Namibia in the Information Age

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EXECUTIVE SUMMARY

Namibia is well-positioned to deploy ICT to its advantage. The geographic and social challenges of Namibia require innovative approaches and considerable effort. Namibia is still far from providing equal access to information to all Namibians. Competition will improve the situation. However, bold steps and courage could facilitate the development of Namibia greatly. The ICT sector around the world is increasingly contributing directly and indirectly to employment creation. Namibia could be a technology centre within Sub-Saharan Africa, attracting additional foreign direct investment, and enjoying stronger growth in GDP and employment opportunities. Courage is required not only from entrepreneurs but also from government officials and regulators.

A digital divide exists that runs between income groups in Namibia as well as between Namibia’s rural and urban population. Bridging this gap is the challenge policy makers face if they are to achieve the objectives set out in Vision 2030 and the NDP2.

Several limiting factors are holding back more rapid development. These factors are:

- Lack of IT literacy, in particular in rural areas;
- High communication costs, owing to Telecom Namibia’s monopoly;
- Under-utilised radio spectrum. Wireless solution can make the Internet affordable to schools and community centres;
- Lack of e-commerce and e-banking legislation;
- Absence of a Namibian automatic clearing bureau for bank transactions;
- Language barriers with respect to Internet content.

E-sectors are growing in Namibia, but not at the same pace as elsewhere in the world. So far, ICT has changed the way we live and work for relatively few Namibians.

Namibia’s best strategy would be to focus on human resource and economic development. The latter is required to fund the human resource development. In the short run Namibia could make much progress with little extra efforts. These efforts would include further liberalisation of the telecommunication sector, active management of radio spectrum, and the passing of e-banking and e-commerce laws. Addressing human resource development and IT skills will require a long-term approach.
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<th>Full Form</th>
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<tr>
<td>ATM</td>
<td>Asynchronous Transfer Mode</td>
</tr>
<tr>
<td>CEE</td>
<td>Central and Eastern European countries</td>
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<td>GATS</td>
<td>General Agreement on Trade in Services</td>
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<td>GSM</td>
<td>Global System for Mobile Communications</td>
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<td>IN</td>
<td>Intelligent Network</td>
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<td>ISDN</td>
<td>Integrated Service Digital Network</td>
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<td>IP</td>
<td>Internet Protocol</td>
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<td>ISP</td>
<td>Internet Service Provider</td>
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<tr>
<td>LAN</td>
<td>Local Area Network</td>
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<td>LNP</td>
<td>Local Number Portability</td>
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<td>ITU</td>
<td>International Telecommunication Union</td>
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<td>Mbps</td>
<td>Million Bytes Per Second</td>
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<td>MGCP</td>
<td>Media Gateway Control Protocol</td>
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<tr>
<td>MPLS</td>
<td>Multi-Protocol Label switching</td>
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<td>MTC</td>
<td>Mobile Telecommunications Ltd.</td>
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<tr>
<td>NCC</td>
<td>Namibian Communications Commission</td>
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<td>NDI</td>
<td>National Democratic Institute</td>
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<td>NDP2</td>
<td>National Development Plan 2</td>
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<td>NEPRU</td>
<td>Namibian Economic Policy Research Unit</td>
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<tr>
<td>NGN</td>
<td>Next Generation Network (IP)</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
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<td>POS</td>
<td>Point of Sale</td>
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<tr>
<td>PSTN</td>
<td>Public Switched Telephone Network</td>
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<tr>
<td>PTOs</td>
<td>Public Telecommunication Operators</td>
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<tr>
<td>QoS</td>
<td>Quality of Service</td>
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<tr>
<td>SCP</td>
<td>Service Control Point</td>
</tr>
<tr>
<td>SS7</td>
<td>Signalling System 7</td>
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<tr>
<td>TDM</td>
<td>Time Division Multiplex</td>
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<tr>
<td>UK</td>
<td>United Kingdom</td>
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<td>UNAM</td>
<td>University of Namibia</td>
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<tr>
<td>USO</td>
<td>Universal Service Obligation</td>
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<tr>
<td>VANS</td>
<td>Value Added Network Services</td>
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<td>VoIP</td>
<td>Voice over IP</td>
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<tr>
<td>VPN</td>
<td>Virtual Private Network</td>
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<td>WAN</td>
<td>Wide Area Network</td>
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<tr>
<td>XDSL</td>
<td>X Digital Subscriber Line</td>
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</table>
1 INTRODUCTION

The aim of this study is to identify to what degree information and communication technology (ICT) has impacted the Namibian society, how ICT could best be employed to achieve the development targets set out by the Government of Namibia in the National Development Plan DP2 and Vision 2030.

A global trend can be identified; the increasing importance of information or knowledge as a fourth factor of production (with land, capital and labour being the first three). Information also becomes increasingly important in our social and cultural spheres. Today communication is quicker and easier than it was a few years ago through technology such as email, video conferencing and cell phones. We are also provided with more information than in the past through multiple TV channels and radio programmes and the Internet.

The information revolution is not likely to have an even impact on Namibian society. The agricultural revolution affected neither countries nor societies evenly and the same is true for the industrial revolution. The questions that will be addressed in this study are:

- Has Namibia undergone an information revolution yet, and if so, what type of revolution has taken place?
- How does Namibia compare with respect to infrastructure and social and economic change to other African countries, and globally?
- How much ICT does Namibia need in order to profit from global trends?
- How can Namibia benefit most from ICT developments?

This study focuses on how Namibia can best make use of the fourth production factor that is gaining importance globally.

First, a theoretical background will be provided, and literature about the information revolution and information society will be reviewed. The following chapter deals with the infrastructure necessary to reap benefits from the information revolution. Here, Namibia’s telecommunication and Internet infrastructure will be analysed and compared at international level. The chapter on ICT in Namibia deals with e-sectors, i.e. sectors that already benefit from advances
in information and communication technology. This chapter deals with e-government, e-learning, e-commerce and e-banking. The chapter on Information Age Technology will derive policy recommendations on how Namibia can build on its comparative advantages to maximise gains from the information revolution that is taking place world wide.
2 THEORY

The aim of this chapter is to explain key terms and concepts that are frequently used when talking about information revolution, information age, information society, knowledge society, new economy, knowledge economy, network society and digital divide. There are two separate issues here. The first is how to define terms such as information society, and the second is how to operationalise these definitions. Once an information society is defined, how can we say whether a country has achieved this or is on the way to achieving this? This chapter discusses some key terms in this regard.

WHAT IS INFORMATION?

There are several ways to define information and any definition will depend on the perspective from which information is looked at and the purpose for which it is defined. For the purpose of this study, a technical perspective will be chosen that distinguishes between data, information and knowledge.

Information shall be understood as processed data and knowledge as processed information. The processing could, for example, be the mere storing of data and/or information. Stored data becomes information and stored information becomes knowledge. However, there are several other ways to process information and data such as combining, analysing and interpreting data and/or information. Lloyed-Laney (2003) defines knowledge in a similar way as:

“Knowledge is not the same as information: it is the sense that people make of information. Knowledge is infused with the insights, expertise and capacities of those who have it. People need to be able to make their own sense of information - to interpret it, to evaluate it, to reach their own understanding of it - whether the objective is to decide how to vote, to decide whether to wear a condom during sex, or to determine what price to charge for their produce at market.”
VALUE OF INFORMATION

Another important aspect is the value of information. There is a potential or intrinsic value of information, and an actual value. The actual value can only be determined when information has actually been used and depends on who used it and how it was used.

The Rothschild family, for example, made its fortunes in part through being able to know the outcome of the battle against Napoleon ahead of other market participants, through a network of horse couriers. This enabled them to buy stocks before the news became known to other traders at the London Stock Exchange. However, the same news would have been of considerable less value to a poor person who could not channel funds quickly into the stock market. The value that the Rothschild family derived from that information depended critically on the funds available to the family at the time, the speed with which it obtained the information, and also on many other factors. Information can be used or not. The Rothschild family could have chosen not to act on the information.

Quality of information is another important value driver. A five-minute chat about the latest movies between teenagers over the phone is likely to be of less value (in monetary terms) than a five minute telephone conversation between the presidents of Russia and the USA via the red telephone.

The potential value of information is a function of time, quantity and quality, location, coincidence, and many other factors. The most important thing to note though is that the actual value of information that is not used is zero. Information can only be used when it is communicated. Without communication, information stays in the same place without adding value. Communication is the process that moves information from source to recipient and back, just like the information about the victory over Napoleon. The information was valuable because it travelled a distance, it reached its destination quickly, the information was potentially useful, and because the Rothschild family had the means to use the information.

Advances in information and communication technology are the factors behind the phenomenal increase in importance of information. Telephone, fax, mobile phones and the combination of these technologies enabled the establishment of networks, such as the Internet, that facilitated the flow of information.
DEFINITIONS OF INFORMATION SOCIETY

There are various ways of approaching a definition of an information society. One could argue that the information society is something new, brought onto us by technological changes. One could also argue that it is a continuation of a process that started a long time ago. Webster (2002) categorises different schools of thought and their representatives along these two views (Table 1).

Table 1 Schools of Thought Webster (2002)

<table>
<thead>
<tr>
<th>Information society is something new.</th>
<th>Information society is simply continuities from the past</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post industrialism (Daniel Bell)</td>
<td>Neo-Marxism (Hubert Schiller)</td>
</tr>
<tr>
<td>Post modernism (Jean Baudrillard, Mark Poster)</td>
<td>Regulation Theory (Michel Aglietta, Alain Lipietz)</td>
</tr>
<tr>
<td>Flexible specialisation (Michael Piore and Charles Sabel, Larry Hirschhorn)</td>
<td>Flexible accumulation (David Harvey)</td>
</tr>
<tr>
<td>The informational mode of development (Manual Castell)</td>
<td>The Public Sphere (Jürgen Habermas, Nicholas Garnham)</td>
</tr>
<tr>
<td></td>
<td>Reflexive Modernisation (Anthony Giddens)</td>
</tr>
</tbody>
</table>

Webster (2002) distinguishes six definitions of an information society, each of which presents criteria for identifying the evolution of an information society.

- Technological definitions: This group of definitions centre around technological innovations;
- Economic definitions: Measures of growth in economic value of informational activities;
- Occupational definitions: Occupational structures are examined over time to identify the share of information work compared to manual work;
- Spatial definitions: The major emphasis here is on information networks which connect locations and affect therefore the organisation of time and space;
- Cultural definitions: Measuring the impact of information on contemporary culture (media saturation, fashion, entertainment, art etc.).

This study will focus on the economic and technological aspects. Social, cultural and occupational implications will derive from that. A technological definition of an information society centres around technical innovations of recent years. The information revolution is seen as a third wave of technological innovation that is shaping the way in which we live, with the agricultural and the industrial revolutions being the first and the second waves.
This is a difficult concept to measure. The agricultural and industrial revolutions had a major impact on the way in which we live and work. However, the impact had not been even across societies and had differed from country to country. In some countries, farming is still done in the way it was done in central Europe 500 years ago.

Furthermore, how many computers per capita are required to declare a society an information society? Dropping a load of ICT equipment on the shop floor of a textile manufacturing business in Windhoek does not automatically bring any productivity gains or change in the way work is carried out.

The economic definition of an information society (or information economy) is based on the value added through information to the economic output of a society. Economic output is usually measured by Gross Domestic Product (GDP) or Gross National Product (GNP). The distinguishing factor is the value contributed to GNP by information activities within a society. The value added by information is steadily increasing not only in the ICT sector but also in the traditional industrial, agricultural and service sectors.

Machlup (1962) identified education, law, publishing, media and computer manufacturing as information industries. Porat (1977) also includes what he calls the secondary information sector, such as human resource (HR) and research and development (R&D) departments of businesses. Today however, these definitions need to be widened since information plays an increasing role in all kinds of economic activity.

Evans and Wurster (2000) argue that every business is an informational business, and information plays a critical role even for businesses that are not generally considered information businesses. They give as an example of the health care sector in the USA, where about one third of the cost (approx. US$350 billion) consists of storing, processing and retrieving information such as patient records, cost accounting and insurance claims. Evans and Wurster (2000) point out that even low-tech manufacturers would find it difficult to compete without information intensive functions such as market research, logistics and advertising. Even more striking is the extent to which information contributes to competitive advantage. Evans and Wurster (2000) give several examples of this:

- Toyota built a powerful competitive advantage through simultaneous engineering by pioneering Total Quality Management, Just in Time (JIT) and the Kanban system, all based on information management;
- American Airlines used its control of the SABRE reservation system to achieve higher levels of capacity utilisation;
• Wal-Mart used its EDI-link with its suppliers and the logistic technique of cross-docking to achieve dramatic increases in inventory turns.

Evans and Wurster (2000) argue that information is the glue that holds value chains and supply chains together.

For the purpose of this study the view is adopted that information has always played an important role in our economic and social lives. Just as globalisation has not started recently, neither has the use of information. It is only that today, globalisation and the value creation through the use of information have become essential strategies for the success of businesses and nations, and that today the importance of information is exponentially increasing. This lends to the term “Information Age”.

Table 2  ICT advances (various sources incl. Castells (2000))

<table>
<thead>
<tr>
<th>Inventions</th>
<th>Inventors</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>book print</td>
<td>Gutenberg</td>
<td>1452</td>
</tr>
<tr>
<td>telephone</td>
<td>Bell</td>
<td>1876</td>
</tr>
<tr>
<td>radio</td>
<td>Marconi</td>
<td>1898</td>
</tr>
<tr>
<td>vacuum tube</td>
<td>De Forest</td>
<td>1906</td>
</tr>
<tr>
<td>transistors (semiconductors)</td>
<td>Bell Laboraties</td>
<td>1947</td>
</tr>
<tr>
<td>silicon based transistors</td>
<td>Texas Instruments</td>
<td>1954</td>
</tr>
<tr>
<td>integrated circuit</td>
<td>Texas Instruments</td>
<td>1957</td>
</tr>
<tr>
<td>microprocessor</td>
<td>Ted Hoff (Intel)</td>
<td>1971</td>
</tr>
<tr>
<td>Apple 1 and Apple 2 (first commercial PCs)</td>
<td>Steve Wozniak and Steve Jobs of Apple</td>
<td>1976</td>
</tr>
<tr>
<td>Icon based (graphical) operating system</td>
<td>Apple (Xerox)</td>
<td>1984</td>
</tr>
<tr>
<td>Cell phones (first commercial)</td>
<td>Motorola</td>
<td>1973</td>
</tr>
<tr>
<td>Internet</td>
<td>US Army (ARPANET)</td>
<td>1969</td>
</tr>
<tr>
<td>TCP/IP</td>
<td>Cerf Postel and Cohen</td>
<td>1980</td>
</tr>
<tr>
<td>html / http</td>
<td>Centre Européen pour Recherche Nucleaire</td>
<td>1990</td>
</tr>
</tbody>
</table>

Some authors speak about an information technology revolution. A revolution is usually understood as fundamental change; change in power, change in technology, change in the way in which we live. This would imply a structural break that dramatically changes the life we live. The invention of the steam engine is often presented as such a structural break for the industrial revolution. However it took quite some time for it to impact the lives of the majority of people since its invention. Castells (2000) identifies advances in ICT since the 1970s as such structural breaks. He states that at the end of the twentieth century, the world experienced one of those rare intervals in history characterised by a change to new technological paradigm organised around information technologies. In this context Castells (2000) refers to information technology as being for this revolution what new sources of energy were to the successive industrial revolutions (steam engine, fossil fuels, electricity).
Information and knowledge have always been important for man and were also the basis for the agricultural and the industrial revolution. What characterises the current technological revolution is not the centrality of knowledge and information, but the application of such knowledge and information to knowledge generation and information processing in a cumulative fashion (Castells 2000).

Another difference is that the agricultural and industrial revolutions took place in only few societies, and diffused in a relatively limited geographic area. The information technology revolution in contrast spread throughout the globe with lightning speed (in historical terms). The geographic spread and the speed of diffusion are unparalleled in history. The speed of the diffusion and the speed of development justify the use of the term information revolution.

**CONCLUSION**

Information society shall for this report refer to an economic concept. The distinguishing factor is the value contributed to GDP by information within a society. The information society can be seen as the fourth stage of industrial development. It follows the agricultural society, the industrial society and the service society. The process started even before humans settled. Information always played an important role: to know where animals grazed and where to find water were essential for bushmen living a few thousand years ago. Sending out scouts (hunters) to gather this information was essential for survival then, and is still today for some communities. The transition from a service society to an information society is difficult one to determine. An information society evolves over time and is not a dichotomous characteristic, a zero or a one, but a process. An information society could be seen where more value is added by information to the GDP than through industry or agriculture services.

To measure how much information contributes to GDP is a difficult task, and virtually impossible in Namibia owing to a lack of statistics such as a full business baseline survey. No such attempt shall therefore be undertaken. The focus will be on certain activities that have already been affected by the information revolution in Namibia, or that have the potential to benefit greatly from the information revolution, such as e-government, e-learning, e-commerce and e-banking. First however, the underlying infrastructure will be analysed that enables the evolution of such e-sectors.
3 ICT IN NAMIBIA

This chapter deals with the infrastructure necessary to generate gains from the information revolution. Namibia’s telecommunication and internet infrastructures will be analysed. Namibia’s e-readiness is compared regionally and globally and in terms of national income levels.

NAMIBIA’S TELECOMMUNICATION SECTOR

Telecom Namibia is the only facility-based operator providing local, long distance, international and leased line services in Namibia. Until 1992 the government department, “Department of Posts and Telecommunications”, was responsible for telecommunication and postal services. The department was dissolved in 1992 resulting in the creation of Telecom Namibia. Telecom Namibia is owned by Namibia Post and Telecom Holdings (NPTH), which in turn is owned by the State. NPTH also holds 51% of the shares of Mobile Telecommunications Ltd. (MTC). MTC was awarded a mobile telecommunication license in 1996.

Considerable advances have been made in the telecommunications sector in Namibia over the past few years. The fixed line teledensity (i.e. telephone lines per 100 inhabitants) increased from 3.11 percent in 1992 to 6.41 percent in 2002 (see Figure 1). The number of installed telephone lines increased from 45,000 in 1992 to 121,413 in 2003. The revenues and the productivity of Telecom Namibia have steadily increased. Figure 2 shows the revenue per line and the number of fixed lines per Telecom Namibia staff. Both graphs are increasing, indicating improving productivity.

The fixed line telephone services offered in Namibia are among the best in Africa. The African Competitiveness Report 2000/2001 ranked Namibia fourth for number of telephones and affordability of telephone prices.

MTC offers two services, a pay-as-you-go service (Tango Card) and a contractual or subscription service (Professional). The subscription service involves a monthly fee and has cheaper rates than the pay-as-you-go service. The development of the mobile
phone industry has also been remarkable in Namibia. Mobile phone teledensity increased from 0.96% in 1998 to 6.97% in 2002 (May).
The number of mobile phone users is already higher than the number of installed fixed telephone lines.

**Figure 3 Mobile Teledensity (source: MTC)**

**Figure 4 MTC Customers (source MTC)**

MTC exceeded 200,000 subscribers in October 2003, while Telecom Namibia still had only 121,413 fixed line subscribers.
(Direct Exchange Lines). The higher growth of mobile phone subscribers compared to fixed line users can mainly be attributed to the population density and the geographical features of Namibia. An additional mobile phone costs much less compared to the installation of an additional fixed line in a location where both networks are already established. Another factor is the ease of use of mobile phones, in particular with respect to Tango cards. The time between the decision to purchase a mobile phone and to have it actually working can be as little as 15 minutes. This is reflected in the growth of mobile phone subscribers using Tango cards compared to mobile phone subscribers using the contractual service offered by MTC.

A disadvantage of mobile phones over fixed line connections is currently the unsuitability for Internet use. This disadvantage could be overcome with the introduction of 3rd generation mobile phones (UMTS) or an intermediary step by introducing 2.5 Generation mobile phones (GPRS).

Employment in the mobile telecommunication sector has increased in contrast to the fixed line sector since the introduction of mobile telecommunication services. Surprisingly MTC was already able to provide a higher teledensity than Telecom Namibia in 2002, with only 138 employees compared to 1516 of Telecom Namibia.

2004 promises to be the year of competition for the telecommunication sector. The tendering process for a second GSM license will close in November 2003. A second mobile operator could then be expected start providing services in late 2004. The new entry would most probably establish a network that could quickly be upgraded to a next generation mobile phone network. A second fixed-line provider has also been considered for quite some time.

Economically and socially Namibia would probably benefit more from a second fixed line provider than from a second cell phone provider. This will be revisited in chapter 5.

INTERNET SERVICES IN NAMIBIA

The provision of Internet services remains unregulated. A draft policy is being prepared and is expected in due course. Thus at present, there are no limitations with respect to market access or ownership.

