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THE DIFFUSION of MODERN TECHNOLOGIES IN NAMIBIA

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Abstract

Theorists of Information Society emphasise the idea that the production and distribution of information is central to the competitiveness of modern economies. Such societies are subsequently called Knowledge-based Societies. What is the process these countries follow before they become what they are? In this work, the researcher presents an analysis of two (2) case studies which were designed to examine the questions: 1) Which factors promote innovations and which ones impede innovations? and 2) How do such innovations develop into producing an Information Society? Information sought in this study comes in two kinds: the critical conditions under which modern technologies are adopted and the processes that eventually yield an Information Society. The analysis is based on data-sets drawn from field research (Namibia, June to September 2002) comprising of key informant interviews, limited statistical data and desk research. Research findings suggest that state-owned enterprises are leading in innovation adoption although increasingly private and civil initiatives are becoming stronger forces of innovation diffusion. Broadly said, whereas political and economic factors appear to be those which encourage this trend, historical legacies and regional policy inadequacy seem to impede innovations. Overall, the process of innovation adoption and diffusion seems sporadic. However isolated the adoption of modern technologies may be, they have a significant impact on regional development and they are signs of an Information Society (IS) in the making. Contrary to contemporary theory, this particular investigation reveals that processes under which Information Society emerges are a result of Reflective Innovation, i.e. the reproduction of an IS comes out of a complex interaction of dissimilar processes.

1 Introduction

Recent literature on regional development studies and economic geography has pointed to stressing the importance of modern technologies among other factors as playing significant roles in influencing the success of regional economies. The 2001 Human Development Report entitled *Making New Technologies Work for Human Development* emphasised this issue (UNDP 2001b). Many researchers have argued that the past few decades have shown an increasing global role of Information and Communication Technologies (ICTs) in development efforts (de Alcantara 2001; Marker, McNamara & Wallace 2002; Rodrigues 2002; van Dijk & Sandee 2002). The digital and information revolution has changed and challenged the way in which the world learns, conducts business and, governs states, and an irrefutable divide between the digital 'haves' and the 'have nots' has unfolded (UNDP 2001, 19-25). Nation states whose economic base and services are information technology-driven have been subsequently dignified with a label as IS. These are societies where the production and distribution of information (in a broad sense) is central in their modern economic

activities (Johnston et al 2000, 394). Other researchers have referred to such economies as 'knowledge economy', an economy in which knowledge and ideas, timely and competitively provided, lead to the innovative development of new products and hence economic growth (Castells 1996; 2000; 2001). A lot is still to be learnt about this process in Namibia.

2 Objectives and methodology of the study

The objective of the study was to analyse how the education and telecommunication sectors re-structure themselves through the adoption of modern technologies in such a way that Namibia transforms itself from a resource-based economy to Information Society. The economic system of Namibia is such that both IS and high usage of natural resources prevail. Through individual effort, regional government policies, trade and global economic trends and strategic decisions, a public institution or a private company may follow a certain path in adopting technological innovations in a way that they fundamentally changes operational and production process, producing a certain type of society. In Namibia's case it can be argued, however, from a regional development perspective that this process has been encouraged/impeded by completely different kinds of factors. Investigating and understanding processes brought about by policy, in general, and other forces of regional and local development as prompted by modern technologies are not easy tasks.

Thus, this study has three specific aims:

a) to identify factors that promote and/or impede innovation technology diffusion in Namibia,

b) to evaluate the role of ICTs in education and the importance of education

c) to illustrate how the Namibian economy is transforming from a resource-based one to a knowledge-based economy, an Information Society.

2.1 Methodology

Empirical evidence was sought through selective interviews of key informants. Key informants are people who are directly or indirectly involved in the development activity and they included government authorities and company leaders. Instead of focusing on statistical data, I focused on different types of processes (internal and external) and causal factors that led to Namibia's general development. Nevertheless, statistical figures were provided by different sources of information and are utilised to some extent in this report. According to Yin (1994), exploratory and explanatory research questions are likely to favour the case study method, particularly when asking about a contemporary set of measures. For the most part, the research questions concern processes and change, which according to Sayer (1992, 241-243) require causal analysis. For Sayer, causality concerns not relationships but causal powers and mechanisms. Causal powers are self-governing features, which entails that they may or

may not lead to the same envisaged results. This means that when the nature of the economic system changes, the causal mechanisms also change. To put Sayer's perspective into this study, the effect of causal mechanisms will depend upon the business environment where companies work.

