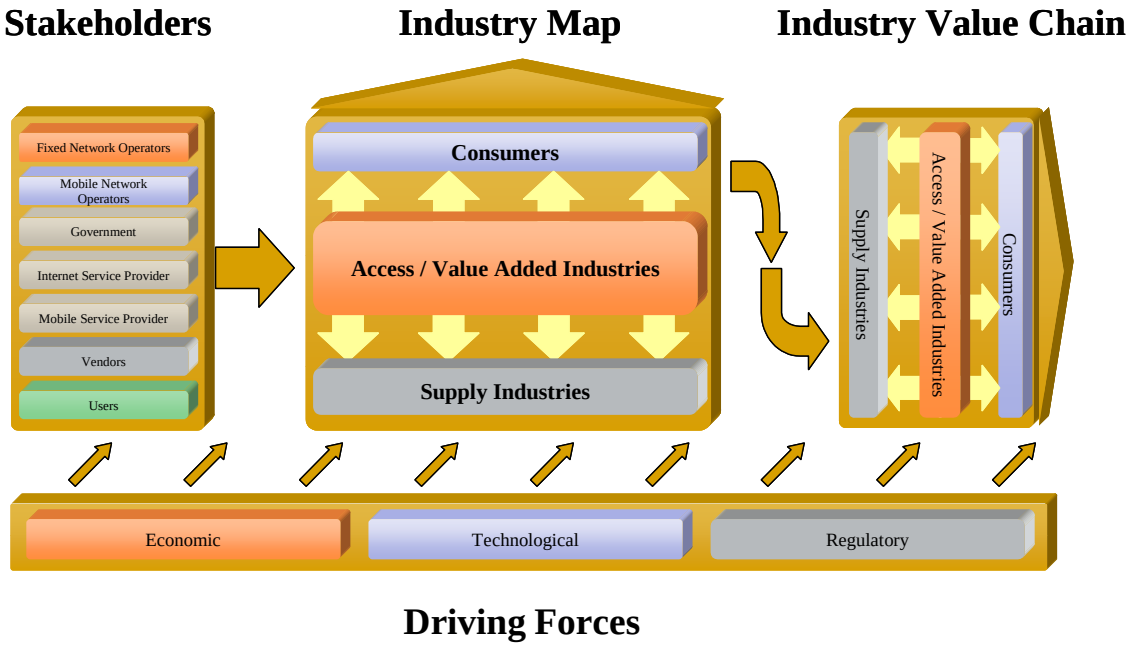


Figure 82: Industry Analysis Integration Map

4.13 Mobile Data Services

Mobile Data Services, the focus of the model, is an umbrella term that refers to a vast collection of innovative value-added services. These services are offered to mobile subscribers and can be accessed by various devices such as mobile phones, personal digital assistants, laptop computers and even autonomous devices employing telemetry services. The specific services that would be the most viable for introduction should be determined by applying a Service evaluation method such as the 5M method as discussed in earlier chapters. Additional methods could include scanning of international publications of evaluations which have been conducted with regard to the evaluation of various Mobile Data Services.

4.14 Existing Business Models

Existing business models refer to any business model that has been proposed for application in the Mobile Data Service industry. Seeing that much effort and thought has gone into such models, it would be worthwhile to analyse them, as they will contain useful concepts that could be used to strengthen the business model being created. Existing business models could also provide hints to detect new lines of business and application of technologies in the area of Mobile Data Services. The analysis is a basic scanning for existing business models related to the telecommunications industry. Since radical innovations could arise from unrelated industries, the scanning should also be broadened to include other industries. The results of such scans could be evaluated for application in the Mobile Data Services market.

4.15 Mobile Data Services Business Model

The business model consists of three sections of analysis as can be seen from Figure 83. The first section is a comparatively generic analysis and is labelled as Industry Analysis. This section examines core components of influence found in the Telecommunications industry. These components are the Industry Stakeholders, the Stakeholder Relationships, the Industry Value Chain and the Driving Forces in Industry. The second section is a more focussed analysis labelled Technology Analysis. This section examines the technology (MDS) which forms the subject of this research. The third section is labelled Business Analysis and examines existing business models with regard to MDS and related services. The answer to the research question is found in the final section of the business model labelled the Critical Success Factors. The bottom line of the Critical Success Factors is the identification and exploitation of opportunities within the market. This is achieved through the integration of three sections of analysis which constitute the MDS business model.