The Namibian Internet Development Foundation (NAMIDEF) was the first Internet Service Provider in Namibia. It started its Internet
services September 13, 1995. The foundation operated an IP link to
the Internet via a land line to Johannesburg, South Africa.
NAMIDEF stopped providing Internet services in 1997.

Today there are three larger Internet service providers (ISPs) in
Namibia and several smaller ones. The larger ones include
AfricaOnline, Mweb Namibia and Iway. The smaller Internet
service providers include OASYS, Incredible Network, Namweb,
Namibnet and Cyberhost.

There are two Internet Access Service Providers (IASP) in Namibia,
these are Infinitum and UUNet. Infinitum is a parastatal belonging
indirectly to Telecom Namibia\(^1\). UUNet is a private company.

ISPs cannot build their own copper or fibre networks. However,
they can build their networks with routers and switches using the
cable network of Telecom Namibia. ISPs are not allowed to own or
lease their own international gateway. Interconnection agreements
are left to private negotiations between parties. There are two
peering points available; one private and the other public. The
public peering point is owned by Infinitum, and the private one by
UUNet.

![Graph showing aggregated direct dial up Internet users, excluding leased line users](image)

**Figure 5**: Aggregated direct dial up Internet users, excluding leased line users (Source: Namibian ISPs)

1. Infinitum and Telecom Namibia are 100% owned by Namibia Post and
   Telecom Holdings (NPTH). NPTH also holds 51% of Namibia’s mobile phone
   operator MTC.
Service providers as well as consumer groups are consulted in advance of regulatory decisions. The draft ISP policy is currently being reviewed by the NCC and will, following approval of the
Board of the NCC, be submitted to the Minister of Foreign Affairs, Information and Broadcasting. Laws and regulatory decisions will be made public via the regulator’s website and the official gazette.

There were roughly 14000 Internet users using fixed lines for Internet access, and 8000 users accessing the Internet via leased lines in 2002. E-commerce is only possible by using overseas banking facilities, since there are no credit card facilities available for e-commerce in Namibia yet.

Cost of accessing the Internet has increased due to a rise in local phone call prices, posing an obstacle to the spread of Internet use.

The African Competitiveness Report 2000/2001 ranked Namibia as number one in Africa for Internet access and number two for Internet hosts. However more can still be done. It can be seen from Figure 8 that the real cost of accessing the Internet has increased due to a rise in local phone call prices, posing an obstacle to the spread of Internet use.

One recent change is the introduction of nation-wide Internet access numbers that are cheaper to call than the local call rates. However, the savings compared to local call prices are marginal.

Another recent change has been the VAT amendments that became effective from 1st October 2002. The amendment of the VAT Act waives the VAT on telecommunication services to residential accounts. This means that VAT is not charged on private telephone rental and related services. Also, the supply of DSTV and M-Net
subscriptions, the supply of Internet connection, and Internet subscription fees are now effectively exempt from VAT.

After the VAT exemption, residential users paid 25 cents instead of 29 cents for nationwide Internet access numbers per minute for internet connection. The monthly connection fee of ISPs dropped for residential users by 15%. The cost of 20 hours access per months dropped from N$239.93 to N$191.2 in real terms (1994 prices).

Conclusion

Despite these recent changes, the real cost of Internet access has nevertheless increased. At N$191.2 for residential users, the cost is still higher than in 1996 to 1999 due to telephone costs.

Competition in fixed line services is likely to reduce access costs to the Internet considerably. Typically voice calls are of much shorter duration than Internet calls. The local voice call rates therefore need to be higher than Internet call rates to cover fixed costs. In OECD countries these fixed costs are usually covered through local call rate charges during the first 3 minutes. In a competitive fixed line environment ISPs would be able to negotiate a connection charge of 3 minutes local rate, and from then on a fraction of a local call rate for additional minutes. This would reduce the costs of a 20 minute Internet call considerably, thus promoting the use of the Internet.

Much has been achieved by Telecom Namibia and MTC over the past years. However, there are still new challenges to be met. Broadband technologies, wireless communication and IP telephony pose a threat to traditional means of communication but also present enormous opportunities for the development of Namibia. These technologies will be discussed in chapter 5.

REGIONAL COMPARISON

Africa is still lagging behind international trends in terms of ICT usage. Asia managed to increase its share of fixed line customers worldwide from 27% to 38% between 1995 and 2001, while Africa in comparison remains at 2%. This implies that growth in Africa has been the same as the global growth of fixed line customers. However considering that Africa’s teledensity is much lower than those of Asia, Europe and the Americas this can be seen as a failure to catch up. Figure 13 displays the regional fixed line teledensities for 2001. It shows that on average Africa’s fixed line teledensity at 2.61 is well below the world average of 17.09. Namibia’s fixed line
teledensity of 6.4 for 2001 is above the African but below the world average.

Figure 9: Global distribution of fixed line customers (source: ITU 2002)

Figure 10: Global distribution of Internet users (source: ITU 2002)
A similar picture emerges when looking at the global distribution of Internet users. Africa in 2001 still lingered at 1% as in 1995, while Europe and Asia managed to gain ground compared with the Americas. Namibia’s number of Internet users per 10,000 inhabitants is at $110^2$ above the African average of 85.21, though far below the world average of 820 (see Figure 12) in 2001. The number of hosts per 10,000 inhabitants in Namibia is also higher than the African average and much lower than the world average.

Only in terms of mobile phone users has Africa managed to increase its share of total mobile phone users world-wide. Africa’s share increased from 1% to 3% from 1995 to 1996. Three percent might sound little, yet Africa tripled its share of global mobile phone users. The success of mobile phones in Africa can be explained by the relative lower cost of installing a mobile phone infrastructure compared to a fixed line infrastructure. Pay-as-you-go schemes additionally contributed to the success of cell phones in Africa. They effectively lowered barriers to telecommunication access as these schemes typically do not require an ID document, a physical address or a bank account thus enabling also less well-off people to gain access to telecommunication facilities.

Figure 11: Global mobile subscriber distribution (source: ITU 2002)

2. Own estimation: Figure 12, Figure 13, and Figure 14 display figures from the ITU. The numbers used in this working paper differ partly from the figures of the ITU since NEPRU has more accurate information on Namibia than the ITU. For comparison sake the charts only display ITU data.
The global trend is towards mobile phones taking over as the leader in providing access to telecommunication services. In 2002 the
The number of mobile phone users surpassed the number of fixed line subscribers in Namibia. The same is true for most countries in Africa. The mobile teledensity in South Africa was already twice as high in 2001 as the fixed line teledensity (see Figure 13).

Looking at Figure 14 it seems that Namibia has an unusually high number of ISPs relative to its population. With 2.8 per million inhabitants it exceeds the world average of 1.81.

In terms of computers per 100 inhabitants we see the same pattern: higher than the African but lower than world average.

One important observation is that South Africa is clearly ahead of Namibia in terms of teledensities, number of internet users, number of hosts and number of computers. The question that arises is, what is South Africa doing better than Namibia?

Globally the liberalisation of the telecommunication market has led to more jobs in the ICT sector.

The answer is that South Africa started earlier with liberalising the telecommunication market. Market liberalisation might be disadvantageous to the incumbent telecom operator but it is advantageous to the economy as a whole. Globally the liberalisation of the telecommunication market has led to more jobs in the ICT sector, even if previous incumbent operators had to reduce staff. Neither the protection of jobs nor the argument of universal service obligation are valid reasons against market liberalisation.
A positive trend can be observed when comparing the relative proportions of fixed line customers, mobile subscribers and Internet users in 1995 with 2001 with respect to wealth categories.

Figure 15 compares the distribution of fixed line customers across income categories in 1995 with 2001. It can be seen that the Lower Middle Income category gained most in terms of relative proportion. Fixed line telecommunication is a well-established product and it is therefore not surprising that the High Income category lost relative to the other income categories. Fixed line connections have come down in price, which is a major factor contributing to the spread to lower income categories.

Figure 16 compares the distribution of mobile phone subscribers, and Figure 17, Internet users across income categories in 1995 with 2001.

The main factor for the shift towards lower income groups has been market liberalisation around the world and technological advances. Competition, broadband technology and mobile telecommunication have brought down the costs of communicating and accessing information.
Figure 16 Mobile subscribers in 2001 for income categories (source: ITU 2002)

Figure 17 Internet users in 2001 for income categories (source: ITU 2002)
The digital divide runs more between income groups rather than nations.

Often the digital divide is referred to as dividing the developed from developing countries. This is supported by statistics that show how many Internet users there are in developed compared to developing countries. However, it detracts from the main reason for the digital divide, and that is income. The digital divide runs more between income groups rather than nations. Teenagers of wealthy families in Vietnam, Bolivia, Namibia, the USA or Europe all have access to cell phones, computers and Internet, while teenagers of poor families in these countries do not. The next sections deals with Namibia’s digital divide.

NAMIBIA’S DIGITAL DIVIDE

The extent to which the Namibian society is affected by technological changes differs across regions and income groups.

The telecommunication sector faces serious challenges owing to the size of Namibia (824 000 km2), the relatively small population of approx. 1,83 million and consequently the low population density. Also, Internet service providers find it difficult to expand the total number of Internet users owing to income barriers.

For many years, developments in the telecommunications and utility sectors have focused on the economically active sector of the community; i.e. industry, commerce and the upper and middle classes of the population. This has resulted in large communities and the majority of rural areas having underdeveloped telecom systems and only poor or no access to water and electricity. The reasons have, in most cases, been a combination of historical (political) factors and socio-economic factors. Due to limited resources, government, parastatals and telecom operators have not been willing or able to invest in costly projects which would not provide a reasonable return on investment.

Figure 18 shows the population density for Namibia’s 13 regions, and Figure 19 the percentage of people that live in urban areas for the 13 regions. It can be seen that Namibia’s population is not evenly distributed throughout the country. Namibia has a rural population of 67%, and only 33% percent of Namibia’s population lives in urban areas. Most of the rural population also lives in the most densely populated area of northern Namibia.

Access to media and technology is unevenly distributed in Namibia as its population. Figure 20 shows the results of the 2001 Census with respect to access to certain types of media.
36.5% of Namibians had access to television. In urban areas however, the number is considerably higher with 66.4% compared to 17% in rural areas. Radio access is more evenly distributed, with
76.6% of rural and 84.5% of urban Namibians claiming to have access to it. Access to daily newspapers was nearly five times higher in urban than in rural areas. Occasional access to newspapers was more than double in urban compared to rural areas. 63.6% and 18.2% of Namibian living in urban areas had access to telephones and computers respectively in 2001, while in rural areas it was only 22.3% and 2% respectively.

Figure 20 Census 2001

Figure 21 to Figure 26 show the distribution of access to telephone, radio, TV, newspapers and computers for Namibia’s 13 regions. Khomas and Erongo lead for all except radio. Khomas and Erongo are the two regions with the wealthiest towns, Windhoek, Swakopmund and Walvisbay, in Namibia. Radio is a very cheap means of access to information in terms of purchasing and operating it. Furthermore, it is also cheap in terms of providing national coverage. It is therefore not surprising to find relatively little difference in access to radio for the 13 regions.

Access to computer varies from 1% in Ohangwena and Omusati to 24% in Erongo.

NEPRU carried out a national household survey on access to financial services in Namibia in September 2003. 810 randomly sampled households, stratified for regions and rural/urban areas, were asked whether they have electricity, water, land-line
telephones, cell phones or computers in their homes. The results are displayed in Figure 27.

Figure 21: Access to TV (Source: Census 2001)

Figure 22: Access to Newspaper Occasionally (Source: Census 2001)
The differences between urban and rural households for all of the above mentioned facilities was stark. 85% of the sampled
households in urban areas had running water and 79.4% had electricity in their homes. The respective figures for rural
households were 25.4% and 18%. Ten times more households had fixed line telephones installed in their homes in urban areas compared to rural ones. Nearly twenty times more households had computers in urban areas compared to rural areas.

Figure 28 shows the coverage of MTC in Namibia. MTC estimates that its network had a coverage of 56% of the population in 2001.

These figures show that the digital divide runs not only between income groups in Namibia but also between rural and urban (which of course is related to income levels). Bridging this gap is the challenge policy makers face if they are to achieve the objectives set out in Vision 2030 and NDP2. Details of the challenges ahead are discussed in the next chapter on e-sectors, and technological solutions to these challenges in chapter 5.

POLICY DEVELOPMENT

Several policy initiatives have been undertaken over the last few years that will shape the ICT sector in Namibia and have profound consequences for the economic and social development of Namibia for the next decade. These policies include the Information and
ICT Policy

An ICT Policy is in place: The Information and Communication Technology Policy for the Republic of Namibia. The policy document was compiled during 2000 and 2001, and was first submitted 30th April 2001. It was later updated in 2002, and passed through parliament in November 2002. The critical success factor is seen in establishing a strong body with committed leadership to guide the implementation of the ICT policy. Given such a body; key recommendations include:

- To enhance rural access to information (multi-purpose telecentres, universal service fund);

Figure 28 MTC coverage (source MTC)

Communication Technology Policy for the Republic of Namibia and the new telecommunication bill.
• To develop and stabilise the ICT professional community (establishing a body that sets national ICT standards, ICT association, immigration of ICT workers);
• To facilitate excellent ICT public education, especially in schools (improve school connectivity, revise 1995 IT in Education Policy);
• To foster e-commerce, e-business and e-government (amend relevant laws, establish statutory bodies, government e-procurement pilot);
• To strengthen the existing ICT infrastructure (liberalising the telecommunication sector);
• To develop the ICT industry (ICT cluster in Windhoek).

Value Added Network Services (VANS)

The Ministry of Foreign Affairs, Information and Broadcasting together with the NCC commissioned a consulting company with recommendations to regulate Internet service provision and other network services such as virtual private networks (VPN). The report submitted in March 2002 provides recommendations for VANS licences, licensing conditions and procedures. The document is however not a public document as yet and no further information can be presented here. It is expected that a policy will be formulated based on this consulting report.

Telecommunication Bill

The new draft Telecommunication bill provides a comprehensive framework for the regulation of the communications industry. It is expected to pass through Parliament in early 2004. The main aspects of the draft communication bill are:

• The creation of an independent regulatory authority for the communication industry;
• Establishing the authority as a juristic person that will be financed through the collection of license fees and levies;
• The implementation of government telecommunications, radio and broadcasting policy;
• The bill provides that broad policy guidelines can be issued to the authority by the Minister responsible for the relevant aspect (telecommunication, broadcasting, postal services...).
The name of the new authority will be the Communications Authority of Namibia (CAN). The following functions are foreseen for the new authority:

- Issuing wireline and wireless telecommunication licenses. Providing Internet access, virtual private networks (VPN), provision of telecommunication equipment and re-selling of telecommunication services will not require a license;
- Supervising of the telecommunication industry to protect consumers and prevent anti-competitive practices;
- Issuing broadcasting service licenses (for radio stations);
- Issuing of station and frequency licenses for radio transmitters and receivers. This affects cellular telephone services, broadcasting stations, aerial data transfer and many other forms of communication.

The draft bill also gives the authority to investigate and prosecute contraventions thereof. The bill further makes provision for a Universal Service Fund. At present only Telecom Namibia has a universal service obligation (USO). The fund might replace the USO and directly subsidise the provision of telecommunication services to areas of Namibia that have been neglected in the provision of infrastructure in the past.

The main differences between the present legislation and the draft communication bill is that Telecom Namibia and MTC fall under the same jurisdiction. Currently NCC has no jurisdiction to regulate Telecom Namibia. The draft bill gives Telecom Namibia an automatic license. At the same time it gives CAN the power to ensure that Telecom Namibia does not misuse its monopoly position.

The act also establishes the Communication and Information Policy Unit within the Ministry of Information and Broadcasting. This policy unit will be responsible for CAN. This takes de facto the responsibility for telecommunications away from the Ministry of Works, Transport and Communications.

Since the act is still in draft form it remains to be seen whether and how this will work in practice. Ideally only one ministry would be responsible for the communications industry.

The main underlying spirit of the draft bill is to regulate the industry independently and to safeguard a competitive environment.
CONCLUSION

Namibia has a solid telecommunication infrastructure. Competition to be introduced in due course will foster the implementation of new technologies and reduce prices for customers of telecommunication services. The geographic and social challenges of Namibia require innovative approaches and considerable effort. Namibia is still far from providing equal access to information to all Namibians. Competition will improve the situation. However, bold steps and courage could facilitate the development of Namibia greatly. The ICT sector around the world is increasingly contributing directly and indirectly to employment creation. Namibia could be a technology centre within Sub-Saharan Africa, attracting additional foreign direct investments, and enjoying stronger growth in employment opportunities and GDP. Courage is required not only from entrepreneurs but also from government officials and regulators.

A digital divide exists that runs between income groups in Namibia as well as between Namibia’s rural and urban population. Bridging this gap is the challenge policy makers face if they are to achieve the objectives set out in Vision 2030 and NDP2. Details of the challenges ahead are discussed in the next chapter on e-sectors, and technological solutions to these challenges in chapter 5.
he heart of a information society lies in the infrastructure that allows the sharing and exchanging of information. This is true for the exchange of information between people and objects (intelligent refrigerators, for example, that communicate with online supermarkets to re-order food supplies). This infrastructure today is the Internet. Basically it is a standardised protocol used for communication between people and between objects (TCP/IP). There are several other names used that describe a certain use of the communication protocol, such as Intranet or virtual private networks, the world wide web, etc.

The Internet has already changed economic rules and systems. At its most basic level, the Internet lays down a communications infrastructure that is universal and inexpensive to access. It makes it possible for companies to communicate with their stakeholders for example, and is an ideal tool for the precise commercial targeting of small groups of people with a common interest. While it threatens whole chains of commerce based on intermediaries, it also creates new Internet-based services to cater for the technically less informed, and in so doing replaces those chains.

In general the Internet broadens the access of developing countries to information and markets. It offers a relatively cheap and efficient service complementing telephones and fax-machines. The Internet makes it possible to circumvent traditional distribution channels, which de facto means lowering barriers to entry, by allowing companies to sell their goods and services directly to customers. The Internet further promises to facilitate a more even delivery of basic services such as health and education. The Internet can help to reduce traditional disadvantages of developing countries, namely distance from markets, lack of basic infrastructure and under-utilised capacity.

The Information & Communication Technology (ICT) sector in general is a key sector for economic performance and overall development (KPMG 2000). ICT advances increase competition by making supply meet demand more effectively, thereby putting pressure on prices. Advances in ICT enable access to new markets and have the potential to improve productivity through supply chain integration and the restructuring of production processes. Advances
in ICT can increase transparency, enabling more effective utilisation of information and improve the quality of existing information (allow information to flow more quickly and in a more targeted manner).

With the growing digital divide looming, governments, businesses, and civil society organizations are assessing the use of ICT for development. They seek to improve their countries' ability to benefit from information and communications technology. It is increasingly clear that for a country to put ICT to effective use, it must be “e-ready” in terms of infrastructure and the legal and regulatory framework. If the digital divide is going to be narrowed, all of these issues must be addressed in a coherent, achievable strategy that is tailored to meet the local needs of particular countries.

This chapter deals with the specific question of e-government, e-learning, e-banking and e-commerce in Namibia. The aim is to assess to what degree ICT has the potential to contribute to Namibia’s ambitious development targets, and to assess the impact of ICT on the selected sectors.

**E-GOVERNMENT**

E-government development is closely connected to information society development. The abbreviation “e-government” denotes electronic government which is variously defined. OECD (2002) defines it as a process that “…provides an opportunity to develop new relationships between governments, citizens, service users, and businesses, by using new ICTs which enable the dissemination and collection of information and services both within and outside of government (government to citizen; government to business; government to government) for the purposes of service delivery, decision making and accountability.”

E-government can facilitate change and create new, more efficient administrative processes, reduce corruption and increase efficiency and civic engagement. ICT has the potential to revolutionise the way people interact with government and each other. E-government can improve the condition of people in developing countries by improving access to information useful to their daily lives, providing government services, and offering new opportunities to participate. The central elements of e-government are summarized as (OECD 2002):
• Information: ICTs makes it easier for citizens, associations, and businesses to acquire information and to communicate with each other;

• Service provision: ICTs can increase the quality of services and the efficiency of service provision. It can bring economic benefits for organizations and consumers, users or citizens;

• Democracy: ICTs can help in designing new forms of participation and influence and thus help re-inventing democracy for the information age;

• Administration: ICTs can help in making administrative and intergovernmental processes more efficient;

• Governance: ICTs can be utilized in managing wider governance relations (e.g. G2B and B2G practices as e-procurement and e-auctions) and partnership-based development activities.

The following four activities further describe the wider concept of e-government:

• e-Administration is at the core of government. It deals with all internal, horizontal and intergovernmental relations that are facilitated by ICTs;

• e-Services are public services provided electronically to citizens;

• e-Democracy describes democratic processes that are facilitated by ICT deployment. This encapsulates electronic town meetings, scientific deliberative polling, e-citizens’ juries and tele-voting;

• e-Governance is about partnerships and co-operative relations among public and private institutions, enterprises and local and foreign NGOs/CBOs with the assistance of ICTs. It is a strategic enterprise, based on networking with clear outputs (such as effective resource mobilisation and management and achieving measurable development goals).