Moreover, analytical research is not intended to "classify people [and institutions], their circumstances and their environment" (Flowerdew and Martin 1999, 77) but to explore processes and to explain causal factors of certain developments. As Lindsay (1997) puts it, data are selectively collected on the basis that they fit for their intended purposes. A simultaneous use of extensive and intensive research methods yields a successful execution of a realistic research (Yeung 1997). Whereas extensive methods are concerned with the context and empirical patterns, intensive methods reveal causal mechanisms (ibid.). Tykkyläinen (1999), emphasised this form of investigation, particularly in transitional societies.

3 Theoretical considerations – towards a new paradigm

In discussing regional development and spatiality of innovation, "a qualitative shift away from work which focuses on particular scales as the locus for understanding innovation, towards that which gives more credence to relationships operating between and across different scales" (Bunnell and Coe 2001, 570) should be employed. It is the focus on particular processes on a geographical scale rather than on distributions that has received little attention in innovation diffusion studies (Lagendijk 2002, 86). When investigating regional and local development, the chief force in innovation diffusion, however, is individual companies for it is they who ultimately decide whether to adopt a certain technology or not (Jussila 1987; Küppers 2002). The technology adoptions take place in geographical milieus. Such milieus are characterised as:

(a) a group of actors that are relatively autonomous in decision-making and strategy formulation;
(b) a specific set of material, immaterial, and institutional elements combining firms, infrastructure, knowledge, know-how, authorities, and legal frameworks;
(c) interaction between actors based on co-operation, and;
(d) a self-regulating dynamic that leads to learning

These features of local economic development foster place-based learning, continuous innovation, and the constant refreshment and reinforcement of local competitive advantage (Plummer and Taylor 2001, 226). But how exactly do these milieus evolve in developing countries? And assuming there is a difference in developing countries, what factors precisely account for a production of an Information Society? A clear picture which depicts a different

circumstance under which Namibia is needs to be developed. The effect of history, political changes, enabling policies and natural resources together with bilateral and multilateral factors among other factors has in part been unravelled. What follows is theoretical discussion that explains the evolution of an African Information Society. Namibia is a society in transition.

Understanding the concept of transitional society is fundamental if a meaningful study about Information Society is to be achieved. Namibia went through several historical eras before independence was attained. They range from the impacts of imperial trade, missionary evangelism to colonialism and independence (Siiskonen 1990; Hellberg 1997; Katjavivi 1983; Hunke 1996; Melber 2000). Nevertheless, the majority of the current political leadership were educated at Lutheran and Catholic missionary schools. To this end, the protestant Christian ethic of work as a duty to 'fellow countrymen' can be seen in Namibia. The independence of Namibia came at a critical time in international politics. It was the time when the Cold War was shelved.

There is the ideology of self-reliance and of working hard that was exhorted into the Namibian society in the early-to-mid 1990s. At independence, development aid from Western financial institutions and donor communities provided impetus for rapid development in all its various meanings. It is these phases that affected (perhaps still do) the development of Namibian society. Each of these epochs had their significant impact and provided powerful incentives for the Namibian economic system. However, a focus on processes in technology development in Namibia, i.e. critical phases and decisions in the development of an IS rather than distribution of modern technologies themselves, should be emphasised. Such a perspective may be found in grounding research on 1) social, 2) policy and 3) political contrasts. A quantitative approach is unlikely to yield evidence that most thoroughly explicates the complex circumstances under which an IS is produced. Therefore, a qualitative approach is employed.

A transitional society may be defined as "a society which is in the process of perceptible developmental or retrogressive transition, significantly affecting aspects of the ideological, material, structural and functional characteristics of the majority of its primary econosocio-political constituent elements" (van Rooyen 1996, 33). In other words, the notion describes a nation that is in the process of change within a specific historical period, which critically affects such a society's social, economic, ecological and political environment. Mainstream economic and regional development theories are "ill suited to explain transition… [because they] implicitly assume that the relevant institutions are there, exogenous to the theory, while

transition seems mainly a dynamic process of [socio-political and] institutional change" (Moers 2001, 19).