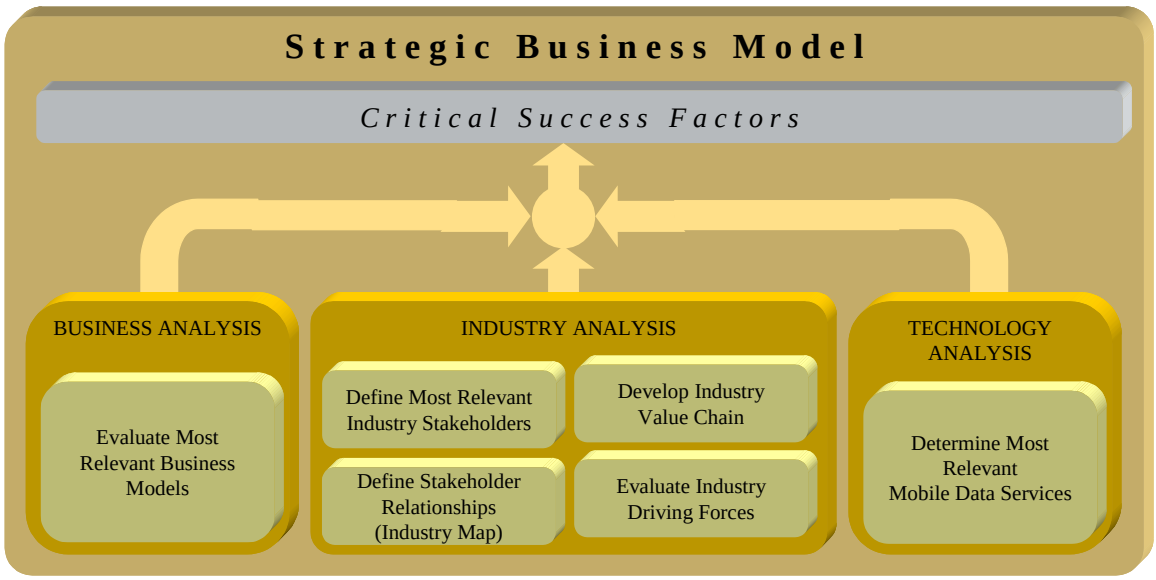


Figure 83: Strategic Business Model for MDS Introduction

5 Conclusion

The trend of decreasing revenue in the traditional voice related business in the industry and pressure from shareholders for higher profitability are the major motivators for Mobile Network Operators and related stakeholders to turn their attention to new sources of revenue. The core business of the Wireless industry was predominantly based on traditional voice services which after reaching a point of saturation, resulted in the aforementioned decrease in revenue. Mobile Data Services is a relatively unexplored technology within the South African Wireless market and is thus also an unexplored source of revenue. Moving streams of revenue results in changes within the market and thus creates a need for change in the structure of the wireless business value chain as the wireless industry becomes more services focused rather than technology driven.

When preparing for the introduction of an innovative technology (specifically Mobile Data Services) as a new line of business in the unique South African market conditions (simultaneous dual economy), companies are faced with a predicament on the genesis of such an introduction. The output of this research offers such a starting point in the form of a strategic business model to be followed in the analysis of relevant factors that make up this intricate composition. The core components (critical factors) constituting such a strategy were elevated during the study of various sources of literature and the importance and relevance of these theoretical core components (critical factors) were verified by a survey and field interviews in the telecommunications industry. The core components are Industry Stakeholders, Stakeholder Relationships, Industry Value Chain, Driving Forces in Industry, Mobile Data Services (the technology) and Existing Business Models.

The value proposition of the strategic business model lies not in its complexity, but rather in its simplicity when it acts as a template for analysis that allows for the assessment of the industry in a structured framework thereby exposing the dynamics which exist among the various stakeholders. It also facilitates the comprehension of the

technology at hand in order to generate a conceptual understanding of the position of Mobile Data Services within the Wireless market, thus broadening the realisation of market opportunities by allowing for the definition of the market pull for services which will in turn elevate the appropriate enabling technologies. Finally, by taking cognisance of relevant current industry business models, modern business concepts within the market can be utilised and enhanced to maximise profitability in the business venture.