The success of e-government requires a fundamental change in how a government works and how people view the ways in which a government helps them. Governments need to develop a citizen-centric model that involves key stakeholders outside of government such as businesses, trade associations, scientists, academics, and NGOs. Without their input, e-government projects are unlikely to be successful since citizens will not use a system that does not respond to their needs.
E-government is more than simply a government buying more computers and putting up a website. While online service delivery can be more efficient and less costly than other channels, cost savings and service improvements are not automatic. E-government is a process that requires planning, sustained dedication of resources and political will. Focusing solely on technological solutions will not change the mentality of bureaucrats who view the citizen as neither a customer of government nor a participant in decision-making. Understood correctly, e-government utilises technology to accomplish reform by fostering transparency, eliminating distance and other divides, and empowering people to participate in the political processes that affect their lives.

Another way of looking at e-government is from a relational perspective. This is displayed in Figure 30.

There are several issues that need to be considered concerning the opportunities that the e-government concept offers.

- Infrastructure Issue: Most developing countries lack the necessary infrastructure to deploy e-government services throughout their country. Infrastructure deficits in
telecommunication can be tackled by liberalising the telecommunication market, the introduction of wireless and other digital technologies (IP Telephony), public access kiosks and mobile centres. Namibia is relatively well positioned in the African context. A more detailed infrastructure discussion and policy recommendations will follow in subsequent chapters.

- Law and Public Policy Issues: E-government might encounter legal or policy barriers. Legislatures must ensure that laws are updated to recognise electronic documents and transactions. They must take proactive steps to ensure that policies support rather than impede e-government. An e-government policy is in the process of being drafted in Namibia.

- Digital Divide Issue: The digital divide is the gap between people who have access to ICT and those who do not. Those without access cannot learn essential computer skills, cannot access information that can utilise economic opportunities, and cannot share the benefits of e-government. Content might need to be provided in more than one language. Further, e-

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**Figure 31: Basic e-government relations (source: Anttiroiko et al. (2002))**

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government must also address the needs of those who are illiterate or disabled. Providing communal access through village computer centres, kiosks or Internet cafes linked to schools and combining access with training are measures addressing the digital divide. Incentives could also be given to produce local language content tailored to different communities.

- E-literacy Issue: It is important to make sure that those who are already educated or have Internet access are not the only ones who benefit from e-government. Such a disparity would only increase the problems of social and economic injustice, which e-government is meant to address. Developing content in local languages and applications that use speech or pictures in addition to written text is one important way to address e-literacy. Another is providing training to citizens at access points in basic computer skills, and using traditional media, like radio programmes or newspaper columns to inform about e-government.

- Trust, Privacy and Security Issue: E-government projects need to build trust within agencies, between agencies, across governments, and with businesses, NGOs and citizens in order to be successful. This requires guaranteeing privacy (protecting personal information the government collects about individuals) and security (protecting e-government sites from attack and misuse). The success of e-government often boils down to building trust and common understanding with the various players early in the process.

- Transparency Issue: Citizens too rarely understand how government decisions are made, which prevents the public from actively participating in government. Posting rules, regulations and requirements for government services (such as requirements for obtaining a license) on the Internet minimises the risk of subjective actions by officials. It helps to build trust and curb corruption.

- Records Management Issue: Better information management can help officials to identify barriers to more efficient government. Encouraging data sharing and cooperation between government departments and streamlining off-line record-keeping processes make the transformation to online publication easier. The creation and standardisation of metadata is critical for conducting successful data searches across institutions and networks. Historical documentation is of particular importance for governments. Digitising the workflow makes it easier to archive these documents.
Digitised archives are more useful and can also be more safely stored.

- **Work Force Issues**: A well-trained and motivated work force is critical to e-government success. Civil servants need training and leadership in order to integrate themselves into the new information structure. Policy makers need to expect that civil servants will feel threatened by e-government, either because they fear being caught for corruption or simply because they fear a loss of power. Leadership can play an important role and create a positive atmosphere for change by ensuring adequate training and rewarding those who support e-government changes.

In an effort to gain an appreciation of the global e-government landscape in 2001, the American Society for Public Administration (ASPA) and the United Nations Division for Public Economics and Public Administration (UNDPEPA) undertook a research study analysing the approach, progress and commitment on the part of the 190 UN Member States. The study's primary goal was to present facts and conclusions objectively that define a country's e-government environment and demonstrate its capacity (or lack of) to sustain online development. This was accomplished by a comparative analysis of fundamental information technology (IT) indicators and critical human capital measures for each UN Member State.
Two methodologies were used in the research. First, national government websites were analysed for the content and services available that the average citizen would be most likely to use. The presence, or absence of specific features contributed to determining a country's level of progress. The stages present a straightforward benchmark which objectively assessed a country's online sophistication. Second, a statistical analysis compared the information and communication technology infrastructure and human capital capacity for 144 UN Member States.

A global index is part of the results of this survey. This index clusters countries in four groups:

- High e-government capacity (Score 2.00 - 3.25);
- Medium e-government capacity (Score 1.60 - 1.99);
- Minimal e-government capacity (Score 1.00 - 1.59);
- Deficient e-government capacity (Score below 1.00).

Namibia falls into the category: “deficient e-government capacity”.

Namibia falls into the last category. Figure 32 gives the scores for African countries and the USA. Namibia is lagging behind even by African standards with respect of e-government capacity. This is particularly puzzling since Namibia scores highly in terms of ICT infrastructure.

Figure 33 ITC per staff (Source: Mijiga, F. (2003))
The telephone, computer, IT staff and Internet ratios in Figure 33 indicate that despite a well-developed ICT infrastructure in Namibia, the government might be under equipped. The ratios are computed by dividing ICT infrastructure element by the number of staff of various regional or local government institutions. In regional councils and municipalities sampled, around a third of the employees had their own computer. For village councils or settlement institutions it was only one tenth. However, a much larger number of employees have access to computers than there are computers in offices, since equipment is often shared. The same is true for telephone lines and Internet access. The low numbers of IT staff is not too worrying, since IT services can be outsourced.

E-government in Namibia

In 2001 a national conference was held in Windhoek to take stock of the accomplishments, successes, failures, challenges and opportunities since independence. A consensus emerged at the conference that the foundation for democratic governance had been laid in Namibia and that the challenge was to consolidate this foundation and build structures for informed citizen participation in the legislative and decision making processes.

Several e-government projects were implemented since then to consolidate the democratic governance process. Efforts to consolidate the democratic governance process include the following initiatives:

- The development of the Parliament Information Management System;
- The Constituency Outreach programme (Mobile Training Unit);
- MRLGH & CABLE: Capacity Building for Local and Regional Authorities.

These initiatives are described in the following sections in more detail.

Parliament Online

The Parliament of Namibia with the assistance of the NDI has developed an Internet Based Information Management System (IMS) aimed at empowering elected officials, the public and administrative staff. The Parliament IMS has been divided into four major components comprising a public website, a public discussion
Public Website: The public website is a depository of legislative information that any member of the public can visit and access information such as draft legislation, Acts of parliament, committee reports, minutes and publications. A unique feature is the provision for direct public input on draft legislation. The public website provides direct access to bills, including research and legal documents related to a particular bill. By pressing a “button,” a user can submit views on a particular piece of legislation. The public website also gives the public background information on the work of parliamentary committees, the two houses of Parliament and direct access to individual Members of Parliament and staff. The public can also access parliamentary publications and subscribe to different items of information through the website. The website gives the public an opportunity to follow parliamentary events and activities through a parliamentary calendar updated on a daily basis.

Public Discussion Forum: This is designed to facilitate dialogue and public participation on public policy issues. The discussion forum allows civil society to engage in discussions with elected representatives on legislative, policy and public issues. The discussion forum also facilitates participation for institutions and individuals throughout Namibia. It is a practical mechanism for informed participation and accountability.

Member Intranet: The Member Intranet is a secure site linked to the public website where Members of Parliament deliberate on issues between themselves, but also with civil society organizations and other stakeholders. The intranet allows elected officials to communicate with their counterparts, including support staff from any part of the country, and any part of the world. The Member Intranet is an “Online Office” for elected officials, in that it is a knowledge bank, where members can access minutes, reports, notices and other documents instantly. The intranet also allows members of parliament to conference and share documents from any part of the country and from anywhere in the world. As an “Online Office,” the Member Intranet also provides members with a virtual diary and allows them to schedule meetings and events, confirm availability of other members and send instant notices through e-mail or SMS. The Member Intranet is also extended to members of Regional Councils and the Association of Regional Councils (ARC). The Intranet provides regional
councils with direct access to parliamentary processes and resources, thereby facilitating informed regional participation in the legislative and policy development process. Regional Councillors can also use the Intranet to hold “Online Conferences” with members of parliament and share information with other regions.

- Staff Intranet: The Staff Intranet is designed to maximise efficiency and eliminate unnecessary bureaucracy that hampers the work of parliament. The Staff Intranet facilitates efficient and cost effective support to parliamentarians and the public. Research documents, reports, minutes and other documents are available to staff from any corner of the country and from anywhere in the world for those members of staff travelling or attending international events. The Staff Intranet also provides staff with access to the common Parliamentary Calendar, where they can schedule events, share and prioritise tasks and track progress. The Teamwork Area within the system allows staff to post notices and share information on projects and seek views or input. The system also allows different units within Parliament to create their own instant “Intranets” such as individual work areas for committees, legal services or personnel. The Staff Intranet eliminates duplications and costly copying, faxing and e-mailing of attachments, as all information is accessible in one central location. The Staff Intranet also provides a discussion forum and an online chat, reducing the cost of telephone communication. The instant messaging complements e-mail communication and facilitates conferencing within and outside of parliament.

Constituency Outreach Programme (Mobile Training Unit)

The Constituency Outreach Programme comprised a series of consultations through questionnaires, interviews, workshops, a national conference, the development of ICT tools and training programmes. In April 2000 NDI embarked on a nation-wide survey, consulting major stakeholders including regional councils, local and traditional authorities, NGOs, CBOs and CSOs. The survey aimed to identify:

- Mechanisms that would enhance public participation in Namibia’s legislative process.
Mechanisms that would enhance communication and information exchange between parliament, the public and the regions.

Mechanisms that would bring the public closer to parliament.

NDI operates a Mobile Training Unit (MTU) in collaboration with parliament and the Ministry of Regional and Local Government and Housing (MRLGH). It addresses the challenge of access to ICT in areas where ICT infrastructure does not exist. The MTU is a bus equipped with computers, power supply, wireless Internet connection and training facilities.

2016 people attended the Constituency Outreach Programme by late 2002. The government made a commitment to integrate aspects of this programme into the Grade 5 – Grade 12 school curriculum. Since the Constituency Outreach Programme began, parliament has received several written submissions and inquiries from public and civil society organisations. Most of the inquiries relate to information that members of the public are seeking on the public website.

MRLGH & CABLE

A major initiative which commenced in 2002, is the e-Government strategy process that is an initiative of the CABLE project of the Ministry of Regional, Local Government and Housing in partnership with the University of Tampere in Finland, the University of Namibia (UNAM) and the National Democratic Institute (NDI). It is a process aimed at embedding ICT at the level of local and regional government as part of the Namibian government’s decentralisation programme.

The initiative of the MRLGH and CABLE aims at strengthening decentralisation and good governance through implementing e-government projects. Three activities are implemented:

- Piloting e-learning for MRLGH and local authority staff;
- Piloting e-offices in MRLGH and local authorities;
- Preparing e-government strategy for MRLGH and local and regional authorities.

Other Developments

Other developments include the drafting of an e-government strategy by Professor Andre du Pisani from the University of
Namibia. Du Pisani (2003) proposes six goals for an e-government strategy for Namibia:

- To ensure the contribution of sub-national authorities to national development;
- To create learning authorities, communities and regions capable of utilising the opportunities of the information society;
- To create cost effective and efficient e-administration for relevant and accurate information, cheaper and improved public service and a more responsive system of government;
- To provide easy and low-cost access for all citizens to public information and services;
- To provide customer-centred and value-adding e-services to all relevant user groups and stakeholders;
- To enhance e-democracy and to guarantee inclusion in the information society.

To achieve these carefully chosen goals requires political commitment and substantial financial resources. The following section briefly discusses cost benefit considerations.

Costs and Benefits

A key factor for any e-government strategy must be cost benefit considerations. These are not easy to determine. For e-procurement and e-administration the costs and benefits can be derived more easily than for e-democracy or e-service. E-procurement should produce directly measurable results for example. The costs and benefits of e-administration can be derived from salaries of civil servants, communication costs, travel etc.

The key factors for determining the benefits of e-government are opportunity costs. The costs are generally easier to determine than the benefits. The key factors for determining the benefits of e-government are opportunity costs. Opportunity costs stem from the value of time, transport costs, inconvenience etc.

The value of time is dependent on many factors and will differ for various income groups. The value of time is less for an unemployed person than it is for a highly-paid asset manager. The opportunity costs for an unemployed person queuing for a certain service for, lets say three hours, might be close to zero, while the opportunity costs for an asset manager on a net income of N$20,000 per month might be close to N$340 (20,000 divided by 22 days, divided by 8 hours, and multiplied by three). Saving time has a different value to
different people. Adding to the complexity is the fact that time even has a different value to one person. 5 minutes between two important meetings is likely to be worth more than 2 hours during a 3 week holiday.

Another type of opportunity cost stems from distance. Someone living in Tsumeb might need to come to Windhoek several times to obtain a certain service. If travelling could be reduced through e-services it would translate into cost savings in terms of transport, in addition to time savings. The cost savings might stem from that person downloading a tax form or applying for a birth certificate online, or from a civil servant in Tsumeb doing that for him or her.

The most difficult benefit to assess is that of increased national integrity. E-administration and e-service provision promote transparency and reduce the risk of misuse and corruption. A public list of requirements for the issuing of a birth certificate together with a digital population registry would minimise the possibility of and the incentives for corruption. The main value drivers are:

- Time saving for citizens (determined by the cost of labour);
- Reduced transaction costs for citizens (transport, communication etc.);
- Increased efficiency of civil servants;
- Reduced administrative costs of decentralisation;
- Better access to critical information for the government;
- Transparency and increased national integrity.

The benefits from e-government will increase as Namibia develops.

- The value of time will increase as Namibia gets closer to its development objectives and the number of citizens with full time employment increases;
- The value of bridging distance effectively will increase as the decentralisation efforts of the government of Namibia progress;
- The effectiveness of civil servants will become increasingly important as the economy develops and the services required by the business community to create jobs increases;

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3. The National Integrity Survey carried out by NEPRU for the Office of the Ombudsman in 2003 reported claims of corruption in connection with birth certificates.
• Reliable information will increase in value to the government as planning tools need to be fine-tuned for better policy making.

E-government is not cheap. Ideally the economic benefits from e-government should outweigh the costs of providing these services. This paradigm would dictate a slow diffusion of e-government as Namibia develops and time savings increasingly become more important economically. The provision of e-services requires e-administration. Once work-processes have been digitised it takes relatively little effort to extend e-services based on that. A e-government strategy could be designed in several phases starting with establishing basic e-administration and e-procurement. E-services and e-voting could be implemented at a later stage.

Conclusion

Mechling (2002) concluded in 2002 that if the e-government agenda were a trip to the moon, we would have just cleared the gantry a few seconds ago. What is true globally is even more true for Namibia.

Namibia is well-positioned to deploy e-government effectively and score much higher in the UN Global e-Government Index. To promote economic development effectively key areas need to be identified to pioneer e-administration and e-services. A cross-cutting area would naturally be that of decentralisation. E-government could facilitate decentralisation if not make it affordable in the first place.

An area where e-administration and e-services would have a direct measurable impact would be in the civic affairs of the Ministry of Home Affairs. An electronic population registry together with e-services such as downloadable forms and application requirements for services like birth certificates, death certificates, passports, IDs, marriage certificates, driver licenses, car registrations etc. would bring direct economic benefit. The problems encountered at the recent voter registration campaign could have been avoided with an electronic population registry (e-administration) saving costs for the government and citizens. Rural people in particular had to spend time and money to register for voting.

E-procurement would also be expected to quickly recover the costs of its implementation due to more effective competition and transparency.
The growing Internet trend has led to the establishment of what is defined as e-learning. It allows for live virtual classrooms, web-based training, broadband e-learning, strategic consulting, and courseware development. E-learning eliminates barriers of time and distance, creating universal learning-on-demand opportunities for people, companies and countries. In the information age, learning opportunities span a lifetime, from childhood to adulthood. Knowledge needs constant refreshing and updating to keep up with new technologies and trends.

Namibia’s 1545 schools cater for some 600,000 students and employ in excess of 18,000 teachers. 292 schools offer grade 8 and upward (secondary) education. Only 30% of Namibia’s schools had telephones, electricity and library resource centres in 2002. Some 230 schools had (basic) access to the Internet in 2002.

The cost of computers and proprietary software is very high in Namibia compared to South Africa, Europe or the USA. Moreover schools in Namibia have few resources to spend on ICT. Schools have a budget of N$50 per month for telephone bills, which is not enough to even register with an ISP, not to mention the costs of staying online for the use of the Internet. In 2002 there were approximately 3000 PCs installed in Namibian schools of which around 2500 were installed by Schoolnet Namibia.

Schoolnet

SchoolNet Namibia has been at the forefront of bridging the digital divide and bringing Information and Communication Technologies closer to the people in the past years. It’s main objective is to introduce computer technology and Internet access to schools in Namibia. The aim is to provide sustainable low cost technology solutions for Internet access to Namibian schools, community-based educational organisations and educational practitioners. Schoolnet’s activities are:

- Management of computer network installation projects on behalf of the Ministries of Basic Education, Sport & Culture, NGOs, donors and corporates;
- Provision and implementation of low-cost networking options to schools and educators, using new and refurbished equipment and open source software;

4. Source: Schoolnet
• Provision of affordable, subsidised internet to schools and educators using both land-line and wireless solutions;
• Implementation of satellite and other wireless Internet solutions, powered by solar electricity, if necessary;
• Technical skills and curriculum development.

Schoolnet is establishing a model suitable to supply schools in Namibia with a cost-effective solution. The model is based on providing schools with refurbished computers that run open source software and use a wireless Internet solution. The wireless Internet solution would incur a cost of approximately N$180 per month for 24-hour, 7 days a week Internet access and would offer a multiple speed of that of ISDN. This solution would require permission to use the ISM frequency by the NCC for providing Internet access to schools. A further obstacle would be the lack of electricity in some schools. A mixture of solar and diesel generators could help tackle this obstacle in remote areas. Setting up a school computer laboratory in this model costs only a tenth of a commercial solution.

Conclusion

Namibia’s past resulted in the majority of Namibians being under-educated. School education is still hampered by a lack of resources and under-qualified teachers. Education provided in urban centres is usually of a higher standard than in rural areas. Delivering high-quality education to all Namibian learners is a priority of the Namibian government. ICT and e-learning can help in achieving this. E-ready schools would address the problems of teacher shortage and distance. Once a school has electricity supplied by solar power, there is virtual no cost in taking part in a video-conference class room if connected to the Internet via a “always on” wireless solution. Pupils could be attending math classes in the absence of a math teacher at the school and communicate or post questions via online chats, SMS or email with a teacher in Windhoek.

Enabling learners to acquire IT skills should be top on the list of human resource development in Namibia. Giving pupils the chance to learn to use computers and the Internet will not only add value for their professional lives but also have profound implications for the democratic and economic development of Namibia. Pupils that cannot afford to spend N$2 a day on a newspaper can read it on the Internet for free.

Establishing computer laboratories in schools would also have other spin-offs. Schools can function after hour as community Internet
cafés, and thereby recover some of the monthly costs and provide wider public access to current information.

If Namibia is to achieve the ambitious development targets set out in Vision 2030, the main emphasis must be on human resource development.

**E-BANKING**

NEPRU and the Bank of Namibia conducted interviews with managers of the online banking divisions of Namibia’s five commercial banks in 2002 (including Swabou). The online banking services offered by commercial banks in Namibia vary considerably. Four of Namibia’s five commercial banks offer online banking to their customers. Swabou did not offer any online banking facilities, although the merger with FNB Namibia, announced in December 2002, will most likely bring online banking facilities to Swabou customers.

FNB Namibia has the highest number of online transactions among the four commercial banks offering online banking. The total number of online transactions in September 2002 was roughly 220,000. There were approximately 1200 business and 5200 individuals using online banking in Namibia in 2002. The fees for online banking vary among Namibia’s commercial banks from 5% to 50% of corresponding teller fees.

All four commercial banks offer the same standard with respect to the duration between the initiation of a transaction and the actual deposit of funds in the account of the recipient.