Thus, a theory that provides the link between information and knowledge – embracing all the dynamics of information and knowledge in society, as a means to the end, without possibly overlooking socio-historical, political, internal and external factors related to regional development needs to be found (see Figure 1 below). The business environment depends not only on technical infrastructure but also on social, cultural and political factors as influenced by economic strategies. The latter factors are more pronounced in Namibia than the technical features of this society. History; cultural diversity, natural resource endowments and political stability play a role in regional development. Depicted in Figure 1 below is a process-interaction of innovation diffusion that has been central to the development of what may be referred to as a Namibian IS. The arrows in the Figure shows information flows aiding decisions of development actors in an interface of divergent but complimenting processes. These processes can be internal on one level and external on the other level.

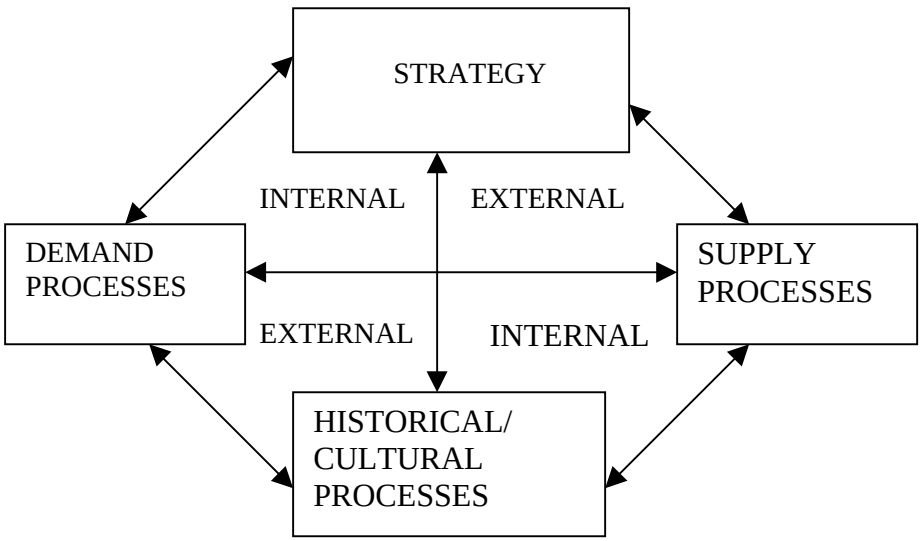

Figure 1: Processes-interaction of innovation creation and diffusion

Reflective Innovation hypothesis therefore, argues that innovation adoption and/or rejection, is a realisation of the harsh past and a projection of competence in response to complex interaction of external and internal forces of the global economy. In this sense, history is also a platform, a justification and a stimulant in the process of Information Society building. In the end, whether history, political, economic or market forces they have a causal reflectivity on one another and thus induce change, in this case producing an IS of a potentially different nature.

4 Empirical analysis

The terminology of the present study ‘innovation’ includes the positive output of new decisions – which may be managerial or product-based. In other words, a reference is not made to something necessarily ‘new in the world’ but specifically new in the particular locale. Innovations may be *Process-based*, which concerns reorganization in the amount, combinations, quality or types of inputs required to produce the same kind of product or *Product-based* that pertain to modification in the nature of the product without changes in the process of production (van Djijk and Sandee 2002, 1). Thus *Innovation Adoption* may be viewed as a result of decision(s) taken by various development actors. The following two case studies explores the process of modern technology adoptions in Namibia.

4.1 Knowledge building in education

Transformation as induced by policy action and technological innovations begins and continues with some form of education of the population. From a systems point of view, education is conceived as a group of processes or activities which are marked out from similar activities by a number of criteria and conditions (Akinpelu 1981, 183). Education refers ‘to no particular process; rather, it encapsulates criteria to which anyone of a family of processes must conform (Peters 1967, 1). Moreover, for a geographer, education as a concept matters because the process of educating and the state of being educated and its output can only be observed, demonstrated, sufficiently carried out and measured in a geographical space.

A point about indigenous knowledge should be made. van Wyk and Gericke (2000); van Wyk and van Oudtshoorn et al.(2000) found that rural villagers in Southern Africa, even though without any formal education in the sense of sitting in class, did have extensive knowledge on using indigenous plants and herbs to successfully treat their livestock without requiring the knowledge of veterinarians. In addition, they also found that the knowledge guiding the choice and use of most medicinal plants could directly be correlated to scientific/pharmaceutical rationale behind their use. Thus, tacit knowledge would prove useful if taken up by the scientific community in harnessing indigenous knowledge systems, scientific research, modern technologies and regional development (ibid.).