Although the overall model remains a theoretical framework, it provides a structured process to be followed for the introduction of a new technology from a business perspective. Moreover, the components which constitute the model are robust enough to allow for practical analysis and application. The technological business perspective point of view of this model excludes some general components (for example elements of human capital) also found in business which are not exclusive to the model but could be developed as enhancements to the model. The model is also not an unchangeable framework, but transformation in the market can be reflected in the structure and content of the model in order to ensure that it is proactively aligned to the unique market demands.

Appendix A: Survey Questionnaire

The Introduction of Mobile Data Services in the South African Market.

Thank you for participating in this study on the introduction of Mobile Data Services in the South African market. The study is being conducted by the Department of Engineering and Technology Management at the University of Pretoria in conjunction with ITWEB. Your contribution to the study is greatly valued, and will allow us to identify the critical success factors to be taken into account when contemplating the introduction of Mobile Data Services in this market.

The questionnaire contains 25 questions and should take you no more than 10 minutes to complete. This estimate was determined from our pre-testing.

Mobile Data Services is an umbrella term that refers to a vast collection of innovative value-added services. These services are offered to mobile subscribers and can be accessed by various devices such as mobile phones, Personal Digital Assistants, Laptop computers and even autonomous devices employing telemetry services.

Examples of Mobile Services:

Mobile Internet Access	(Internet access on the move.)
Entertainment	(Games, Sport)
Multimedia Messaging Services	(Send long text messages with sound and video clips.)
Location Based Services	(Guide yourself to the nearest Restaurant.)
Rich Voice	(Talk and send data simultaneously.)
Mobile Intranet / Extranet Access	(Access the company Intranet while on the move.)

1 **Which type of organisation are you employed in?**

- ◯ Mobile Network Operator
- ◯ Fixed Network Operator
- ◯ Value Added Network Provider
- ◯ Internet Service Provider
- ◯ Software Application Development
- ◯ Broadcasting
- ◯ Vendor
- ◯ Other - Please Specify

2 **What is your current position in your organisation?**

- ◯ Executive Management
- ◯ Sales
- ◯ Operations
- ◯ Marketing
- ◯ Other

3 **What is your primary function in your organisation?**

- ◯ Sales
- ◯ Strategic
- ◯ Technical
- ◯ Management
- ◯ Other

4 **How often do you make use of the Internet?**

- ○ Several times a day
- ○ Daily
- ○ Weekly
- ○ Monthly
- ○ Very Seldom

5 **Do you believe that your company will participate in some form of Mobile Data Services delivery within the next 3 years?**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

6 **Do you believe that the deployment of Mobile Data Services will result in a change in relationships between current industry players?**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

7 **Do you think that strategic partnerships within the telecommunications industry will significantly influence the deployment rate of Mobile Data Services?**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

8 **Do you believe that the deployment of Mobile Data Services could result in new companies joining the existing Mobile Value Chain.**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

9 **Do you believe that Mobile Network Operators will be the primary developer of content for Mobile Data Services.**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

10 **All mobile devices (e.g. PDA's) will be able to access all portals.**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

11 **The distribution of income in South Africa will have a significant influence on the adoption rate of Mobile Data Services.**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

12 **There are sufficient devices in the market to form a critical mass for the development of Mobile Data Services.**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

13 **3G networks will be deployed in South Africa within the next 6 years.**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

14 **Restrictions (e.g. laws) in the use (e.g. taking unsolicited photos) of devices will affect the deployment of Mobile Data Services?**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

15 **Mobile commerce will mostly be used by corporates as opposed to consumers.**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

16 **In future the preferred method of access to corporate Intranet will be via a mobile device as opposed to a fixed PC.**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

17 **The billing of Mobile Data Service applications will be done centrally at the Mobile Network Operator.**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

18 **The Mobile Network Operator will only provide network access and no Mobile Data Services.**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

19 **Mobile Network Operators will also be Internet Service Providers.**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

20 **Would you allow advertisements to be sent to your mobile device if this subsidised your mobile account?**

Strongly Disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Strongly Agree

21 **The single most appealing characteristic of a Mobile Data Service to users is:**

- ○ Security
- ○ Reliability
- ○ Affordability
- ○ Content
- ○ Aesthetics
- ○ Personalisation

22 **The single most motivating factor for companies to participate in Mobile Data Service deployment is:**