Transfers between own accounts or to other accounts within the same bank are executed in general in real time, which translates under current technological settings into 30-40 seconds. Transfers to accounts other than the own bank have to be cleared by the Automatic Clearing Bureau in South African (ACB). This takes until the next day if the transaction is initiated before 15:00, which is the cut-off point. Transfers initiated after that will take a day longer. The speed of execution could be improved with the establishment of a Namibian clearing system.

All online banking service based on HMTL offered in Namibia use 128-bit secure encryption and socket protection, which meets with international Internet security standards. A PIN number is also often required, in addition to the username and password. Transaction codes as they are used by, for example, Citibank in Europe and America are not used in Namibia. All banks provide protection
against hacking. The banks will cover any damage through fraud or hacking. Bank Windhoek is moreover insured against damage through hackers. All four banks that offer online banking facilities also have a mechanism to deal with mistakes by users. A user who transferred money by mistake would need to contact the online banking division of his or her bank, who would then contact the bank of the beneficiary to reverse the transfer. The online banking services offered by commercial banks in Namibia are briefly described in following sections.

**Standard Bank**

Standard Bank offered online banking only to business customers until December 2002. The online banking service offered to business customers is called CATS, which stands for Corporate Account Terminal Service. This service was introduced in 1993 and requires a specialised software. Private individuals could also make use of this system at reduced fees. The new service introduced for private individuals in December 2002 is called Internet Banking.

**Commercial Bank of Namibia**

The Commercial Bank of Namibia (CBN) offers three forms of online banking. Nedexec and Nedinform are both targeted at companies. Both products allow companies to gain dial-up access to the mainframe via special software provided by CBN. The third product, Nedbank, is targeted at individual users and is HTML-based. NedExec permits controlled access to accounts via PCs linked to Nedbank's mainframe, allowing customers to carry out virtually all their financial transactions electronically. NedExec is a module-based solution. NedInform is designed primarily for users with fairly complex or sophisticated transaction requirements. It permits controlled access to accounts via PCs linked to Nedbank's mainframe. Using the smart card technology to guarantee security, NedInform allows customers to carry out virtually all financial transactions electronically. NedInform is also a module-based solution. Nedbank is an online banking facility of CBN for individual customers that allows for money transfers from any computer capable of running a web-browser and connecting to the Internet. However, money transfers are limited to accounts that have had the details previously entered by the personal banker. This is an outdated system. To do a once-off transfer of money to a previously unused account requires a visit to the local branch.
First National Bank Namibia

FNB Namibia offers four online banking services. Three of these target the needs of businesses. These are:

- CAMS = Corporate Access Management System;
- PACS = Payment and Collection System; and
- Bankit.

CAMS and PACS were introduced in 1997, while Bankit was introduced in 2002. The online banking facility for individual customers is called Videobank. CAMS and PACS both require specialised FNB software that provides access to the mainframes in South Africa), while Bankit and Videobank are both accessible via the Internet through an HMTL browser. PACS and CAMS are customised solutions, and therefore pricing varies. FNB also offers a free sms service to all its customers, called inContact.

For the individual customer and small businesses FNB Namibia offered the Videobank facility until August 2003. It was then replaced by eBucks. This service allows one to:

- Transfer money between accounts at any time and place, from any location;
- Make payments to third parties by setting up their account details online and then electronically transferring money to them;
- Use the once-off payment facility to make once-off payments to an external beneficiary in Namibia or South Africa;
- Instantly view account transactions for the past 60 days;
- Export transaction history (statements) in a CSV, Quicken Qif Format as well as a Microsoft Money OFC Format.

Bankit is First National Bank of Namibia's Internet Banking service for businesses. Bankit's dual signatory capability is enhanced with Digital Certificate technology, an additional security mechanism that prevents Electronic Funds Transfer (EFT) fraud. This mechanism is an added security feature to the normal User ID and Password that is used to log on to the system.

Corporate Access Management System (CAMS) was developed to cater for the electronic banking requirements of medium to large sized businesses. These are typically customers who process large volumes of payments to recipients in Namibia and South Africa. Cash Management forms an integral part of this product. It offers the customer daily reporting of decentralised financial activities, all
the way from full consolidation, regional or other consolidation, to account and entry level. CAMS offers the customer the functionality of working off-line until a transaction has to be submitted for processing. This facility saves the customer unnecessary time connected via a telephone line. The customer can connect directly to the FNB mainframe by means of a modem connection from their PC. The dial up connection does not go via an Internet Service Provider (ISP), which improves the speed of the connection, and the customer is not dependent on the ISP's downtime. It also enhances security.

The Payment And Collection Services (PACS) cater for customers who would like to use the collection - debit order facility, or for bulk payments of salaries or premiums. PACS has an up-front validation of information, so the user is certain that the banking details of their debtors or creditors are valid. The connection is same as the CAMS connection.

InContact is a free service to all customers of FNB Namibia and allows the tracking of financial transactions, as they occur, the picking up of any unauthorised use of debit card, receiving confirmation of the value, location and time of transactions, being kept informed about all purchases and withdrawals and receiving confirmation of all transfers and payments.

Other electronic solutions offered by FNB Namibia are:

- Electronic Salary Solution: Complete Human Resources and payroll solution to customise and enhance salary payments;
- Electronic Payments to non-ACB code holders;
- Pension payments: Secured electronic payments to pensioners into current accounts and cash even to far-off places;
- Medical fund payments: Secure electronic premium collections and electronic claim payments to enhance efficiency of medical fund operations;
- Limited NPS payments: A hassle-free electronic solution to making restricted payments of up to N$5 million from a desktop.

**Bank Windhoek**

Bank Windhoek converted to new banking systems and processes on 2 April 2001. These new system solutions make it easier to roll out new products and services that can satisfy specific needs, such as Internet Banking. iBank, the online banking facility of Bank Windhoek, was launched October 2001. Some other features are:
- View statements online, download or print;
- Stop payments;
- Account alerts;
- Transfer funds between savings and current accounts;
- Electronic payments to Namibian and South Africa banks and collections;
- Internal messaging system;
- Can send emails to internet department for technical assistance, to remove or add account for online banking etc.;
- Stop payments if check book stolen;
- View uncollected funds;

Online services planned for the near future are the issuing of stop orders, check book ordering, and change of Pin numbers. The online banking facility of Bank Windhoek is HTML-based and does not require specialised software. Bank Windhoek restricts transfers to N$5 million per day.

**Conclusion**

Much progress has been made in recent years in terms of online banking services offered to business and individuals in Namibia. All four commercial banks offer online banking services. The provision of electronic banking services to businesses goes as far back as 1994. All major players offered online banking facilities to individual customers at the beginning of 2003. Bank Windhoek, Standard Bank Namibia and First National Bank Namibia all offer up-to-date online banking solutions for individuals. It remains a question of time for Commercial Bank of Namibia to catch up. This will very much depend on its South African partner bank.

Banking over the Internet not only saves the hassle of a visit to the local branch but also provides better control over finances, and is considerably cheaper than conventional banking. The relatively high share of online transactions compared to total transactions is also a positive indication.

None of the commercial banks planned to make credit card facilities available to businesses for e-commerce use when interviewed in 2002. Currently businesses can retrieve credit card details from customers but have to send forms by fax or mail and wait for the completed form before they can charge the customer’s credit card. In particular, the IT and the tourism sectors would profit from an
advanced credit card facility. A online credit card facility is crucial for real e-commerce solutions, and commercial banks and the Bank of Namibia should look into this issue more deeply.

Exchange controls within the CMA prohibit online transfers to accounts outside the CMA area. This is seen as a serious limitation to services that commercial banks would like to offer. A Namibian ACB might make it possible to have worldwide transfers. Other limiting factors mentioned were computer illiteracy, lack of digital certificates for emails and laws that protect banks and customers.

The Bank of Namibia should take the initiative and create online banking regulations and/or guidelines. Currently South African laws apply indirectly to the online banking customers of Standard Bank, FNB Namibia and Commercial Bank of Namibia. The Bank of Namibia could play a more active role in future in shaping the online banking industry. Namibian legislation, a Namibian clearing bureau and incentives for introducing advanced credit card services and e-money could all contribute to better services, lower costs and higher growth figures in Namibia.

E-COMMERCE

Electronic commerce has the potential for promoting economic growth, expanding world trade and improving social conditions. E-commerce is about the selling or purchasing of goods or services via computer-mediated networks. The payment and ultimate delivery of the goods or services ordered over those networks may be conducted on- or off-line. The most widely-known computer-mediated network is the Internet.

E-commerce can take place between businesses and consumers (B2C), consumers and consumers (C2C), businesses and government (B2G) and business to business (B2B). Three key areas to promote e-commerce are:

- Building trust for users and consumers;
- Establishing ground rules for the digital marketplace;
- Enhancing the information infrastructure for electronic commerce.

A survey was carried out by NEPRU and the Bank of Namibia concerning the state of e-commerce in Namibia in 2002. A questionnaire was sent by email to 270 selected companies. This questionnaire dealt with e-commerce in general and was based on the e-commerce questionnaire used by OECD for its member states.
This allows one to compare the results from Namibia with those from OECD countries.\textsuperscript{5}

In all, 270 companies received an e-commerce questionnaire of which 126 returned it completed. The selection of companies did not follow random sampling and the sample was biased towards larger urban companies. Most of the responding companies fell into the medium to large sized company category. Over 70\% (70.63\%) of the responding companies had a turnover of above N\$1 million. Also, 47.62\% of the respondents had more than 50 employees. The chart below displays the sectorial distribution of the responding companies.

![Sectoral Distribution of Respondents](image)

**Figure 34 : Sectoral distribution of respondents (n=113)**

**IT and Internet Usage by Companies**

The overwhelming majority - 89\% - of the companies used the Internet in one way or another. This is higher than the OECD average of 77.2\%. Only 38.52\% of Namibian companies had their own website. This is in line with the average 39.92\% of business in OECD countries with own Web page.

\textsuperscript{5} It should be kept in mind that the OECD figures presented here as comparisons are average values that contain data from a wide choice of OECD countries. The presented data reflects results from e-commerce surveys conducted in OECD countries during 2000 and 2001.
In a third of the responding companies, 50% to 100% of the employees used a computer as part of their daily work. In nearly...
20% of the responding companies, 50% to 100% of the employees used the Internet as part of their daily work. In only 8% of the responding companies no one used a computer. In 39.7% of companies, fewer than 5% of the employees used the Internet as part of their daily work.

Leased line access was the favourite mode of accessing the Internet among the responding companies (47.6%). ISDN followed with 21.8%, and modem access with 9.7%. On average businesses in OECD countries preferred ISDN access, with nearly 54%. A reason for the preference might have been the early roll-out of ISDN in Europe and the USA.

![Figure 37 Type of external connection to the Internet (n=124)](image)

Most companies used the Internet for banking and financial services and market monitoring. Other important online activities were: shopping, communication with clients, branches or headquarters, obtaining after-sales reports and marketing. The Internet was further used as a general source for information and research. Noticeable is also the Internet use by the tourism sector, where the Internet was used for online bookings and reservation confirmations.

**Selling and Buying via the Internet**

Of the companies that responded, 17.46% (OECD 13.1%) have conducted sales via the Internet. Only 6.84% of the enterprises
received on-line payments for Internet sales. The number for OECD countries is even lower than this with 3.7%. About 11.5% of the enterprises were targeting markets in other countries via Internet sales. Hotels and lodges accounted for 38.5% of the 11.5%. The tourism sector has the highest potential to profit from e-commerce owing to the nature of its business and origin of its customers.

Only one company had an online share of total turnover of above 50%, and only 20 out of 121 had an online turnover at all.

Several main reasons were cited as to why companies sell via the Internet or are looking into selling in the future via the Internet. Companies could tick several answers in the questionnaire and add their own as well. Reaching new customers was cited 35 times as the motivation for Internet sales; speeding up the business process 31 times, and keeping up with competitors 26 times. 22 respondents saw improved quality of services as a main motivation for sales via the Internet and 19 saw it as a good way to launch new products.

Company image considerations and keeping up with competitors both stem from the perception that companies can no longer afford not to be online if they want to remain competitive and innovative. Commercial banking is a good example where players cannot afford not to offer online banking to their customers. The reasons for this are competitive pressure and the need to improve the quality of
Online banking also has the potential to reduce operating costs for commercial banking.
Dominant reasons for selling via the Internet are similar across OECD countries with a few exceptions. Geographic expansion and simplification of the business process were two reasons given in OECD countries, both for nearly 15% of companies of importance.

For only a few of the responding companies had selling via the Internet entailed a change for the business process (8.73%). Around 10% of the companies asked used electronic supply-chain management to facilitate electronic-procurement. Of the companies that responded, 20.66% (OECD 23.9%) made purchases via the Internet.

**Barriers to e-commerce**

The top reason given by responding companies was that goods and services offered by a particular enterprise are not suitable for sale over the Internet. Second was the reason that the majority of customers are not yet ready to buy via the Internet. Only three respondents did not see any barriers to e-commerce. Here too, companies could tick more than one answer. Altogether only 84 of the 126 respondents answered this question.

Other barriers mentioned were that the in-house accounting and sales systems are not suited to e-commerce, and the lack of a legal framework in Namibia to protect customers and vendors.
Figure 42 Percentage of companies: Internet purchases as a share of total purchases (n=121)

Figure 43 Percentage of mentions concerning barriers to e-commerce in Namibia (n=84)
Security

The security of e-commerce was of great concern to 80% of the respondents. Only 15.8% did not perceive it as a problem. Security concerns ranged from fear of viruses and hackers to privacy issues. Also in this category was the worry that someone would be charged but no product or service delivered.

The number of respondents was too small to allow any cross tabulations. It would have been interesting to explore which sector adapted faster to e-commerce and the degree to which small companies differ from medium or large sized ones. A second survey would be useful, targeting a much larger number of companies and making use of random sampling for that purpose.

NEPRU carried out a bi-annual Business Climate Survey in 2002. This survey targeted 400 businesses using random sampling. Here too, the sample was too small to derive meaningful results for sectorial or size distributions for ICT related questions. Of roughly 380 respondents, only 250 answered the ICT questions.

Businesses were asked about the number of computers they possess, how many of these computers were connected to the Internet and whether they bought or sold goods and services via the Internet. Table 3 presents the summary results for the two business climate
surveys in 2002. The average number of computers per company had increased by 4.57% in six months. The average number of computers with Internet access per company had also increased. It increased from 3 to 3.12, an increase of 4%. The number of companies in the survey that used the Internet to buy goods or services via the Internet had decreased slightly (-0.25%), while the number of companies that used the Internet to sell goods and services had increased by nearly 2%.

**Conclusion**

The fact that both the number of computers per company and the number of computers with Internet access per company increased in 2002 at a higher rate than the real GDP growth for that period is encouraging. Also, it is promising that nearly 90% of businesses used the Internet to sell goods and services.

6. The real GDP growth was approximately 2% in 2002.
were using the Internet, and roughly 40% of the companies had their own website. A bottleneck to wider e-commerce activity seems to be the absence of a legal framework and the facility to charge a client’s credit card via the Internet.

CONCLUSION

Namibia is well-positioned to deploy ICT to its advantage. Progress is being made in e-government, e-banking, e-learning and e-commerce. However there are several limiting factors holding back more rapid development. These factors are:

• Lack of IT literacy, in particular in rural areas;
• High communication costs, owing to Telecom Namibia’s monopoly;
• Under-utilised radio spectrum. Wireless solution can make the Internet affordable to schools and community centres;
• Lack of e-commerce and e-banking legislation;
• Absence of a Namibian automatic clearing bureau for bank transactions;
• Language barriers with respect to Internet content.

Bold steps are required if Namibia is to achieve the ambitious development targets set out in Vision 2030. It is not enough to achieve by 2030 what development countries have achieved today, if Namibian wants to pull even by 2030. Developed nations will have developed even further by then. Namibia’s best hope is to focus on human resource and economic development. The latter is required to fund the human resource development. With little extra effort Namibia could make much progress. These efforts would include liberalisation of the telecommunication sector, active management of radio spectrum, and the passing of e-banking and e-commerce laws.

E-sectors are growing in Namibia, but not at the same pace as elsewhere in the world. So far, ICT has changed the way we live and work for relatively few Namibians.
5 INFORMATION AGE TECHNOLOGIES

This chapter evaluates some of the technological advances and trends in information and communication technologies and their potential impact for Namibia. Global trends will be discussed first. The second section deals with IP telephony, the third with mobile Internet, the fourth with broadband technologies and the fifth with open source software.

GLOBAL TRENDS

The most remarkable trend of the last five years has been the phenomenal growth in the number of cell phone subscribers. In 2002 there were already more cell phone than fixed line subscribers globally.

![Figure 46: Mobile versus fixed line subscribers globally in millions (Source: ITU 2003)]

Only in the Americas are fixed lines still more widely used than cell phones. A main reason for this is that the USA has a very extensive
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fixed line and cable TV network with widespread broadband access to the Internet. Cell phones as an additional communication tool are adding comparatively less value to the consumer in the USA than in
Italy or Japan (ITU 2003). Figure 48 shows - surprisingly - that cell phones overtook fixed lines only for the high and upper middle income countries and not for the lower middle and low income countries. However the data only reflects 2002, and the data for 2003 and 2004 when it becomes available will most likely show that cell phones dominate all income classes.

Apart from cell phones coming to dominate telephone access, there are three other major trends:

- the shift towards packet-switching, all-IP networks;
- the accelerated increase in access speeds;
- changes in the way we pay for communication and information services; and
- the growing importance of open-source software.

Independent telecommunication networks will gradually be integrated with IP technology as the Internet expands. The introduction of the new Internet Protocol IPv6 will enable virtually unlimited IP addresses allowing the establishment of access to information networks anytime and anywhere. Mobile and fixed line telephony will increasingly be online 24 hours and communicate with computers and other electrical appliances such as refrigerators, car navigation systems and vending machines.

In the late 20th century, broadband technologies appeared, allowing fixed line Internet access to reach speeds of a multiple of ISDN. Also with the introduction of 2.5G and 3G and WLAN onto the mobile market, high speed data transmission becomes increasingly possible.

Broadband technologies and packet-switching make the pricing regimes of fixed line PSTN and mobile 2G obsolete. Voice call charges have usually been calculated according to distance, duration and time of the day or week. Flat rate charges or volume charges will replace these pricing regimes for broadband technologies.

Open-source software is gaining momentum for several reasons. First of all it is virtually free and secondly the software code is transparent and allows user to have control over what is installed on their networks.

The next section will deal with IP telephony, and the one after with mobile telephony. Subsequent sections deal with broadband technologies and open-source software.
IP TELEPHONY

The US Army in the 1960s was exploring ways of designing communication systems invulnerable to nuclear attacks. This led to the development of packet-switched communication technology that makes a communication network independent of command and control centres, so that message units would find their own routes along the network and be reassembled at the receiving end (Castells 2000). These efforts led to the establishment of ARPANET in 1969, and later to the Internet.

IP telephony is a growing technological field that allows voice, data and video collaboration through existing IP telephony-based LANs, WANs and the Internet. The same networks supporting email and Web data traffic can also carry voice. The fear of a nuclear attack is no longer the driving force behind the development, but rather cost savings and added value through new services. Businesses and individuals can reduce communication costs, and include video conferencing, application sharing and white-boarding tools.

Previously, separate networks were required to handle traditional voice, data and video traffic, which limited their usefulness. Each required separate transport requirements, making them costly to install, maintain and reconfigure. Integration was practically impossible. By blending voice, video and data and utilising a common transport for each, it effectively merges three networks into one. The benefits to the consumer are easier manageability, lower costs for services and support and new tools for collaboration, ultimately leading to increased productivity.

Technical Aspects

It is important to look first at current circuit switched networks before discussing the packet switching environment. Both these technologies are the building blocks for an information society. In a circuit switched environment (as shown in Figure 49), network resources are reserved all the way from sender to receiver before the start of the transfer, thereby creating a circuit. All the resources are committed to the circuit during the transfer. Control signalling and payload data transfers are separated in circuit switched networks. The processing of control information and control signalling such as routing is performed mainly at circuit set-up and termination.

Over the last few years, Internet telephony has advanced rapidly. Many software developers now offer PC telephony software, and gateway servers are emerging to act as an interface between the
“Circuit Switched”
‘traditional voice’ - PSTN

Figure 49: PSTN, Circuit Switched (Source: Telecom Namibia, 2002)

Internet and the PSTN. Equipped with voice-processing cards, these gateway servers enable users to communicate via standard telephones over considerable distances without going over the “Long Distance” telephone network.

A call goes over the local PSTN to the nearest gateway server, which digitises the analogue voice signal, compresses it into IP packets, and moves it onto the Internet for transport to a gateway server at the receiving end. This server converts the digital IP signal back to analogue and completes the call locally. With its support for computer-to-telephone calls, telephone-to-computer calls and telephone-to-telephone calls, VoIP represents a significant step toward the integration of voice and data networks.