Learning is especially important because “...while somebody can be educated without being taught by any teacher, he cannot be educated without having learned something” (Akinpelu 1981, 199). To develop an innovative economic environment in organisations, a culture of

learning is essential. Thus “when the economy is pictured as a process of communication and cumulative causation rather than as an equilibrium system, i.e. from an institutional rather than a neo-classical point of view, learning can be conceptualised as the source of technical innovation” (Johnson 1992, 23). It comes with a great degree of applying literal thinking (Adair 1996, 158-230).

4.1.1 ICT training in educational institutions

There are about 1,500 primary and secondary schools in Namibia. Basic Information Science, Computer Literacy, Computer Practice and Computer Studies are taught from grade 4 to grade 10. Figures provided by the Ministry of Basic Education indicate that in each of these subjects, less than 4 percent of the total number of students enrol. For example, in 1998 there were about 149,115 learners between grades 4 and 7 in the country, of which only 3,623 enrolled for the subject Basic Information Science. Obviously lack of electricity and other infrastructure impedes an increase in the number of enrolments. It is very likely that these figures are strictly for urban-based schools. There is no record of the percentage of qualified ICT teachers, but it can be assumed to be generally very low.

In terms of tertiary institutions’ ICT training programmes, both the University of Namibia (www.unam.na) and the Polytechnic of Namibia (www.polytechnic.edu.na) do have ICT diploma and degree courses. A look at enrolment and graduation figures shows that there has been a lot of interest in these subjects. Recently (2003), the University of Namibia announced a Master’s Degree Programme in Information Technology, the first in Namibia. Most students, however, still hover in between a bifurcated proficiency and real strength in mathematics and science subjects needed for ICT studies. The main reason is due to the fact that before Namibia achieved her independence, the education system under apartheid was different: there was one for the dark-skinned population (Bantu Education) and another for light-skinned people, and accordingly the curriculum was designed on a racial basis (Amukugo 1993; Hellberg 1997; Hunke 1996). Because of these historical facts, the country’s training and educational facilities are still greatly constrained. To put it figuratively, there are:

- One national/public university and a private university
- One polytechnic
- Four teachers’ training colleges
- Seven vocational training centres
- Two agricultural colleges

The Government of the Republic of Namibia funds all these institutions to a great degree. However, in all these institutions, there is no empirical evidence available to me about government funding for R&D activity. Nonetheless, it should be stated that education is not always about achieving qualification. Rather it does always involve two aspects: 1) knowing '*that*', which usually refers to mental awareness of facts; 2) knowing '*to do*', which is about the application of skills or know-how earned from an activity (Akinpelu 1981, 163-203). Together, these two aspects continuously reinforce themselves to produce a knowledge-based society (Grulke 2001). ICT training focuses on the 'knowing to do' part of education. In this regard, the Namibian Government intends to "promote the work of national science and technology institutions and facilitate their advancement to Centres of Excellence in respective areas of service, production, teaching, testing or research" (MHEVTST 1999a, 33).

Table 1: Schooling paradigm in the Information Society

From Old	**To New**
A School as a building	As a knowledge infrastructure (schools, laboratories, radios, television, Internet)
Classrooms	Focusing on individual learners
A teacher as provider of knowledge	A teacher as educator and facilitator of skills, talents, etc
A set of textbooks	Multimedia materials (print, textbooks, audio, audio-visual, digital, CD-ROMs, etc)

Source: Modified from Haddad and Draxler (2002, 8)

Why is it important that ICT usage should be promoted? ICTs offer the possibility of enhancing and providing education expediently to as many people as possible. In order to do this, however, there is change required in education (in broad terms). As Table 3 above indicates, educational needs in the global environment have changed. There are specific benefits that come with that change and some of them are:

- General Awareness: through the use of ICTs, learners may earn a great awareness about important facts such as those relating to governance, developments in modern technologies, HIV/AIDS, and global environmental challenges.
- Educational Resource Delivery: ICTs can be used to provide prompt up-to-date resources to large numbers of educational institutions easily and relatively cheaply.