- ○ Fits core competencies
- ○ Fits corporate strategy
- ○ Niche market opportunity
- ○ MDS is future of Mobile
- ○ Extensive revenue generation

23 **The single most restricting factor for the deployment of Mobile Data Services in South Africa is:**

- ◯ Performance limitations
- ◯ Infrastructure cost
- ◯ Mobile device interoperability problems
- ◯ Regulatory Restrictions
- ◯ Small potential market

24 **Which Mobile Data Service do you believe will be the most popular?**

- ◯ Entertainment
- ◯ Corporate Applications
- ◯ Internet Access
- ◯ Multimedia Messaging Service
- ◯ Rich Voice

25 **What do you think would be the main reason for using Mobile Internet Access?**

- ◯ Low prices
- ◯ Email access
- ◯ High access speeds
- ◯ New access devices
- ◯ Content
- ◯ Mobility

Appendix B: Interview Questionnaire Answer Sheet

Cellphone Name:

Introduction

What will be done with the info?

1 Which type of organisation are you employed in?

2 What is your current position in your organisation?

3 What is your primary function in your organisation?

4 How often do you make use of the Internet?

5	**Do you believe that your company will participate in some form of Mobile Data Services delivery within the next 3 years?**
6	**Do you believe that the deployment of Mobile Data Services will result in a change in relationships between current industry players?**
7	**Do you think that strategic partnerships within the telecommunications industry will significantly influence the deployment rate of Mobile Data Services?**

8	**Do you believe that the deployment of Mobile Data Services could result in new companies joining the existing Mobile Value Chain.**
9	**Do you believe that Mobile Network Operators will be the primary developer of content for Mobile Data Services.**
10	**All mobile devices (e.g. PDA's) will be able to access all portals.**

11	**The distribution of income in South Africa will have a significant influence on the adoption rate of Mobile Data Services.**
12	**There are sufficient devices in the market to form a critical mass for the development of Mobile Data Services.**
13	**3G networks will be deployed in South Africa within the next 6 years.**

14	**Restrictions (e.g. laws) in the use (e.g. taking unsolicited photos) of devices will affect the deployment of Mobile Data Services?**
15	**Mobile commerce will mostly be used by corporates as opposed to consumers.**
16	**In future the preferred method of access to corporate Intranet will be via a mobile device as opposed to a fixed PC.**

17	**The billing of Mobile Data Service applications will be done centrally at the Mobile Network Operator.**
18	**The Mobile Network Operator will only provide network access and no Mobile Data Services.**
19	**Mobile Network Operators will also be Internet Service Providers.**

20	**Would you allow advertisements to be sent to your mobile device if this subsidised your mobile account?**
21	**The single most appealing characteristic of a Mobile Data Service to users is:**
22	**The single most motivating factor for companies to participate in Mobile Data Service deployment is:**

23	**The single most restricting factor for the deployment of Mobile Data Services in South Africa is:**
24	**Which Mobile Data Service do you believe will be the most popular?**
25	**What do you think would be the main reason for using Mobile Internet Access?**

Appendix C: Details on ITWEB

Information downloaded from ITWEB website on 06/10/2003 at www.itweb.co.za.

ITWeb - Reader base

(Traffic audited by PricewaterhouseCoopers)

Unique monthly readers	>60 000
Unique subscriber base to ITWeb's daily newsfeed	>29 500
Unique subscriber base to ITWeb's weekly Channel newsfeed	> 7 300
Average monthly page impressions for 1st quarter 2003	>1 300 000

ITWeb – Demographics by job title

Occupation	Percentage of total
CEO / MD	6.56%
Director	12.10%
Senior manager	24.31%
Total from senior positions	42.97%
Specialist	8%
Consultant / self employed	15.91%
Middle manager	11.19%
Lecturer / student	4.15%

Other	17.06%
Editors / journalists	0.74%

ITWeb – Demographics by industry

Occupation	Percentage of total
Computer	49.80%
Telecommunications	8.21%
Financial	7.67%
Parastatal	5.61%
Banking	5.19%
Mass retail	4.96%
Heavy industry	4.89%
Academic	4.74%
Other	8.93%

ITWeb – Demographics by size of turnover

Annual turnover	Percentage of total
> R100 million	40%
Between R10 million and R100 million	33%
< R10 million	27%

Where ITWeb is accessed from

	Percentage of total
From work	92%
From home	8%

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