Adding voice to IP networks requires a critical understanding of the system level challenges and how to cope with these. These challenges are, amongst others, interoperability, density, call control, call signalling, reliability, voice encoding, delay, echo, and all the elements that constitute the next generation networks (NGN). If Telecom Namibia is to harness the enormous potential of the Voice-over IP technology platforms, a next generation network must be evolved. The benefits of NGNs, which enable transport of both voice and data over the same network, are numerous and can justify an investment to the tune of over N$100million (US$10million) for Telecom Namibia. Amongst others, it is expected that three key benefits will accrue to Namibian companies, and the nation by extension, namely, cost savings on telephony, consolidation of numerous forms of communication media and increased usage of advanced multimedia applications.
“Packet Switched”

This platform incorporates a distributed architecture in which the media gateway/bearer transport platform, signalling, call control, and application elements are divided into separate logical network components, communicating with one another through the use of intra-switch protocols such as Megaco, media gateway control protocol (MGCP), and SCTP/M3UA. A distributed model of this format allows different service providers to provide scaling possibilities of their networks to support numerous subscriber ports per node. What is envisaged here is that voice traffic moves between the traditional voice network and the IP-based network with the aid of the media gateway. A soft-switch handles call control while the features and services are handled by an application platform. What transpires in reality is that the soft-switch (or call control platform) may actually support some of the more popular services without the aid of a separate application platform. Some examples where this might be the case are the caller name delivery, local number portability (LNP), and E-800 service. In a traditional PSTN environment the services are already implemented with the aid of service control points (SCPs). In all these instances, the call control platform will send intelligent network (IN) queries over the signalling system 7 (SS7) network to existing SCPs.

The Next Generation Network is expected to accord telephone calls and access to services over IP-based data networks with improved cost/benefits to traditional PSTN-based platforms. The added
advantages of scalability and flexibility of these networks allow IT practitioners additional scope for managing increasing demands for a company’s bandwidth with ease, as argued earlier.

The proliferation of IP-based applications and devices forces many service providers to offer consumers advantages which are in their favour in the form of cost reductions, simplification and consolidation of various communications media. It is expected that companies in Namibia can also enjoy similar benefits and hopefully translate those savings into opening additional investment opportunities in the country’s economy. The initial investment into Next Generation Networks for Telecom Namibia might be thought of as mountainous at first but should be seen as offering longer-term benefits for the nation-state.

An example for cost savings through IP based VPNs based on current prices offered by Telecom Namibia’s IP Operator, Infinitum, clearly argued the case for IP-based solutions for many a Namibian corporate. Whether the organisation simply operates within the national borders or has operations globally, the IP environment still offers the best choice by far. Treating voice traffic in a similar fashion can only add to the basket of cost reduction benefits which consumers and corporates can expect to enjoy should Telecom Namibia continue to roll out the relevant technologies.

Technical difficulties still to be resolved are quality of service (QoS) and numbering. Standards for VoIP quality and network reliability should be seen to be the same as that for traditional public switched networks. Every customer expects no less quality than what is currently available from the traditional telephone networks. IP based voice is transparent to the customers. Features such as tone processing, packet play-out, voice activity detection (with comfort noise generation), and echo cancellation are key in meeting quality expectations.

While everyone makes much of the tremendous cost savings any corporate and nation can make with IP based solutions, significant challenges still remain in the area of numbering. In other words, how do we address calls as they pass from the IP (packet-switch) environment to the circuit-switched? While it is already possible to terminate calls from the IP environment to numerous other networks, the reverse is still a challenge. A numbering scheme, which marries the two environments into one, still has to be evolved if VoIP is to realise its full potential of driving costs down for nations and enterprises.

7. See “Businesses: Virtual Private Networks” on page 79.
Although much progress has been made to date in introducing VoIP solutions globally, the chapter also highlighted challenges in the areas of Numbering and Quality of service (QoS) concerns. If these challenges can be circumvented, Namibia as a nation can easily migrate towards the Next Generation Networks and take advantage of the expected results.

**Economic Impacts of IP telephony**

IP telephony has the potential to provide comparative cost advantages. The Internet uses the same lines of communication as standard telephones but uses digital technology, allowing more information to be carried at a lower cost. Combined with wireless communication technology it promises to provide wider universal services, to save costs, to allow more comprehensive services to be offered and to effectively combine different media formats (sound, data and picture).

However there are several changes that will be brought through IP telephony. Costs in certain areas will fall away or decrease, and in other areas new costs will arise or existing cost positions will increase. The same is true for profits. This might threaten incumbent telephone providers, but also provide new profit potential. IP telephony must not be seen as a threat but as an opportunity, or at least as an alternative way to make profit.

The essential question is: What is the potential impact of IP telephony on the competitiveness of a country? Namibia could gain a competitive advantage or fall behind global developments depending on what measures are taken by the government, MTC and Telecom Namibia.

Venables (2001) analyses the impact of new technologies on economic convergence between developed and developing countries. He analyses how new technologies help to reduce the costs of overcoming distance. The profitability of a location depends on:

- labour costs;
- labour efficiencies;
- social infrastructure; and
- distance of the location to sources of supply and markets.

Venables (2001) splits the costs of distance into search costs, shipping costs, management costs and the cost of time involved in shipping to and communicating with distant locations.
IP telephony addresses two of the four cost factors of distance. It would make it cheaper for Namibians to search for trading partners. It would also reduce the cost of managing and monitoring distant production facilities. It makes VPN and international communications (video conferencing, voice, fax, etc.) cheaper.

**Costs of Service Provision**

A study by McGarty (1999) analysed the impact of IP Telephony on the potential disaggregation of international and domestic telecommunication markets. He concludes that:

- There is a convergence of networks;
- A disaggregation of services and systems takes place that lowers any barrier to entry and dramatically expands the Internet market for any new entrants.

This development is mainly attributed to cost advantages of IP networks compared to circuit switched networks. The cost advantages that arise from sending voice over the IP stem not so much from reduced network element costs but from the sharing of equipment and operation costs across data and voice networks (Sharma 2001a). An IP-based network allows more standardisation as an integrated infrastructure that supports all forms of communication (voice, data, video, etc.). IP based networks promise up to 70% cost savings on capital expenditure and operating costs (Sharma 2001a). Other estimates state that IP telephony can reduce network costs by a factor of 4 (CEPT 2001a).

Table 4 compares the cost structure between a circuit switched and an IP-based network. The costs for human resources in terms of wages are likely to be higher for IP networks. IP Telephony requires fewer but more highly-skilled staff than circuit switched telephony. This may pose a serious challenge to developing countries where highly skilled IT staff are in short supply. Another major cost saving factor of IP networks is the ability to send compressed information. Sharma (2001a) estimates that the transmission costs through IP Telephony are between 40 and 60% lower than PSTN networks due to compression on the backbone.

New costing models need to be developed for IP networks for pricing and regulatory purposes. The costs for a circuit switched network are dependant on distance and call duration. The costs of IP networks only indirectly depend on distance and call duration through the amount of traffic a call generates. Costing models for PSTNs have evolved over years and take into account distance and time. These costing models cannot be applied to IP networks, since
volume and time are the cost-driving factors for IP networks, as opposed to distance and time.

No answers can be given at present on how these costing models will look like since standards have not emerged yet.

**Table 4 Comparison of IP and Circuit Switched Networks (Sharma 2001a).**

<table>
<thead>
<tr>
<th>Cost with Circuit Switched Networks</th>
<th>Cost with IP Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carriage of Voice Calls</td>
<td>Strong distance and duration dependent.</td>
</tr>
<tr>
<td>Customer Support</td>
<td>Staff intensive, either high cost or low level of support</td>
</tr>
<tr>
<td>Adding new Services</td>
<td>High costs</td>
</tr>
<tr>
<td>Dealing with Growth in Data Traffic</td>
<td>Very high costs</td>
</tr>
<tr>
<td>Data Services</td>
<td>High because of the requirement to run separate overlay networks</td>
</tr>
<tr>
<td>Human Resources</td>
<td>Wage costs are high but not as high as for IP networks.</td>
</tr>
</tbody>
</table>

**Revenues from Service Provision**

Flat rates or volume pricing are the natural solutions to the cost drivers of IP networks. Flat rates or volume pricing would need to generate enough income to pay for the investments required through the growth of data traffic. This implies a complete rethinking on the side of operators on how to make a profit. Existing PSTN revenue streams from international and domestic long distance calls will shrink, and revenue streams from local calls will increase. Offering value added services at lower costs through IP technology is likely to increase the demand for telecommunication services, and hence replace some of the former revenue streams.

For developing countries a further impact of IP telephony is the reduction in settlement payments. Developing countries are often on the receiving end of settlement payments. Payments are made when traffic from one country is greater than the traffic in the reverse direction under the international Settlement System. The net settlement payments are usually made based on negotiated “Accounting Rates” and traffic minutes. ITU estimated a net flow of settlement payments from developed to developing countries in the region of US$50 billion during the 1990s. IP telephony enables operators to develop alternative routing procedures using international IP backbones to avoid settlement payments.

The Figure 51 indicates the distribution of call revenues for Telecom Namibia. It can be observed that Telecom Namibia is very
vulnerable to a break-away of national and international call revenues. In the period 1999 to 2000, nearly 75% of total revenues were from national or international calls.

A new player in the fixed line market could threaten the existence of Telecom Namibia, should this provider base its entire network on IP. A second fixed line licence is bound to be awarded in 2004. A potential candidate for this licence could be MTC or NamPower. NamPower is the national electricity provider and already owns an extensive fibre network. NamPower might also join forces with MTC or another mobile telecommunication provider.

Urgent steps are required by MTC and Telecom Namibia to anticipate changes in revenue streams. The cost savings brought about by IP networks can either be put to other uses by consumers and businesses or they can translate into a higher demand for added services. It is up to Telecom Namibia and MTC to design new products and services to capture the freed disposable income.

**Universal Service Obligation**

A Universal Service Obligation (USO) is often imposed on the dominant telecommunication operator. It is an obligation to provide...
basic access to telecommunication services to anyone who reasonably requests it. It often involves extending network infrastructure to unserved areas. Telecom Namibia has such a roll-out obligation. Universal Service is seen by the Government of Namibia as entailing:

- Assured access to all existing users;
- Provision of access to the national telephone network to all potential users;
- Provision of services on standard terms and conditions;
- Provision of services on affordable terms.

At present Telecom Namibia justifies high international and national call rates with its USO. This type of cross-subsidising is under threat through IP telephony. However, there are alternative concepts. One way is to charge VoIP providers to access the PSTN to fund the USO. There could also be a levy placed on minute traffic over IP networks to account for USO costs. However, IP technology might also help to fulfil the USO, since it is cheaper to run and services can be offered for less, compared to PSTN services. The USO could also be extended to mobile telecommunication and VoIP providers.

**Interconnections and Prices**

Switching from PSTN to IP-based networks will affect the cost structure of providing telecommunication services. This will involve the unbundling of network elements and the definition of technical issues such as QoS. It will also alter the basis of some key interconnection functions such as call origination and call termination. The interconnection agreements between Telecom Namibia and MTC are determined through private negotiations. These interconnection agreements do not need to be made public. End user tariffs are not regulated for fixed line services, but price caps are set by regulator for mobile call rates. Market forces can only partly influence these prices since there is no other fixed line operator in Namibia but Telecom Namibia and no other mobile telecommunication provider but MTC. The negotiations are not balanced due to the dependence of MTC on using Telecom Namibia’s backbones and international gateways.

**Consumers**

Consumers will benefit one way or another through the occurrence of IP telephony. Transmission quality over managed IP networks will be similar to circuit switched networks in the medium term. At
the same time IP telephony will be considerably cheaper and will unify different communication forms (voice, video and data) to deliver enriched services. Those consumers that pick up IP telephony will benefit from cheaper communication costs. Those that remain with conventional telephony will also benefit from falling prices due to competition brought about by IP telephony. Table 5 compares the cost savings that can be realised already today. The examples are based on the prices of Telecom Namibia, MTC and Net2Phone.

Table 5: Price comparison for consumers in N$ (Prices for April 2002)

<table>
<thead>
<tr>
<th>3 minute peak call from Namibia to (10N$ Ý 1 US$, April 2002)</th>
<th>Telecom Namibia</th>
<th>MTC</th>
<th>Net2Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tokyo</td>
<td>N$42.50</td>
<td>N$47.93</td>
<td>N$3.63</td>
</tr>
<tr>
<td>London</td>
<td>N$24.78</td>
<td>N$30.21</td>
<td>N$1.32</td>
</tr>
<tr>
<td>New York</td>
<td>N$37.17</td>
<td>N$42.6</td>
<td>N$3.3</td>
</tr>
<tr>
<td>Johannesburg</td>
<td>N$7.53</td>
<td>Cell to fixed N$10.29</td>
<td>N$11.88</td>
</tr>
</tbody>
</table>

In April 2002, Net2Phone was already at least 10 times cheaper for all destinations, with exception of calls to Johannesburg. The voice quality will be higher on PSTNs compared to IP networks for some time to come. The difference in quality is ever diminishing. Telecom Namibia might offer both PSTN and IP services at the same time until the point where the quality of service (QoS) becomes indistinguishable. IP telephony could be marketed as an “economy class” service at lower rates. This would make it possible, in particular for the poor, to use this telephone access more often considering that Namibia has one of the highest income disparities in the world.

Businesses: Virtual Private Networks

Businesses can profit in several ways from IP telephony / IP networks. Businesses and consumers would benefit from lower call charges. However, major cost savings are already possible today under existing regulations. Virtual Private Networks can already be based on an IP network without violating any regulations in Namibia.

A Virtual Private Network (VPN) allows clients to have access to low-cost shared resources of the public Internet. This replaces the expensive private intranets which most companies had to contend with until recently. These private networks offer security, reliability and control but are inflexible when it comes to upgrades since they are based on fixed infrastructure and the costs of administration tend to be exorbitant as well. A VPN offers a solution that is less
expensive over a public network with dedicated bandwidth and
offers secure performance through the use of encryption and
firewalls. VPNs are also fairly flexible and scalable. Bandwidth can
be expanded in real time, and within 24 hours in most instances for
infrastructure. Flexibility and scalability allow IT managers room to
manoeuvre in the face of increased pressures on bandwidth in most
corporate settings. The benefits for corporate end-users in a nutshell
are:

• Ability to enjoy the cost benefits of Internet telephony without
  the need for capital investments or new network management
  infrastructure;

• Ability to realise cost savings for internal corporate calling
  whilst also utilising the public Internet Telephony network for
  calls outside the company;

• Ability to control corporate network configurations and
  routing whilst outsourcing the management and operations to
  the service provider;

• Quick, flexible upgrade of network capacity as required.

The benefits for service providers are:

• New revenue streams through VPN services and bandwidth
  utilisation;

• Service offerings to corporates are extended from simple
  bandwidth to full-service network operations for fax, voice,
  and data;

• Total solution for all of the customer’s communication needs;

• Enhanced competitiveness against direct solutions from router
  and PBX vendors;

• Reduced costs by consolidation of voice, fax, and data traffic
  to a single network – with a single point of administration.

An example will better demonstrate the above-mentioned benefits.
It is assumed that a company has three points of presence (POPs) in
Namibia with a branch in Johannesburg, South Africa. Should the
company migrate its network from the classic PSTN environment
with a physical pipe (Digicon) link to one where it is serviced
through an IP-based network, the savings are tremendous. Even if
there were additional costs incurred with the addition of a firewall to
secure the company’s data, the costs would still be lower.
The example does not account for the second half of the intercontinental link which the PSTN operator in South Africa has to account for. The cost savings would hence be even higher. Adding those costs to the equation would further drive the costs of a
traditional link up. In the real-life example below, with actual data from Infinitum, Telecom Namibia’s IP operator, the monthly savings are to the tune of N$22,906.55 for a 64kbit/s connection and N$41,296.03 for a 128kbit/s connection.

Sharma (2001a) suggests the following strategies on how to deal with IP telephony for incumbent operators depending on the market situation.

Developed economies with a telephone penetration density of over 50%:

- Utilising existing PSTN while reducing or even stopping investments in it;
- Lowering the costs of PSTN services (effective management, new technologies, reducing operating costs, etc.);
- Speeding up the development of broadband IP network and providing of value added services (video conferencing, VPN, etc.).

Economies with a telephone penetration density between 10 and 20% and high growth rates:

- Avoid premature redundancy of PSTN investments, by making full use of network resources and offering supplementary services;
- Building up a moderate IP network;
- Tariff rebalancing lowering the costs of PSTN services (effective management, new technologies, reducing operating costs, etc.) to compete with IP telephony;
- Lowering investments for long distance PSTN;
- Introducing innovative services to attract more demand for telecommunication services.

Economies with a telephone penetration density between 3 and 5% and high growth rates:

- Continue developing a PSTN structure;
- Using IP technology in backbone network of long distance operators;
- New entrants using IP telephony should also be obliged to USO targets.

Economies with a telephone penetration density below 3%:

- Reducing reliance on international traffic;
• Pricing models based on volume or flat rates to increase Internet usage and foster Internet based service market.

Sharma (2001a) suggests that it is in general a good idea to gradually migrate the core network for voice services to IP technology. Namibia would fall into the second category with teledensity between 10 and 20% (mobile plus fixed line teledensity together).

MOBILE INTERNET

Mobile Internet shall refer in this study to the convergence of mobile telecommunication technologies with information and data communication services. The section is devoted to next-generation mobile phone networks.

Given that the number of mobile phone subscribers has surpassed the number of fixed line subscribers globally, the importance of cell phones in providing equal access to information and bridging the digital divide has increased. In Namibia MTC outperformed Telecom Namibia substantially in terms of subscribers. In October 2003 MTC surpassed the 200,000 subscriber mark, while Telecom Namibia was still trailing at around 120,000 (121,413 official public figure).

The two major developments in telecommunications over the last decade have been the Internet and mobile telecommunications. It is their seamless combination that heralds the promise of “anywhere, anytime, anyplace” communication systems. The ITU’s vision for third-generation (3G) mobile systems (IMT-2000) foresees a convergence of mobile, fixed and Internet Protocol (IP) networks. This convergence can be brought about by third-generation mobile systems. During the last several years, the world has seen a large number of licenses for 3G services being awarded. Over 100 3G licenses have been secured worldwide in 2002 via a combination of auctions, beauty contests, “sealed bid” competitions and automatic awards.
Mobile phones can dramatically extend access to communications, particularly in developing countries. Developing countries are presently experiencing the highest levels of mobile growth. There are a number of reasons why mobile can be more attractive than fixed-lines for improving access to telecommunications in developing countries:

- Mobile networks can be installed more rapidly than fixed-line networks;
- Mobile networks are increasingly available with pre-paid cards so that users are not automatically disqualified from using the service because of a lack of creditworthiness (account);

Table 8 Allocation of 3G mobile licences, Source: ITU (2002b)

<table>
<thead>
<tr>
<th>Country</th>
<th>No of licences</th>
<th>Mobile incumbents</th>
<th>Method</th>
<th>Date awarded</th>
<th>Sum paid, US$ million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>6</td>
<td>3</td>
<td>Auction (regional licences)</td>
<td>March 2001</td>
<td>610</td>
</tr>
<tr>
<td>Austria</td>
<td>6</td>
<td>4</td>
<td>Auction</td>
<td>November 2000</td>
<td>618</td>
</tr>
<tr>
<td>Belgium</td>
<td>4</td>
<td>3</td>
<td>Auction</td>
<td>March 2001</td>
<td>421.2</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>2</td>
<td>2</td>
<td>Auction</td>
<td>December 2001</td>
<td>200</td>
</tr>
<tr>
<td>Denmark</td>
<td>4</td>
<td>3</td>
<td>Sealed bid Auction</td>
<td>September 2001</td>
<td>472</td>
</tr>
<tr>
<td>Finland</td>
<td>4</td>
<td>3</td>
<td>Beauty contest + nominal fee</td>
<td>March 1999</td>
<td>Nominal</td>
</tr>
<tr>
<td>France</td>
<td>4</td>
<td>3</td>
<td>Beauty contest + fee</td>
<td>July 2001</td>
<td>4'520</td>
</tr>
<tr>
<td>Germany</td>
<td>6</td>
<td>4</td>
<td>Auction</td>
<td>August 2000</td>
<td>About 7'690 each</td>
</tr>
<tr>
<td>Greece</td>
<td>3</td>
<td>3</td>
<td>Beauty contest + auction</td>
<td>July 2001</td>
<td>414</td>
</tr>
<tr>
<td>Hongkong SAR</td>
<td>4</td>
<td>6</td>
<td>Hybrid</td>
<td>September 2001</td>
<td>Minimum 170 each plus royalties</td>
</tr>
<tr>
<td>Israel</td>
<td>3</td>
<td>3</td>
<td>Beauty contest + fee</td>
<td>December 2001</td>
<td>157.1</td>
</tr>
<tr>
<td>Italy</td>
<td>5</td>
<td>4</td>
<td>Hybrid</td>
<td>October 2000</td>
<td>10'180</td>
</tr>
<tr>
<td>Japan</td>
<td>3</td>
<td>3</td>
<td>Beauty contest</td>
<td>June 2000</td>
<td>Free</td>
</tr>
<tr>
<td>Korea (Rep.)</td>
<td>3</td>
<td>2</td>
<td>Beauty contest + fee</td>
<td>August 2001</td>
<td>2'886</td>
</tr>
<tr>
<td>Malaysia</td>
<td>3</td>
<td>3</td>
<td>Beauty contest</td>
<td>December 2001</td>
<td>Nominal</td>
</tr>
<tr>
<td>Netherlands</td>
<td>5</td>
<td>5</td>
<td>Auction</td>
<td>July 2000</td>
<td>369 to 667 each</td>
</tr>
<tr>
<td>New Zealand</td>
<td>4</td>
<td>2</td>
<td>Auction</td>
<td>January 2001</td>
<td>59.9</td>
</tr>
<tr>
<td>Norway</td>
<td>4</td>
<td>2</td>
<td>Beauty contest + fee</td>
<td>November 2000</td>
<td>88</td>
</tr>
<tr>
<td>Singapore</td>
<td>3 (+1?)</td>
<td>3</td>
<td>Cancelled auction</td>
<td>April 2001</td>
<td>165.8</td>
</tr>
<tr>
<td>Slovenia</td>
<td>1</td>
<td>2</td>
<td>Cancelled auction</td>
<td>December 2001</td>
<td>82.2</td>
</tr>
<tr>
<td>Spain</td>
<td>4</td>
<td>3</td>
<td>Beauty contest + fee</td>
<td>March 2000</td>
<td>480</td>
</tr>
<tr>
<td>Sweden</td>
<td>4</td>
<td>3</td>
<td>Beauty contest</td>
<td>December 2000</td>
<td>44.1</td>
</tr>
<tr>
<td>Switzerland</td>
<td>4</td>
<td>2</td>
<td>Auction</td>
<td>December 2000</td>
<td>119.8</td>
</tr>
<tr>
<td>UK</td>
<td>5</td>
<td>4</td>
<td>Auction</td>
<td>April 2000</td>
<td>6'100 to 9'100</td>
</tr>
</tbody>
</table>

Mobile networks are generally provided by private companies which often tap the financial resources and technical expertise of strategic foreign partners; and

Mobile networks are generally cheaper to install than fixed networks.