- Communication: ICTs can be used to support strategic communication systems. By utilising videoconferencing facilities, for example, learners can be taught in real time without the teacher necessarily being there.
- Electronic Databases: there many databases available on the Internet which learners may use. On the other hand, increasingly, it has become important for schools to be able to essentially develop their own electronic databases through effective data capture, storage and processing mechanisms.
- Development Interaction: a combination of resources, educators and other players in education can assemble interesting information set(s) which may provide attractive possibilities for stimulating innovation.

Most high educational institutions in Namibia are drifting toward the above, but the preparation for an ICT knowledge-pool should begin already in primary schools. The intensity and quality of interactions among R&D bodies, policy-making departments and economic enterprises will ultimately determine whether Namibia and its particular regions can generate and/or harness science and technology for development. In fact, "change on a global scale is now so fast that it is widely recognised that school is only the beginning of a lifelong educational journey. A country which is unable to become a nation committed to a lifelong learning will fall behind and be dominated by others" (Presidential Commission on Education, Culture and Training 1999, 11). With this background information, I now take an example of a project which may be interpreted as part of a process of life-long learning assisted by modern technologies.

4.2 Schoolnet Namibia (www.schoolnet.na)

Schoolnet Namibia is an association which flows out of two different processes. First, the groundwork activities of the Namibia Internet Development Foundation (NIDF)[1] were essential in the projects' vision. NIDF wanted to promote Internet usage and accessibility because "*it is a cost-effective tool…*" (Fuller, pers.comm). Second, Schoolnet itself is rooted in the successful National insect@thon competition, which was organised by the National Museum of Namibia in the mid-to-late 1990s to sensitise the youth on biodiversity issues and to train them to catalogue different insects by drawing information electronically i.e. through the Internet. Members of Schoolnet come from all parts of Namibia's private and public lives.

[1] NIDF was a loose organisation for Internet pioneers in Namibia in 1993-1994. The members had different background ranging from social scientists, government senior technocrats to medical doctors. They donated their investments to the Schoolnet project.

However, by August 2002 the association had a total number of 101 company partners and for this reason it embraces many aspects of ICT-users.

By November 1999, the project was formally launched and registered as a non-profit-making association in February 2000. The general objective of Schoolnet Namibia is to connect formerly disadvantaged schools to the Internet. According to its constitution, the vision is "to establish a network among schools and allied educational institutions in Namibia with the strategic and operational partnerships of Internet Service Providers, Telecom Namibia, Nampower, other parastatals, key ministries of the public service, certain research and higher education institutions, the business community, donor agencies, other stakeholders nationally and internationally, and on-the-ground educators and learners" (Schoolnet Internet page).

Behind these developments is the idea that schools and teachers are well situated to become hubs for hosting modern information communication centres for rural development. In other words, teachers together with their students assume the role of facilitating the supplying of information in their communities. The Ministry of Basic Education through its National Institute for Educational Development (NIED), US Peace Corps and the United States Aid for International Development (USAID) has a support group to the project. The support group plays a role of supplying substantial resources for expansion of the project to more rural schools, as well as supplying ICT skills to a large number of Namibian teachers. The Swedish International Development Aid (SIDA) has been providing most of the financial needs since 2001.

4.2.1 Changing the old system

Namibian schools are different: while the better equipped schools are in urban areas, those located in rural areas are less equipped and in most instances are without electricity. Most rural schools are without fixed telephone lines. Thus, with a growing number of schools, Schoolnet faces an increasing demand for supporting and maintenance of the infrastructure they put up in rural schools. More resources will be needed in the future. Nonetheless, despite the legacies of the past and the challenging tasks the association faces, Schoolnet had to confront its own objective of providing Internet to the formerly disadvantaged.

Human Resources

Schoolnet Namibia provides peer-to-peer training through young volunteers who offer training to primary schools. Most ISPs in the country together with other industry players are assisting the association in installing Internet services. At the end of 2002, about 250 rural

schools out of approximately 1,500 schools in the country had been connected to the Internet. A total number of about 2,000 computers have been installed by Schoolnet. The computers have been donated by Namibian companies, organisations and international agencies. Internet connection to members of the public is available.