The first-generation mobile phones (1G) were analog cellular systems; the second-generation (2G) digital ones. The 2G networks were or are primarily circuit-switched networks. Third-generation networks will primarily be packet-switched, though the early versions might still be hybrid systems. A common approach is to compromise between 2G and 3G with 2.5G technology which is a universally agreed migration path (ITU 2002a).

The shift from 2G to 2.5G will be a bolder step than the shift from 2.5G to 3G, since 2.5G already implies a transition from minute based to volume-based billing. 2.5G and 3G mobile telecommunication requires revised billing concepts. Traditional concepts of duration and distance of a call will need to give way to volume based or flat rate concepts in an “always-on” network.

Future 3G networks will have a wider range than current 2G and 2.5G networks and eventually provide full global roaming. Table 9 in the next section describes various wireless solutions and their range. The big advantage with an all-IP network is that IP is compatible with but independent of all the various wireless technologies. An all-IP network can be designed by combining different technologies to arrive at an optimal solution.

Combining various wireless technologies in networks based on IP will increase the demand for IP addresses since it allows various devices to communicate with another. A new Internet Protocol, IPv6, has been developed to deal with the expected increase in demand for IP addresses. It potentially allows each user a million uniquely addressed and locatable IP devices (ITU 2002a).

Cell phones offer already much more than mere voice communication. Mobile banking has, for example, been pioneered in several counties already. South Korea, South Africa, Germany, Austria, Sweden, the United Kingdom and Japan are some of the countries that have experimented with transactions initiated by cell phone. Financial transactions can be made to pay for a service, get a drink from a vending machine or buy stocks on a stock exchange.

MTN as well as Vodacom offer phone banking to private individuals in South Africa. These services are provided in co-

operation with commercial banks such as First National Bank and Standard Bank. These services allow the viewing of account balances, the transfer of funds between accounts, and the payment of accounts.

South Africa’s MTN further recently introduced a mobile credit and Point-of-Sale (POS) service. The Mobile Credit service allows the processing of credit card payments and guarantees cheques using only a cell phone, securely and within seconds, from anywhere with cell phone reception. Cell phones basically replace credit card swiping devices at restaurants and shops through this service. Additionally this service is independent of locations and land lines. Plumbers, electricians, tour guides, roadside assistance, garden services, tupperware sales, pizza delivery, flea market stalls and other mobile businesses can charge the credit card of a customer directly. The Mobile Credit service works the same way as any normal point-of-sale device, using a cell phone connection instead of a fixed line. For credit card authorisations, transaction details are relayed to the appropriate bank via your cell phone, where the transaction is approved or declined. For cheque guaranteeing, transaction details are sent to CGS (Cheque Guarantee Services) for approval or declining. In both cases a reference number is sent to the phone of the billing person as an SMS to confirm the transaction.

Other business application of cell phones include Location-Based services (LBS) - services based on knowing the precise geographical location of a cell phone using the Global Positioning System (GPS):

- Taxi companies can identify location of a caller and send the taxi closest to him or her;
- A personal navigator can display position of a person on a digital map and provide guidance to a desired location (restaurant for example).

All these services are already possible with 2G technology. 2.5 and 3G will make these services more convenient and also cheaper. A more profound consequence in the way we use cell phones will be the “Always-on” concept.

In the past few years, the availability of pre-paid schemes has transformed the prospects for mobile communication, especially in developing countries, and in particular in Namibia.

The question as to whether and when 3G systems will come to Namibia depends very much on when a second mobile license will be awarded. The later a second operator enters the market the more likely it will be that this operator will choose from the outset to install a 3G compliant system, even though the licence would initially be issued as a GSM license (2G). A certain threat exists
from a new operator entering the market offering 3G services only to wealthy citizens. Opportunistic cream-skimming by new entrants might be avoided through universal service obligations and or price regulations (Koski & Kretschmer 2002).

**BROADBAND INTERNET**

Broadband Internet access is another technology emerging that has the potential to facilitate the information revolution. While next generation cell phones represent a convergence of mobile phones with information and data communication services, broadband technology represents a convergence between computing, communications and broadcasting. At the end of 2002 broadband services had been made available in 81 out of 200 economies (ITU 2003). These are displayed in Figure 53.

![Figure 53: Broadband worldwide - Shaded countries had commercially available broadband services at 31 December 2002 (Source: ITU 2003)](image)

Broadband technology competes with leased line providers, since it provides similar or faster speeds but at much lower costs. It poses a threat to existing markets for leased lines, virtual private networks and other business services. The estimated cost ranges from a quarter in the USA to a 1/111 in Japan of leased line services (Source: ITU 2003).

Moreover, there exists an overlap between broadband access where users are “always-on” and traditional “dial-up” Internet access where users use modems and telephone lines to establish a temporary
connection to the Internet. The expansion of broadband access is usually at the expense of the customer base of dial-up subscribers.

Broadband technologies provide effective means of carrying voice over IP, with or without the involvement of third parties. Video conferencing, for example, is feasible across continents at the cost of local call rates, or even less if operating at flat rates.

Broadband technologies are basically devices hooking computers to the Internet either through fixed lines or through wireless LAN transmitters. Recommendation I113 of the ITU Standardisation Sector (ITU-T) defines broadband as anything faster than ISDN, declaring analog modems (56k/V90) and ISDN narrowband. However, what is broadband today might soon become narrowband as technology advances.

Apart from speed, another major difference is the “always-on” concept in contrast to the “dial-up” concept. Broadband subscribers usually pay a flat rate per month or pay for volume up- or down-loaded while dial-up users by for time being connected to the Internet Service Provider (ISP).

Broadband falls into two basic categories: wired (fixed line) and wireless.

The main wired technologies are Digital Subscriber Line (DSL) and Cable Modem technology. DSL uses existing copper-twisted pair
wiring and does not require new cabling like ISDN. However DSL speeds are influenced by the distance between subscriber and the local exchange. It is currently the most popular broadband technology in the world (ITU 2003). DSL could be deployed without delays in Namibia. It would require Telecom Namibia to open the local loop to competitors (local loop unbundling = LLU). There are several forms of DSL, such as ADSL and SHDSL, SDSL, ADSL2 and VDSL, each having its own merits.

Cable modem technology uses the infrastructure of Cable TV. Initially cable TV infrastructure was built to transmit video sequences (TV programmes) to households. Technological developments have made it possible to transfer data both ways allowing households to get access to the Internet. The disadvantage compared to DSL is that this bandwidth is shared among several households, and individual bandwidth might vary depending on how much bandwidth is used by neighbours. DSL in comparison provides an dedicated, unshared bandwidth. However, this technology is not relevant in Namibia, since Cable TV has not yet been implemented.

Rapid technological advances and the release of large portions of radio spectrum have boosted wireless technology to access the Internet. Wireless technology has the advantages of faster deployment, greater flexibility and therefore lower costs. This makes wireless technologies ideal for rural areas. Wireless technologies offer the natural solution to broadband access to areas beyond DSL and Cable network range.

<table>
<thead>
<tr>
<th>Name</th>
<th>Speed</th>
<th>Range</th>
<th>Frequency</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.11b (WiFi)</td>
<td>11Mbit/s</td>
<td>100m</td>
<td>2.4GHz</td>
<td>Most popular and widespread</td>
</tr>
<tr>
<td>802.11a</td>
<td>54Mbit/s</td>
<td>50m</td>
<td>5GHz</td>
<td>Newer, faster and higher frequency</td>
</tr>
<tr>
<td>802.11g</td>
<td>54Mbit/s</td>
<td>100m</td>
<td>2.4GHz</td>
<td>Fast, backwards compatible with Wi-Fi</td>
</tr>
<tr>
<td>802.11e</td>
<td>54Mbit/s</td>
<td>NA</td>
<td>5GHz</td>
<td>Adds QoS</td>
</tr>
<tr>
<td>802.16 (WiMAX)</td>
<td>70Mbit/s</td>
<td>50km</td>
<td>2-11GHz</td>
<td>QoS, very long distance</td>
</tr>
<tr>
<td>RadioLAN</td>
<td>10Mbit/s</td>
<td>35m</td>
<td>5.8GHz</td>
<td>specialises in wireless bridges</td>
</tr>
<tr>
<td>HomeRF2</td>
<td>1Mbit/s</td>
<td>50m</td>
<td>2.4GHz</td>
<td>replaced by HomeRF2</td>
</tr>
<tr>
<td>HomeRF2</td>
<td>10Mbit/s</td>
<td>100m</td>
<td>2.4GHz</td>
<td>QoS, better encryption, not widespread</td>
</tr>
<tr>
<td>HiperLAN2</td>
<td>54Mbit/s</td>
<td>150m</td>
<td>5GHz</td>
<td>European standard, QoS, for video and voice</td>
</tr>
<tr>
<td>HiperMAN</td>
<td>NA</td>
<td>50km</td>
<td>2-11GHz</td>
<td>European, compatible with 802.16a</td>
</tr>
<tr>
<td>Bluetooth</td>
<td>1Mbit/s</td>
<td>10m</td>
<td>2.4GHz</td>
<td>Personal Area Network (not WLAN)</td>
</tr>
<tr>
<td>InfraredLAN</td>
<td>4Mbit/s</td>
<td>20m</td>
<td>350000GHz</td>
<td>same room only</td>
</tr>
</tbody>
</table>

There are several wireless solutions. Differences are in the range and speed of various technologies as well as add-on features such as encryption. Higher frequencies can generally carry more data but
cannot travel as far as lower frequencies. Table 9 provides an overview of selected wireless network solutions.

A promising technology to deliver broadband access for developing countries is the use of power lines. Power lines as communication networks are ideal for developing countries and might also pose a sustainable approach to Namibia since power grids usually surpass phone grids in coverage. Many houses in Namibia have electricity but not fixed line telephones. Power Line Communications (PLC) networks have successfully been deployed in Iceland, for example (ITU 2003). Nampower is moreover said to have its own fibre optic network already installed which could complement PLC.

Who would benefit from broadband technologies?

- Governments: To promote economic development and to deliver services cost-effectively such as e-learning, e-government and tele medicine.

- Telecommunication companies: Adaptation of Broadband technologies offers a way to offset the current slow down in the industry.

- Consumers: Users can use the Internet more intensively since it is cheaper and costs no longer depend on the time connected to the Internet. This opens the gates for new services such as video, radio or gaming per Internet. Some broadband providers have also started to provide Voice over IP services enabling consumer to save money on phone calls.

- Businesses: Broadband technologies add flexibility to the work place through tele working and remote access at high speed. Cost savings compared to leased lines can also be realised.

Altogether the Namibian economy as a whole, and lower income groups in particular would benefit from broadband technologies. Broadband technologies have the potential to provide greater access to information, at lower cost, to more people in Namibia and hence to facilitate the emergence of an information society. More importantly, the variety of broadband technologies promise more equitable access to information for parts of the population that have not been able to profit from the information revolution to date. Schools without water and electricity can still enjoy access to the Internet using solar energy and wireless broadband technologies, as demonstrated by Schoolnet Namibia. Petrol stations, schools and community centres could all become information points for those that do not have individual access to the Internet. The pupils of any school hooked up by Schoolnet Namibia have the opportunity to read Namibian newspapers online free of charge.
In Namibia the barriers to equitable access to information result from a variety of factors including income, education, literacy levels, gender, age and connectivity (mobile phone and fixed line coverage). To overcome these barriers the Government of Namibia should continuously encourage network development. One way of facilitating infrastructure investments is to extend the Universal Service Obligation (USO) used for fixed line telecommunication to other areas. There are several different USO concepts, though obliging the incumbent telecom operator with rolling out broadband access might not be the most effective one. However, it might be the only option in the absence of competition as is currently still the case in Namibia.

Starting with communal access points at telecentres, schools, post offices and libraries would be an effective approach to fostering universal access, in particular for rural areas. Where possible, wired broadband technologies could be used and wireless ones in remote rural areas.

**OPEN SOURCE SOFTWARE**

Open Source Software has managed to gain popularity in last few years. Recent news announcements can be seen as an indicator for governments beginning to wake up to the potential of open source software and starting to understand the benefits of open source to the whole community. The city of Munich decided in 2003 to replace Windows on its 14,000 computers with Linux (Economist 2003). Cost savings were among the main reasons for that move since Linux is essentially a free operating software. However, a reason cited that weighs even heavier is that the municipality wants to control its technological destiny and does not wish to place the functioning of government in the hands of a single company that is accountable to its shareholders rather than to citizens. Other national and local governments around the world share these sentiments. Japan, South Korea and China are collaborating to develop open-source alternatives to Microsoft’s software, not least on the grounds of national self-sufficiency and security.

Open source software is considered to be more secure, since the source code is public domain and “back doors” and bugs can be more easily identified and dealt with. A further advantage is that the software can be easily customised to meet individual needs. Customised operating systems and software applications can run potentially faster and more stable.
The British government commissioned the Office of Government Commerce (OGC), responsible for government procurement standards, to evaluate the deployment of open source operating software and applications for personal computers and servers for various levels of government.¹⁰

Other than consumers, large consulting companies (such as IBM) and numerous software developers (e.g. SuSe, RedHat) are likely to benefit from the growing significance of open source software. IBM recently opened a Linux Centre in Moscow to foster the spread of open source software development and strengthen its open source strategy.

Open source doesn't simply mean access to the source code. The Open Source Initiative sets following criteria for open source software:¹¹

- Free Redistribution: The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programmes from several different sources. The license shall not require a royalty or other fee for such sales.

- Source Code: The programme must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicised means of obtaining the source code for no more than a reasonable reproduction cost – preferably, downloading via the Internet without charge. The source code must be the preferred form in which a programmer would modify the programme. Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a preprocessor or translator are not allowed.

- Derived Works: The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.

- Integrity of The Author’s Source Code: The license may restrict source code from being distributed in modified form only if the license allows the distribution of “patch files” with the source code for the purpose of modifying the programme at build time. The license must explicitly permit the distribution of software built from a modified source code. The license

may require derived works to carry a different name or version number from the original software.

- No Discrimination Against Persons or Groups: The license must not discriminate against any person or group of persons.

- No Discrimination Against Fields of Endeavour: The license must not restrict anyone from making use of the programme in a specific field of endeavour. For example, it may not restrict the programme from being used in a business, or from being used for genetic research.

- Distribution of License: The rights attached to the programme must apply to all to whom the programme is redistributed without the need for execution of an additional license by those parties.

- License Must Not Be Specific to a Product: The rights attached to the programme must not depend on the programme's being part of a particular software distribution. If the programme is extracted from that distribution and used or distributed within the terms of the programme's license, all parties to whom the programme is redistributed should have the same rights as those that are granted in conjunction with the original software distribution.

- License Must Not Restrict Other Software: The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programmes distributed on the same medium must be open-source software.

- License Must Be Technology-Neutral: No provision of the license may be predicated on any individual technology or style of interface.

- Several operating systems and software applications are today based on the open source principle.

Linux is the most used, Unix-like operating system world-wide. Versions have been run on anything from hand-held computers and regular PCs, to the world's most powerful super computers. FreeBSD, OpenBSD, and NetBSD are all based on the Berkeley Systems Distribution of Unix, developed at the University of California, Berkeley. Another BSD based open source software is Darwin, which is the base of Apple's Mac OS X.

Popular Internet applications include Apache (which runs over 50% of the world's web servers), BIND (the software that provides the domain name service for the entire Internet), Mozilla, (Internet browser) and OpenSSL (standard for secure communication over
the internet). Open source software application accounts for the key application to run and use the Internet.

In the field of office application, open source software is also building a strong base with applications such as OpenOffice and StarOffice, K-Office which are free open source alternatives to Microsoft Office.

Commercial companies that support open source software development include IBM, Apple, HP, Sun, SGI and Sharp.

Open Source software is likely to be among the hottest topics to be discussed at the World Summit on the Information Society to be hosted in December 2003 in Geneva. Influential companies such as Microsoft that fear losing market share will use all their clout to lobby against firm commitments to open source software by the summit.

CONCLUSION

The aim of this chapter was to evaluate the impact on ICT developments on Namibia. Recommendations derived from this chapter are dealt with in the following sections:

Telecom Namibia

Telecom Namibia will see a shift in their revenue streams through IP telephony sooner or later. The ITU report on IP telephony from 2001 (ITU 2001) states that incumbent operators are likely to experience a loss of international traffic revenues, both direct (loss of collection charges) and indirect (loss of settlement payments). This can clearly be expected for Telecom Namibia. Telecom Namibia is best advised to embrace IP telephony, and bear the consequences of reduced per-minute revenues from long distance and international calls, rather than to risk missing the opportunity to develop revenues in future growth areas. A consequence will be that Telecom Namibia can no longer cross-subsidise local call rates and its USO through long distance and international calls. In anticipation of these changes a tariff rebalancing will be required to bring the prices for local, national and international calls closer. Reduced revenues from national and international calls will then partly be made up for through increasing revenues from local calls. This is through higher local call rates and higher local call volumes induced by VoIP and Internet traffic. Telecom Namibia will also need to accelerate the transformation process and invest heavily in a Next
Generation Network to prepare for the competition that might be brought through a second fixed line provider in 2004. IP networks enable new players such as utility providers (NamPower, e.g.) easy market access and to compete with much lower cost structures. This poses a direct threat to the existence of incumbent operators. Offering new IP-based services and products can recover some of the cost savings brought about by IP telephony. Also cheaper call rates will attract more minute turnover.

Furthermore, Telecom Namibia would be well-advised to introduce access to the Internet via broadband technologies. Broadband technologies would be expanding at the costs of VPN and the lucrative leased line business. This would threaten Telecom’s profit streams from Infinitum and Iway. However, at the same time broadband technologies also provide new income streams. Broadband technologies could be introduced and priced in such a way as to make up for potential VPN and leased line business while a second fixed line provider has not yet entered the market. Competition would then bring the prices down.

The longer Telecom Namibia waits to implement these new technologies the higher the risk will be of losing market to competition. Telecom Namibia’s time is running out to become a technology leader in Sub-Saharan Africa. Rolling out broadband technology and a Next Generation Network would not only broaden the customer base and lead to considerable economic growth and employment (not least in the telecommunications sector), but would also strengthen Telecom’s ability to compete in the SADC market.

MTC

MTC might soon face competition from a second mobile telecommunication provider. It will be difficult for that provider to build up an entire new mobile network throughout Namibia and compete on price at the same time. MTC would be well-advised to adjust its network for 2.5G networks and design a migration path for a 3G network. The fact that the second mobile phone license will also be a GSM license will give MTC more time. There are two possible strategies to react to the arrival of a new competitor in the market. MTC could either try to maintain or expand its customer base via an aggressive pricing strategy, or it could focus on added value. The right strategy will very much depend on who the second mobile phone provider will be, and what the entry strategy of that provider will be.
Namibian Communications Commission (NCC)

NCC should be responsible for fixed line and mobile telecommunication services. The proposed telecommunication bill foresees a new authority (CAN) that would be responsible for both. It would be advisable for NCC to define technical standards such as QoS and to regulate fixed line prices until full competition is established. This should be done in such a way as to allow and motivate Telecom Namibia to migrate gradually to a Next Generation Network (NGN), to protect consumers and foster the use of Internet and other communication means. Approaches to IP Telephony should be technologically neutral; i.e. applying regulation in an even-handed manner to like services regardless of the technology used to provide these services. This supports competition amongst technologies and operators.

Another consideration would be to broaden the Universal Service Obligation of Telecom Namibia to include broadband technologies such as DSL.

NCC has also been hesitant in the past in granting permission for radio frequencies. The radio spectrum is a renewable resource. Using it will not use it up; i.e. not using it is an economic waste. E-government and e-learning programmes would benefit greatly from access to a free radio spectrum. Business could profit as well from an activity managed radio spectrum.

Government of Namibia

Import duties should be reduced or abandoned for ICT goods and services, in particular for Internet related products such as routers, switches, hubs, servers etc. This will enable major player to easier migrate to NGNs. VAT exemption for ICT goods and services should be evaluated. This would reduce the costs of ICT technologies to the end user. The recommendation is based on the findings of Pilat and Lee (2001) that OECD countries with a more rapid diffusion and lower costs of ICT technologies experienced a substantial pick up in Multi-Factor Productivity Growth in the second half of the 1990s. The provision of free or cheap Internet access to institutions such as schools, universities, libraries and other public service institutions would reduce the digital divide within Namibia and contribute to the achieving of Vision 2030 objectives. The use of the Internet would be promoted, and the access of the poor to communication services increased. This might enable services such as e-learning and e-health.
The Government should use its influence over Telecom Namibia to push for the introduction of broadband and IP technologies. Telecom Namibia, belonging as it does to the state, has a social responsibility to all Namibians. Namibia could be at the forefront in SADC in terms of telecommunication infrastructure and access to the Internet.

Distance is one of the major obstacles to globalisation. IP telephony addresses two of the four cost factors of distance, the four cost factors being search costs, shipping costs, management costs and cost of time for shipping and communication with distant locations. It would make it cheaper for Namibians to search for trading partners. It would also reduce the cost of managing and monitoring distant production facilities. It makes VPN and international communications (video conferencing, voice, fax, etc.) cheaper. IP telephony offers the opportunity to gain competitiveness and attract foreign direct investment, but it also poses the threat of being left behind if these opportunities are not realised.

Namibia already has a fully digital telephone network. Transforming this network to an NGN offering IP telephony on various levels would reduce the costs of communication drastically and translate into a considerable gains in competitiveness for both Telecom Namibia and the nation-state.
CONCLUSION

Namibia has a solid telecommunication infrastructure. Competition to be introduced in due course will foster the implementation of new technologies and decrease prices for customers of telecommunication services. The geographic and social challenges of Namibia require innovative approaches and extra efforts. Namibia is still a long way from providing equal access to information to all Namibians.

Every society has people that work in farming, some that work in industrial production and some that provide services. The information revolution had a different impact on different countries and a different impact for various income groups and communities.

The impact on Namibia is particularly uneven due to the unequal income distribution in Namibia. A digital divide exists in Namibia that runs between income groups as well as between its rural and urban population. Breaching this gap is the challenge policy makers face if they are to achieve the objectives set out in the Vision 2030 and the NDP2.

Trying to emulate the best will always leave one second best. It is not enough to achieve what developed countries have achieved today to fulfil the Vision 2030. Namibia needs to anticipate where developed countries are in 2030 and build on strategies to be there too. Bold steps and courage are required to facilitate the economic and social development of Namibia.

The ICT sector around the world is increasingly contributing to employment creation directly, and productivity gains indirectly. Namibia could be a technology centre within Sub-Saharan Africa, attracting additional foreign direct investments, and enjoying stronger growth in employment opportunities and GDP. Courage is required not only from entrepreneurs but also on the part of government officials and regulators.

Namibia has not yet fully benefited from the information revolution. The lives of only a small segment of the population have been impacted by the latest ICT developments. However, the potential is high for deploying ICT for Namibia’s development.

The World Economic Forum (2002) derives the following recommendations for Namibia:
• Ensure stakeholder participation in the policy process;
• Accelerate ICT market liberalisation plus to encourage FDI;
• Revisit dependency upon RSA for basic infrastructure;
• Formulate and implement e-commerce, encryption and digital signature laws;
• Install more telephone lines especially in rural areas;
• Electrify rural areas (production capacity exists);
• Improve affordability of ICT access and services;
• Extend current ICT projects to rural areas;
• Formulate and support e-health, e-education and community training projects to develop human capital;
• Promote entrepreneur development projects.

Three main strategies evolve from these recommendations. These are to make ICT and access to information more affordable, to focus on human resource development and to create a conducive business environment.

At the heart of making ICT and access more affordable lies the liberalisation of the telecommunication sector. ITU’s World Telecommunication Development Report (2002c) draws the following conclusions on market liberalisation:

• Privatisation without competition is good, but privatisation with competition is much better;
• Introducing private sector players is good, but allowing them the freedom to compete is better;
• Creating regulators is good, but giving them adequate powers and independence is better;
• Creating a duopoly is good, but allowing open competition is better;
• Introducing competition is good, but introducing it at an early stage of market development is better.

Furthermore, VAT exemptions on ICT goods and services as well as reduced or import duty exemptions could be evaluated. The reasoning behind this would be that lower ICT costs would in the medium-term lead to a productivity increase that offsets the tax loss.

On the part of human resource development even bolder steps are required to reach the aims set out in Vision 2030. It is not only about IT literacy but about the quality of teaching in general. This affects early childhood development, primary and secondary schooling as
CONCLUSION

Conclusion

well as tertiary education. The government of Namibia would be well-advised to priorities human resource development and to beef-up current efforts considerably.

The authors believe strongly that establishing the legal framework for e-commerce and online banking and liberalising the telecommunication sector will lead to sustainable growth and increased employment which in turn will generate the resources to deliver better education and prospects to all Namibians. At the same time these measures will make it also cheaper and more effective to deliver that education.

Namibia could be the first African country to roll out an all-IP telephone service, reducing local telephone costs to a tenth of what they are now and long distance and international calls at the same price. Communication costs for e-learning, e-health, e-commerce and e-government could be a fraction of the cost of what they are now. Telecom Namibia would have to undergo considerable change, and might even have to cut down employment. However, overall more jobs would be created in the telecommunication sector, as well as in other sectors. This is a national issue, and not just a question for Telecom Namibia to decide. Telecom Namibia has the capability to deliver all this, but not the motivation to do so in the current set-up. Introducing competition as early as possible will provide the right motivation.

Namibia could leapfrog development by directing development efforts towards what will be the most important production factors for the next century: human resources and information.
7 REFERENCES


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8 GLOSSARY

Entries in this glossary are taken from ITU Internet reports (2001, 2002a, and 2003):

- **2.5G**: Second-generation enhanced. Name given to enhanced 2G networks, for example GPRS and cdmaOne.

- **2G**: Second-generation mobile network or service. Generic name for second generation networks, for example GSM.

- **3G**: Third-generation mobile network or service. Generic name for mobile network/service based on the IMT-2000 family of global standards.

- **3GPP**: Third Generation Partnership Project. Collaboration agreement bringing together a number of telecommunication standards bodies, with the objective of producing globally applicable technical specifications and technical reports for a third generation mobile system based on evolved GSM core networks and radio access technologies that they support, i.e. Wideband CDMA (W-CDMA). See http://www.3gpp.org.

- **3GPP2**: Third Generation Partnership Project 2. Collaborative third-generation telecommunication standards-setting project comprising North American and Asian interests. The objective of this project is to develop global specifications for 3G CDMA2000 technologies. It can be said to be the CDMA2000 counterpart to 3GPP. See http://www.3gpp2.com/.

- **Access charge**: Amount paid per minute, charged by network operators for the use of their network by other network operators. Also known as interconnect charge.

- **ADSL**: Asymmetric digital subscriber line. A technology that enables high-speed data services to be delivered over twisted pair copper cable, typically with a download speed in excess of 256 kbit/s, but with a lower upload speed. Corresponds to ITU Recommendation (standard) ITU-T G.992.1

- **ADSL2**: Asymmetric Digital Subscriber Line 2 (ITU-T G.992.3 and ITU-T G.992.4). A sequel to the original ITU Recommendation. It allows increased line speeds, new power-saving elements, and extends the reach of the original ADSL specification.
• ADSL2+: Asymmetric digital subscriber line 2 plus (ITU-T G.992.5). This revised version of ADSL2 enables increased speeds by increasing the frequencies used on the copper line.

• Air time: The minutes of calls a subscriber makes or receives from a mobile phone. Also referred to as talk time. This term is mainly used in RPP environments (see RPP).

• AMPS: Advanced Mobile Phone System. An analogue cellular telephone service standard utilizing the 800 to 900 MHz band (and recently also the 1’800-2’000 MHz band).

• Analogue: Transmission of voice and images using electrical signals. Analogue mobile cellular systems include AMPS, NMT and TACS. Contrasts with digital.

• ASP: Application service provider. Provider of a service that allows users to run applications remotely from a server rather than having the actual programmes installed on their computers. This allows for higher power applications to run on small or basic terminals.

• ATM: Asynchronous Transfer Mode. A transmission mode in which the information is organised into cells; it is asynchronous in the sense that the recurrence of cells from an individual user is not necessarily periodic.

• Bandwidth: The range of frequencies available to be occupied by signals. In analogue systems it is measured in terms of Hertz (Hz) and in digital systems in bits per second (bit/s). The higher the bandwidth, the greater the amount of information that can be transmitted in a given time. High bandwidth channels are referred to as “broadband” which typically means 1.5-2.0 Mbit/s or higher.

• Base station: A radio transmitter/receiver and antenna used in the mobile cellular network. It maintains communications with cellular telephones within a given cell and transfers mobile traffic to other base stations and the fixed telephone network.

• Bit (binary digit): A bit is the primary unit of electronic, digital data. Written in base-2, binary language as a “1” or a “0”. Bit/s: Bits per second. Measurement of the transmission speed of units of data (bits) over a network. Also kbit/s: kilobits (1’000) per second;

• Bit/s: Bits per second. Measurement of the transmission speed of units of data (bits) over a network. Also kbit/s: kilobits (1’000) per second; Mbit/s: megabits (1’000’000) per second, and Gbit/s: Gigabits (1’000’000’000) per second.
• Bluetooth: A radio technology that enables the transmission of signals over short distances between mobile phones, computers and other devices. It is typically used to replace cable.

• Broadband: Although there exist various definitions of broadband that have assigned a minimum data rate to the term, it may be defined as transmission capacity with sufficient bandwidth to permit combined provision of voice, data and video, with no lower limit. Effectively, broadband is implemented mainly through ADSL, cable modem or wireless LAN (WLAN) services.

• Browser: Application that retrieves WWW documents specified by URLs from an HTTP server on the fixedline Internet. Displays the retrieved documents according to the Hyptertext Markup Language (HTML).

• Burstiness: Technical jargon used to describe a high peak-to-average rate of packets as they are received over the network. There is no unique mathematical definition of “burstiness”, but a traffic stream is considered to be more “bursty” than another if its packets are more clumped together.

• Cable modem: A technology that allows high-speed interactive services, including Internet access, to be delivered over a cable TV network.

• CAGR: Compound annual growth rate.

• CDMA: Code division multiple access. A technology for digital transmission of radio signals based on spread spectrum techniques where each voice or data call uses the whole radio band and is assigned a unique code.

• CDMA2000: Code Division Multiple Access 2000. A third-generatiion digital cellular standard based on Qualcomm technology. Includes CDMA2000 1x, 1xEV-DO (Evolution, Data Optimized) and 1xEV-DV (Evolution, Data and Voice). One of the IMT-2000 “family” of standards.

• cdmaOne: 2.5G mobile cellular standard (IS-95B) based on CDMA and backed by Qualcomm. The evolution from cdmaOne continues with the 3G standard, CDMA2000. The related 2G standard is known as IS-95A.

• Cell: The geographic area covered by a single base station in a cellular mobile network.
• Cellular: A mobile telephone service provided by a network of base stations, each of which covers one geographic cell within the total cellular system service area.

• Channel: One of a number of discrete frequency ranges utilized by a base station to transmit and receive information from cellular terminals (such as mobile handsets).

• Churn: Term used to describe the turnover in the number of subscribers to a network, typically measured monthly. There are several different ways of measuring churn (for instance, based on the subscriber base at the start or the end of the month) which means that comparisons between companies or between countries are not always meaningful.

• Circuit-switched connection: A temporary connection that is established on request between two or more stations in order to allow the exclusive use of that connection until it is released. At present, most voice networks are based on circuit-switching, whereas the Internet is packet-based. See also Packet-based.

• Condominium Fibre Build: A network model where a group of end-users band together to install strands of fibre optic cable to an ISP at the same time. At completion, the end-users are each given separate strands of fibre for their own usage.

• Connectivity: The capability to provide, to end-users, connections to the Internet or other communication networks.

• Coverage: Refers to the range of a mobile cellular network, measured in terms of geographic coverage (the percentage of the territorial area covered by mobile cellular) or population coverage (the percentage of the population within range of a mobile cellular network).

• CPP: Calling party pays. Billing option typically used in mobile networks whereby the person making the call is charged for its full cost, in contrast to billing also the recipient of the call (see also RPP).

• D-AMPS: Digital Advanced Mobile Phone Service. A digital version of AMPS, the original analogue standard for mobile phone service in the United States and now used in many countries. It is now called TDMA/IS-136. See also TDMA.

• DCS-1800: Digital Cellular System 1800. GSM networks using the 1’800 Mhz frequency. See also PCS.

• DECT: Digital Enhanced Cordless Telecommunications. A standard for cordless telephony originally established by ETSI.
• Digital: Representation of voice or other information using digits 0 and 1. The digits are transmitted as a series of pulses. Digital networks allow for higher capacity, greater functionality and improved quality.

• DNS: Domain Name System. Databases located throughout the Internet that contain Internet naming information, including tables that cross-reference domain names with their underlying IP numbers.

• DOCSIS: Data over cable systems interface specifications (ITU-T J.112). An ITU

• DOCSIS2: Data over cable systems interface specifications 2 (ITU-T J.122). The newest, revised version of DOCSIS, approved at the end of 2002.

• Domain Name: The registered name of an individual or organization eligible to use the Internet. Domain names have at least two parts and each part is separated by a dot (e.g. itu.int). The name to the left of the dot is unique for each top-level domain name, which is the name that appears to the right of the dot.

• DSL: Digital subscriber line. See also xDSL. Dual-mode (also tri-mode or multi-mode): Handsets that can work with more than one different standard and/or at more than one frequency.

• DSLAM: Digital subscriber line access multiplexer. A device, located at the central office of a DSL provider, that separates and routes the voice-frequency signals and data traffic on a DSL line.

• E-commerce: Electronic commerce. Term used to describe transactions that take place online where the buyer and seller are remote from each other.

• EDGE: Enhanced Data rates for GSM Evolution. An intermediate technology, still under development, that brings second-generation GSM closer to third generation capacity for handling data speeds up to 384 kbit/s.

• E-mail: Electronic mail. The exchange of electronic messages between geographically dispersed locations.

• EMS: Enhanced Messaging Service. EMS is a text service allowing mobile users to send and receive short text messages from other mobile and PC users. Compared to SMS, EMS includes additional features such the transmission of simple melodies, graphics, sounds, animations and modified text as an integrated message.
• Endrun: A fibre optic infrastructure that provides a dedicated fibre optic cable directly to each user’s premise rather than several premises optically splitting off one line. See PON.

• End-user: The individual or organization that originates or is the final recipient of information carried over a network (i.e. the consumer).

• ENUM: Standard adopted by Internet Engineering Task Force (IETF), which uses the domain name system (DNS) to map telephone numbers to Web addresses or uniform resource locators (URL). The long-term goal of the ENUM standard is to provide a single number to replace the multiple numbers and addresses for users’ fixed lines, mobile phones, and email addresses.

• EPOP: Expanding point of profitability. A network topography where the network expands incrementally to unserved areas as they become profitable to operators. Newly connected areas can then be used as backbones to more remote areas as they eventually become profitable to providers.

• Ethernet: A protocol for interconnecting computers and peripheral devices at high speed. Recently Gigabit Ethernet has become available which enables speeds up to 1 Gbit/s. Ethernet can run on several types of wiring including: twisted pair, coaxial, and even fibre optic cable.

• Exchange: See Switch.

• FDD: Frequency Division Duplex. One technique used for wireless communications where the up link and down link are at different frequencies.

• FDMA: Frequency Division Multiple Access. A cellular technology that has been used in the first generation analogue systems (i.e., NMT, AMPS, and TACS).

• Firewall: Software or hardware that controls access in and out of a network. Firewalls can be dedicated computers that act as the intermediary between a business network and the Internet, or can be software tools that help individual computers control which programmes are allowed access to the Internet.

• Fixed line: A physical line connecting the subscriber to the telephone exchange. Typically, fixed-line network is used to refer to the PSTN (see below) to distinguish it from mobile networks.

• Frequency: The rate at which an electrical current alternates, usually measured in Hertz (see Hz). It is also used to refer to a
location on the radio frequency spectrum, such as 800, 900 or 1’800 MHz.

- FSO: Free space optics. A system of lasers used to transmit data optically through the atmosphere at very high speeds. Similar to optical fibre without the physical cable.

- FTTH: Fibre to the home. A high-speed fibre optic, Internet connection that terminates at a residence. See FTTx.

- FTTx: Fibre to the x, where x is a home (FTTH), building (FTTB), curb (FTTC), or neighbourhood (FTTN). These terms are used to describe the reach of an optical fibre network.

- FWA: Fixed wireless access. Technologies that provide Internet access between stationary points.

- Gateway: Any mechanism for providing access to another network. Entrance and exit to a communications network.

- GDP: Gross domestic product. The market value of all final goods and services produced within a nation in a given time period.

- GEO: Geostationary earth orbit. A satellite in orbit 35’650 km above the Earth in a rotation that mimics that of the Earth, thus appearing stationary in the sky.

- GMPCS: Global Mobile Personal Communications by Satellite. Non-geostationary satellite systems that are intended to provide global communications coverage to small handheld devices.

- GNI: Gross national income. The market value of all final goods and services produced in a nation’s economy, including goods and services produced abroad. GNI in constant prices, differs from GNP in that it also includes a terms of trade adjustment; and gross capital formation which includes a third category of capital formation: net acquisition of valuables.

- GNP: Gross national product. The market value of all final goods and services produced in a nation’s economy, including goods and services produced abroad.

- GPRS: General Packet Radio Service. A 2.5G mobile standard typically adopted by GSM operators as a migration step towards 3G (W-CDMA). Based on packet-switched technology enabling high-speed data transmission (approx. 115 kbit/s).

- GPS: Global positioning system. Refers to a “constellation” of 24 “Navstar” satellites launched initially by the United States
Department of Defense, that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location accuracy ranges from 10 to 100 metres for most equipment. A Russian system, GLONASS, is also available, and a European system, Galileo, is under development.

- **GSM**: Global System for Mobile communications. European-developed digital mobile cellular standard. GSM is the most widespread 2G digital mobile cellular standard, available in over 170 countries worldwide. For more information see the GSM Association website at: http://www.gsmworld.com/index.html.

- **Half duplex**: Half duplex refers to a communication channel that can only handle one-way traffic at a time. In essence, each side of the communication must wait until the other is finished transmitting to start sending information. By contrast, full duplex communication allows for both parties to broadcast and receive at the same time.

- **Hand-off**: A central concept of cellular technology, enabling mobility for subscribers. It is a process by which the Mobile Telephone Switching Office passes a mobile phone conversation from one radio frequency in one cell to another radio frequency in another as a subscriber crosses the boundary of a cell.

- **HAPS**: High altitude platform station. A term referring to balloons and high altitude aircraft that can be used to provide communication services. See LAPS.

- **HDTV**: High-definition television. A new format for television that offers far superior quality to current NTSC, PAL, or SECAM systems. The resolution of the picture is roughly double previous television signals and the pictures are displayed with a screen ratio of 16:9 as compared with most of today's TV screens, which have a screen ratio of 4:3.

- **HFC**: Hybrid fibre copper. A broadband network that utilises fibre optic cabling to the vicinity and then copper lines to individual users.

- **HiperLAN**: High-performance radio local area network. An ETSI standard that operates at up to 54 Mbit/s in the 5 GHz RF band.