Technical Capabilities

To meet the challenge of lack of basic infrastructure, the association has designed an innovative way of providing the Internet to rural schools. With financial assistance from the Swedish government and the United States of America, Schoolnet has introduced a 'solar-powered-container model' mounted on a reception antenna and equipped with solar panels and radio wave or satellite reception. The container enables schools without electricity or telephone lines to be connected to the World Wide Web. Mounting the system on aerial antennas permits the system to have a coverage of about 60 km radius. These are wireless systems, and as a result they can be installed more rapidly.

Innovation in management

Although the project is headquartered in Katutura, the technical operations are at the Polytechnic of Namibia. This reduces the workload of Schoolnet technical management providing a mechanism of managerial and institutional networking. In this way, Schoolnet is able to draw from new innovations from R&D at the Polytechnic. Mindful of the fact that there is need for appropriate material to be put to the young learners and that the Internet is user-dependent, the Schoolnet management has successfully installed immoral-material blocking software on its servers. The software firewalls were donated by the Germany security firm Astaro, and were configured on Schoolnet's servers at the Polytechnic of Namibia's data centre.

4.2.2 Conclusion

What were the crucial decisions that led to this rapid progress? And who were/are the real actors in this project? The answer lies in the diversity of Schoolnet's partners, which total 55. The partners are from all sectors of the Namibian society including civil, government, political parties, economic actors, extending to foreign embassies and international NGOs. We have to remember that the original idea was the insect@thon project supported by USAID. The public interest and the interaction between various institutions gave birth Schoolnet. There were prior assessments before the project was registered as an association. At each stage there was multiple external and internal processes, with financial assistance coming from the local companies but the major portion from the Government of Sweden.

Why is the Swedish Government enthusiastic about investing in this project? It does not have the same historical ties with Namibia as Finland, for instance. As you will see in section 5.3, Sweden's Swedefund International AB and Telia International AB have 50 percent share in Namibia's Mobile Telecommunication Limited (MTC). So, while investing in business, Sweden shows that it is not only engaged in the process of extracting finances from Namibia but it is in partnership with Namibia, and it is proved through supporting the Schoolnet project and other IS-related projects. On the whole, why not support the project, after all, the endeavour is driven purely by civilian rather than state-sponsored initiative. Moreover, the decision to institute the mobile container model does show how the less-developed countries can divert from the normal path of development that Western countries have followed. When companies and civil innovative activities are put together, the process of leapfrogging and catching-up would seem to be hastened.

There are indications that while the project is laying a strong foundation for an Information Society on the one hand, on the other hand, a future customer-base for many industries who use modern communications is in the making. Thus, the real (positive) impact will come with time. Even if the rate of growth becomes gradual, the project is still a significant achievement as evidenced by the recent (2002) award of the APC's Nancy Hafkin prize for effective ICT applications in Africa and the Global Youth Incubator award at the Global Junior Challenge exhibition in Rome (2002).

In accordance to its plans, Schoolnet's radio data network will increasingly grow, covering most of the schools in densely populated northern Namibia. The association's network has already a capacity for voice communication using Voice Over the Internet (VOI) technology. Although this is a good development, current legislation and business policies of Telecom Namibia prohibit VOI. Nonetheless, the new legislation governing telecommunications, which may enable VOI, is under scrutiny in the Namibian Parliament. The Schoolnet project is unique in the sense that its target is Namibia's precious resource, today's youth – the future generation.

The 'strategicness' of the project is such that it prepares the next generation for what it would do with regard to technology innovations and the idea of learning. The inception of this project was marked by not the government but mainly civil initiative and to some extent ICT market drives. In this sense, the causal forces behind the endeavour are unusual for Namibia. It seems that the undertaking has two sides. On the one hand, it is preparing a customer base for new technology service providers such as ISPs. On the other hand, it is a reflective

responsive role to global forces, structural changes and development needs. Nonetheless, the University of Namibia and the Polytechnic of Namibia are both consolidating their computer science and engineering related courses and in some cases upgrading them to Master's level.

5 Information communications technology

The ICT sector of Namibia is still small but rapidly growing. It is estimated that around 200 ICT companies exist in Namibia, about 170 of them in Windhoek alone. Key companies in the software, hardware and services sectors include: AST Namibia, ORBIT Data Systems, Schoemans Office Systems, UNISYS Namibia, Comparex Namibia, and Namibia Business Solutions. In terms of telecommunications, Namibia is connected to four other satellite earth stations (Intelsat), through Africa One and South African Far East (SAFE) submarine cables' network. At the beginning of 1990s, a series of legislative processes that aimed at establishing an ICT policy for Namibia were put in place.