- **HiperLAN2**: High-Performance Radio LAN Type 2. Wireless LAN (specified by ETSI/BRAN) in the 5 GHz IMS Band with a bandwidth up to 50 Mbit/s. HiperLAN2 is compatible with
3G WLAN systems for sending and receiving data, images, and voice communications.

- **HIPERMAN**: High performance radio metropolitan area network. This is a European standard aimed at providing a broadband wireless solution for Metropolitan Area Networks.
- **Host**: Any computer that can function as the beginning and end point of data transfers. Each Internet host has a unique Internet address (IP address) associated with a domain name and a permanent connection to the Internet.
- **Hotspot**: An access point to a wireless local area network (WLAN). Hotspots are areas where wireless data can be sent and received, and Internet access is provided to wireless devices. For example, a laptop computer can be used to access the Internet in a hotspot provided in an airport or hotel.
- **HSCSD**: High-Speed Circuit-Switched Data. An intermediary upgrade technology for GSM-based on circuit-switched technology and enabling data service speed of 57 kbit/s.
- **HTML**: Hypertext Markup Language. The set of symbols or codes inserted in a file for display on a World Wide Web browser page and which contain the necessary information for the display of images and text on screen. Mark-up languages for translating Web content onto mobile phones include cHTML (compact), WML (wireless), xHTML (extensible hypertext) and XML (extensible).
- **HTTP**: Hypertext Transfer Protocol. Hypertext is any text that cross-references other textual information with hyperlinks.
- **Hz**: Hertz. The frequency measurement unit equal to one cycle per second.
- **IMEI**: International Mobile Equipment Identity. Unique serial number used on mobile phones, typically those connected to the GSM network.
- **i-mode**: information mode. A mobile Internet service launched in Japan in spring 1999 by NTT DoCoMo. The service is accessed over a packet-based network and the contents are viewed through a subset of the Hypertext Markup Language, cHTML.
- **IMT-2000**: International Mobile Telecommunications. Third-generation (3G) “family” of mobile cellular standards approved by ITU. For more information see the website at: http://www.itu.int/imt.
• Incumbent: The major network provider in a particular country, often a former State-owned monopoly.

• Instant messaging (IM): Refers to programmes such as AOL Instant Messenger and ICQ that allow users to exchange messages with other users over the Internet with a maximum delay of one or two seconds at peak times. Mobile versions of IM have also been launched in 2002.

• Interconnection: The physical connection of telecommunication networks owned by two different operators. Network operators typically charge a perminute fee for use of their network by other operators. See Access charge.

• Internet backbone: The high-speed, high capacity lines or series of connections that form a major pathway and carry aggregated traffic within the Internet.

• Internet content provider (ISP): A person or organization that provides information via the Internet, either with a price or free of charge.

• Internet: Interconnected global networks that use the Internet protocol (see IP). The collection of interconnected networks that use the Internet protocols (IP).

• IP telephony: Internet protocol telephony. IP telephony is used as a generic term for the conveyance of voice, fax and related services, partially or wholly over packet-based, IP-based networks. See also VoIP and Voice over broadband.

• IP: Internet Protocol. The dominant network layer protocol used with the TCP/IP protocol suite.

• IPO: Initial public offering. The first sale of publicly tradable stock shares in a company.

• IPR: Intellectual property rights. Copyrights, patents and trademarks giving creators the right to prevent others from using their inventions, designs or other creations. The ultimate aim is to act as an incentive to encourage the development of new technology and creations which will eventually be available to all. The main international agreements are the World Intellectual Property Organization’s (WIPO) Paris Convention for the Protection of Industrial Property (patents, industrial designs, etc.), the Berne Convention for the Protection of Literary and Artistic Works (copyright), and the World Trade Organization’s (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS).

• **IPv4**: Internet Protocol version 4. The version of IP in common use today.

• **IPv6**: Internet Protocol version 6. The emerging standard, which aims to rectify some of the problems seen with IPv4, in particular the shortage of address space.

• **ISDN**: Integrated Services Digital Network. A digital switched network, supporting transmission of voice, data and images over conventional telephone lines.

• **ISP**: Internet Service Provider. ISPs provide end-users access to the Internet. Internet Access Providers (IAPs) may also provide access to other ISPs. ISPs may offer their own proprietary content and access to online services such as e-mail.

• **ITU**: International Telecommunication Union. The United Nations specialized agency for telecommunications. See http://www.itu.int/.

• **Java**: programming language developed by Sun Microsystems. Some versions of Java are likely to be used in the creation of mobile services. Java is primarily characterised by the fact that programmes written in the language do not rely on a specific operating system.


• **LAN**: Local Area Network. A computer network that spans a relatively small area. Most LANs are confined to a single building or group of buildings. However, one LAN can be connected to other LANs over any distance via telephone lines and radio waves. A system of LANs connected in this way is called a wide-area network (WAN). See also WLAN.

• **LAPS**: Low altitude platform station. A system usually consisting of balloons that provides wireless communication services over a wide area. Similar to HAPS but the altitudes are lower.

• **LBS**: Location-based services. LBS make use of information on the location of a mobile device and user, and can exploit a number of technologies for the geographic location of a user. Some of these technologies are embedded in the networks and
others in the handsets themselves. Location capability is already available to some level of accuracy (approx. 150 m) for most users of cellular networks. Increased accuracy can become available through location technologies such as GPS. See GPS.

- **LEO**: Low Earth orbit. A term that refers to satellite orbits between 650 km and 2'600 km above the Earth. A LEO satellite is only in view for a few minutes and rotates the Earth every few hours. See GEO.

- **LLU**: Local loop unbundling. The process of requiring incumbent operators to open the last mile of their legacy networks to competitors. Similar reference to ULL (unbundled local loop).

- **Local loop**: The system used to connect the subscriber to the nearest switch. It generally consists of a pair of copper wires, but may also employ fibre-optic or wireless technologies. Main telephone line: Telephone line connecting a subscriber to the telephone exchange equipment. This term is synonymous with the term fixed line used in this report.

- **Main telephone line**: Telephone line connecting a subscriber to the telephone exchange equipment. This term is synonymous with the term fixed line used in this report.

- **MASP**: Mobile Application Service Provider. MASPs provide the same service to mobile clients as regular application service providers provide to fixed-line clients, that is to say Web-based access to applications and services that would otherwise be stored locally.

- **Mbit/s**: megabits (1’000’000) per second, and Gbit/s: Gigabits (1’000’000’000) per second.

- **m-commerce**: Mobile commerce. Similar to ecommerce but the term is usually applied to the emerging transaction activity in mobile networks.

- **MDG**: Millennium Development Goals. The 8 MDGs are global targets that 191 nations adopted at the UN Millennium Summit (September 2000). They include specific goals for human development and poverty eradication to be met by 2015.

- **MMS**: Multimedia Messaging Service. MMS will provide more sophisticated mobile messaging than SMS or EMS. A global standard for messaging, MMS will enable users to send and receive messages with formatted text, graphics, audio and
video clips. Unlike SMS and most EMS, it will not be limited to 160 characters per message.

- Mobile: As used in this report, the term refers to mobile cellular systems and to mobile phones.

- MP3: MPEG-1 Audio Layer-3 (MPEG stands for Moving Pictures Experts Group). A standard technology and format for compression of a sound sequence into a very small file (about one-twelfth the size of the original file) while preserving the original level of sound quality when it is played.

- m-tailing: Mobile tailing. Expression used in the billing and charging environment for mobile retailing.

- MVNO: Mobile Virtual Network Operator. An MVNO can be defined as a mobile service provider that offers mobile services but does not own its own radio frequency. Typically, MVNOs lease capacity from operators, e.g. licensed 2G and 3G operators.

- NMT: Nordic Mobile Telephone system. An analogue mobile cellular system developed in the Nordic countries.

- Number portability: The ability of a customer to transfer an account from one service provider to another without requiring a change in number.

- OFDM: Orthogonal frequency division multiplexing. A method of digital modulation in which a signal is split into several narrowband channels at different frequencies in order to minimise interference among channels that are close in frequency. OFDM is used in European digital audio broadcast services, and also in wireless LANs.

- P2P: Peer to peer. P2P refers to networks that facilitate direct connections among individual nodes rather than through a centralized server. However, many famous P2P networks, such as “Napster”, actually relied on a central server to connect users. Other networks (such as “Gnutella”) offer true peer-to-peer, decentralized connections.

- Packet: Block or grouping of data that is treated as a single unit within a communication network.

- Packet-based: Message-delivery technique in which packets are relayed through stations in a network. See also Circuit-switched connection.

- PAN: Personal Area Network. For the purposes of this report, a PAN is referred to as the interconnection of information technology devices within the range of an individual person,
typically within a radius of 10 metres. For example, a person travelling with a laptop, a personal digital assistant (PDA), and a portable printer could interconnect these devices through a wireless connection, without the need for physical wiring. Conceptually, the difference between a PAN and a wireless LAN is that the former tends to be centered around one person while the latter has a greater range of wireless connectivity, typically serving multiple users.

- **PCS**: Personal Communication Services. In the United States, refers to digital mobile networks using the 1’900 Mhz frequency. In other countries, refers to digital mobile networks using the 1’800 Mhz frequency (See also DCS-1800). The term Personal Communications Network (PCN) is also used.

- **PDA**: Personal Digital Assistant. A generic term for handheld devices that combine computing and communication functions.

- **PDC**: Personal Digital Cellular. A Japan-developed digital mobile cellular system. PDC has been adopted exclusively in Japan.

- **Peak rate**: Term used for calls made during the busy part of the working day, at full tariff. Off-peak refers to calls made at other times, with discounted tariffs.

- **Penetration**: A measurement of access to telecommunications, normally calculated by dividing the number of subscribers to a particular service by the population and multiplying by 100. Also referred to as teledensity (for fixed-line networks) or mobile density (for cellular ones), or total teledensity (fixed and mobile combined).

- **Pervasive computing**: A concept which describes a situation in which computing capability is embedded into numerous different devices around the home or office (e.g. fridges, washing machines, cars, etc.). Also referred to as ubiquitous computing. Pervasive communications implies that the microchips in these devices are also able to communicate, for instance their location and status.

- **PKI**: Public Key Infrastructure. PKI enables users of unsecure public networks such as the Internet to securely and privately exchange data and/or funds. This is done using public key cryptography, i.e. through the use of a public and a private cryptographic key pair that is obtained and shared through a trusted authority (e.g. certification authority). PKI provides a digital certificate that can identify an individual or an
organization and directory services that can store and, when necessary, revoke the certificates.

- **PLC**: Power line communications. A communication network that uses existing power lines to send a receive data by using electrical signals as the carrier. Power flows on the line at 50-60 Hz while data is sent in the 1 MHz range.

- **PON**: Passive optical network. A type of full passive wave division multiplexing (WDM) network that allows multiple locations to connect to one optical fibre strand (or wavelength) by using optical splitters break up the wavelength of light into allocated time slots for each user. See Endrun and WDM.

- **POPs**: The population within a mobile operator’s licensed area that could theoretically be served. Confusingly, in the Internet world, the same abbreviation is used to refer to Point of Presence (PoP).

- **Portal**: Although an evolving concept, the term portal commonly refers to the starting point, or a gateway through which users navigate the World Wide Web, gaining access to a wide range of resources and services, such as e-mail, forums, search engines, and shopping malls. A mobile portal implies a starting point which is accessible from a mobile phone.

- **PPP**: Purchasing power parity. An exchange rate that reflects how many goods and services can be purchased within a country taking into account different price levels and cost of living across countries.

- **Proportionate subscribers**: The number of subscribers of a mobile cellular operator based on ownership. Calculated by multiplying the mobile cellular operator’s share of ownership (equity) in a particular subsidiary by the total number of subscribers.

- **Protocol**: A set of formal rules and specifications describing how to transmit data, especially across a network.

- **PSTN**: Public Switched Telephone Network. The public telephone network that delivers fixed telephone service.

- **PTO**: Public telecommunication operator. A provider of telecommunications infrastructure and services to the general public (“public” refers to the customer base). Also referred to as a service provider, carrier or “telco”.

- **Public payphone**: Typically supplied and operated by the incumbent carrier, public payphones have been a traditional
method of encouraging widespread access to telecommunication facilities.

- **QoS**: Quality of service. A measure of network performance that reflects the quality and reliability of a connection. QoS can indicate a data traffic policy that guarantees certain amounts of bandwidth at any given time, or can involve traffic shaping that assigns varying bandwidth to different applications.

- **Recommendation for cable modems.** It specifies modulation schemes and the protocol for exchanging bi-directional signals over cable.

- **RFID**: Radio frequency identification. A system of radio tagging that provides identification data for goods in order to make them traceable. Typically used by manufacturers to make goods such as clothing items traceable without having to read bar code data for individual items.

- **RLAN**: Radio local area network. See WLAN.

- **Roaming**: A service allowing cellular subscribers to use their handsets on networks of other operators or in other countries.

- **RPP**: Receiving party pays. Billing option whereby the person receiving a call is charged in addition to the person initiating the call (as opposed to only the caller paying, see CPP).

- **SDSL**: Symmetrical DSL. A proprietary North American DSL standard. However, the term SDSL is often also used to describe SHDSL.

- **Server**: (1) A host computer on a network that sends stored information in response to requests or queries. (2) The term server is also used to refer to the software that makes the process of serving information possible.

- **SHDSL**: Single pair high-speed DSL. The informal name for ITU-T Recommendation G.991.2 that offers high-speed, symmetrical connectivity over a twisted copper pair.

- **SIM**: Subscriber identity module (card). A small printed circuit board inserted into a GSM-based mobile phone. It includes subscriber details, security information and a memory for a personal directory of numbers. This information can be retained by subscribers when changing handsets. See also USIM.

- **SMS**: Short Message Service. A service available on digital networks, typically enabling messages with up to 160 characters to be sent or received via the message centre of a network operator to a subscriber’s mobile phone.
• SMTP: Simple Mail Transfer Protocol. A protocol designed for the seamless transmission of electronic mail across an Internet using e-mail servers and clients.

• Spectrum: The radio frequency spectrum of hertzian waves used as a transmission medium for cellular radio, radiopaging, satellite communication, over-the-air broadcasting and other services.

• SSL: Secure Sockets Layer. A programme layer created by Netscape for managing the security of message transmissions in a network. SSL uses a public-and-private key encryption system, which also includes the use of a digital certificate.

• Switch: Part of a mobile or fixed telephone system that routes telephone calls to their destination.

• TACS: Total Access Communications System. An analogue mobile cellular system.

• TCP/IP: Transmission Control Protocol/Internet Protocol. The suite of protocols that defines the Internet and enables information to be transmitted from one network to another.

• TCP: Transmission Control Protocol. A transport layer protocol that offers connection-oriented, reliable stream services between two hosts. This is the primary transport protocol used by TCP/IP applications.

• TDD: Time Division Duplex. One technique used for wireless communication where the up link and down link use the same frequencies.

• TDMA IS-136: Time Division Multiple Access IS-136. A digital cellular standard earlier referred to as D-AMPS. For more information see the Universal Wireless Communications Consortium website at: http://www.uwcc.org/. See also D-AMPS.

• TDMA: Time Division Multiple Access. A digital cellular technology that divides frequency into time slots. It is the prevalent technology of the second-generation digital cellular with three main versions: North American TDMA (IS-136); European TDMA (GSM); and Japanese TDMA (PHS/PDC).

• Teledensity: Number of main telephone lines per 100 inhabitants. See Penetration.

• Total teledensity: Sum of the number of fixed lines and mobile phone subscribers per 100 inhabitants. See Penetration.
• Ubiquitous computing: A term that reflects the view that future communication networks will allow seamless access to data, regardless of where the user is. See Pervasive computing.

• ULL: Unbundled local loop. See LLU.


• Universal access: Refers to reasonable telecommunication access for all. Includes universal service for those that can afford individual telephone service and widespread provision of public telephones within a reasonable distance of others.

• URL: Uniform Resource Locator. The standard way to give the address or domain name of any Internet site that is part of the World Wide Web (WWW). The URL indicates both the application protocol and the Internet address, e.g. http://www.itu.int/.

• USIM: Universal Subscriber Identity Module (card). A printed circuit board (similar to a SIM) that is inserted into a mobile phone. Adopted by W-CDMA operators for 3G mobile. Capable of storing much more information and has strong security functions compared with SIMs. Also referred to as User Identity Module, or UIM.

• USO: Universal service obligations. Requirements that governments place on operators to offer service in all areas, regardless of economic feasibility.

• UTP: Unshielded twisted pair. A cable with one or more twisted copper wires bound in a plastic sheath. It is used extensively for high-speed connections because it allows the release of radiation that would interfere if kept in the line with a shielded cable.

• UTRA: UMTS Terrestrial Radio Access. The European third-generation mobile standard ETSI has agreed on which draws upon both W-CDMA and TDMA-CDMA proposals.

• VDSL: Very-high-data-rate digital subscriber line. (ITU-T G.993.1). The fastest version of DSL that can handle speeds up to 52 Mbit/s over very short distances. Often used to branch out from fibre connections inside apartment buildings.

• Voice over broadband: A method of making voice calls over a broadband connection. The calls can be either made via a
computer or through traditional phones connected to voice over broadband equipment. See also IP telephony and VoIP.

- **VoIP**: Voice over IP. A generic term used to describe the techniques used to carry voice traffic over IP (see also IP telephony and Voice over broadband).

- **VPN**: Virtual private network. A method of encrypting a connection over the Internet. VPNs are used extensively in business to allow employees to access private networks at the office from remote locations. VPNs are especially useful for sending sensitive data.

- **VXML**: Voice eXtensible Markup Language. A new standard under development that uses voice to browse the Web.

- **WAN**: Wide area network. WAN refers to a network that connects computers over long distances.

- **WAP**: Wireless Application Protocol. A license-free protocol for wireless communication that enables the creation of mobile telephone services and the reading of Internet pages from a mobile phone, thus being a mobile equivalent of HTTP (Hypertext Transfer Protocol).

- **W-CDMA**: Wideband code division multiple access. A third-generation mobile standard under the IMT-2000 banner, first deployed in Japan. Known as UMTS in Europe. See also CDMA.

- **WDM**: Wave division multiplexing. Technology that allows multiple data streams to travel simultaneously over the same fibre optic cable by separating each stream into its own wavelength of light.

- **Website / Web page**: A website (also known as an Internet site) generally refers to the entire collection of HTML files that are accessible through a domain name. Within a website, a webpage refers to a single HTML file, which when viewed by a browser on the World Wide Web could be several screen dimensions long. A “home page” is the webpage located at the root of an organization’s URL.

- **Wi-Fi**: Wireless fidelity. A mark of interoperability among devices adhering to the 802.11b specification for Wireless LANs from the Institute of Electrical and Electronics Engineers (IEEE). However, the term Wi-Fi is sometimes mistakenly used as a generic term for wireless LAN.

- **Wi-Fi5**: Wireless fidelity 5. A mark of interoperability among devices adhering to the 802.11a standard at 5 MHz.
• WiMAX: Fixed wireless standard IEEE 802.16 that allows for long-range wireless communication at 70 Mbit/s over 50 kilometres. It can be used as a backbone Internet connection to rural areas.

• Wireless: Generic term for mobile communication services which do not use fixed-line networks for direct access to the subscriber.

• WLAN: Wireless local area network. Also known as Wireless LAN. A wireless network whereby a user can connect to a local area network (LAN) through a wireless (radio) connection, as an alternative to a wired local area network. The most popular standard for wireless LANs is the IEEE 802.11 series.

• WLL: Wireless local loop. Typically a phone network that relies on wireless technologies to provide the last kilometre connection between the telecommunication central office and the end-user.

• WML: Wireless Markup Language. See HTML.

• Worm: A self-contained programme (usually malicious) that can automatically propagate throughout a network. In addition to damage caused by the programme on a user’s machine, the programmes can slow down network traffic as all infected machines scan simultaneously to find new hosts.

• WSIS: The United Nations World Summit on the Information Society. The first phase of WSIS will take place in Geneva (hosted by the Government of Switzerland) from 10 to 12 December 2003. The second phase will take place in Tunis (hosted by the Government of Tunisia), from 16 to 18 November 2005. For more information see: http://www.itu.int/wsis.

• WWW: World Wide Web. (1) Technically refers to the hypertext servers (HTTP servers) which are the servers that allow text, graphics, and sound files to be mixed together. (2) Loosely refers to all types of resources that can be accessed.

• xDSL: While DSL stands for digital subscriber line, xDSL is the general representation for various types of digital subscriber line technology, such as ADSL, SHDSL, and VDSL. See ADSL, SHDSL, VDSL.

• xHTML: eXtensible Hypertext Markup Language. See HTML.

• XML: eXtensible Markup Language. An open standard for describing data from the W3C. It is used for defining data
elements on a web page and business-to-business documents. By providing a common method for identifying data, XML supports business-to-business transactions is expected to become the dominant format for electronic data interchange.