One result was the Regulatory Telecommunications Framework (1999) and this is being boosted by an actual ICT policy which was proposed in 2001 (draft) and included the following key recommendations:

- Establishment of a Communications Authority of Namibia as a multiple stakeholder platform to set priorities, strategies and plans for national implementation.
- Prioritisation of rural residents' access to information: calls for the establishment of a universal fund and creation of multi-purpose telecentres and other state-subsidised ICT services.
- Liberalise the telecom business environment: considers opening the market to competition in mobile and fixed telephones and recommends that ongoing plans be expeditiously implemented. This includes prohibition of anti-competition practices.

Generally, the policy seems to have been drafted in conformity to the Southern African Development Community (SADC) recommended policy model. However, the Namibia version appears broad as it encompasses aspects such as postal services and broadcasting. On the whole, an examination of the Central Bureau of Statistic's national accounts is rather surprising. It portrays a picture that Telecom Namibia Ltd and MTC Ltd are the only technology and communications company in the country. However, the Namibian telecommunications market is by no means only Telecom Namibia Ltd and MTC Ltd. Although it would be correct to say that Telecom Namibia Ltd is the principal player of the technological change in the country, there are many other players in the telecommunication

industry of Namibia. These players include Siemens, Ericsson, Telkom SA, Business Solutions, ISPs, and so on.

5.1 Telecom Namibia Ltd (www.telecom.na)

Upon independence, the Namibian Government commercialised the Department of Posts and Telecommunications in accordance with the Companies Act of 1992. The Act recommended the establishment of: Namibia Post and Telecom Holding Ltd., Namibia Post Ltd., and Telecom Namibia Ltd. From inception Telecom Namibia was led by a highly skilled Swedish, as the managing director. In the mid 1990s, a Namibian took over the reigns of the company.

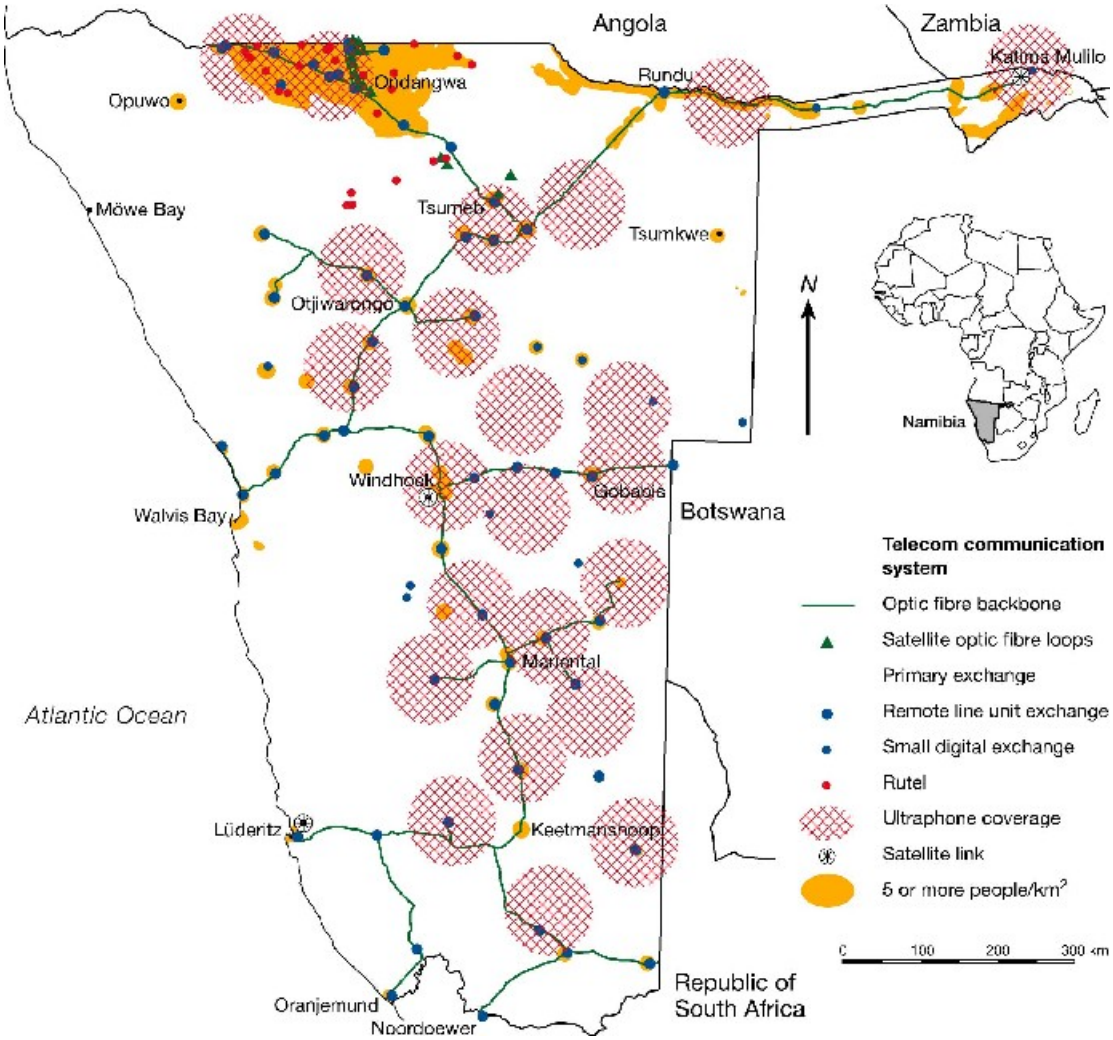

Figure 2 Telecommunication Systems in Namibia. Source: modified from Telecom Namibia (2002)

The company maintains one of the most advanced telecommunication infrastructures in Africa (Jensen 2002a; 2002b). Approximately six out of every 100 people have a fixed

telephone connection, which is four times higher than the average in Africa. From 47 automatic telephone exchange stations, subscribers are directly connected to 201 countries world wide (Ministry of Information and Broadcasting 1999, 115). Telecom Namibia Ltd has its own satellite-earth station (Intelsat) based on the outskirts of Windhoek. As Figure 6 above indicates, the fibre-optic cable network covers most of the country's urban centres and they connect to South Africa and Botswana through microwave relay link and directly to other countries (van Niekerk, pers. comm*)*. The network was laid by Telecom Namibia but in some cases sub-contractors were used. According to Telecom senior managers, annual investments of about N$200 million were made to lay the fibre-optic network. Recently (2003), Telecom Namibia Ltd, announced the installation of wireless broadband solution in Windhoek. Alcatel will deploy the technology at a cost of N$26 million.

As a result of these fixed investments, the total number of fixed-line users rose from 70,000 in 1994 to more than 150,000 in late 2002 and are currently managed on an IBM programme called Integrated Customer Management System (ITU 2000; van Niekerk, pers. comm). According to figures provided by the Central Bureau of Statistics, when profits are considered, the company increased profits from N$205 million in 1993 to N$529 million in 2001 and its turnover (ratio of profit to expenses) has never been below 14 percent. The increase in profits is not only a result of new management strategies and adoption of new technologies but also primarily a result of an increase in the number of subscribers. On the whole, currently about N$1.9 billion worth of investment has been made. Clearly, we see the impact of early financial investment-decisions in the company's transformation strategy. The rapid deployment of fibre-optic network and satellite links, however, cannot be solely credited to Telecom. When the company was established, there was already good basic infrastructure to build on. It did not have to start from the 'surface'. Thus, historical forces (South African colonial occupation) in this sense did lay the foundation. Telecom is not alone in this market and therefore besides the initial supply factors, there is the demand side of it (as shown in the following two sections). On the whole, Telecom Namibia is an example of how large companies rapidly adopt modern technologies in a relatively short period of time.

5.2 Internet services and connectivity

Commercial Internet services were constituted in Namibia at the beginning of 1996. Since then, the number of Internet Service Providers (ISPs) has risen to four with each having Points Of Presence (POPs) in most major towns of the country. These ISPs include UUNET

Namibia (www.uunet.com.na), IWAY Namibia (www.iway.com.na), M-web Namibia (www.mweb.com.na) and Africa On-line Namibia (www.africaonline.com.na). Among these, UUNET has the biggest coverage (mostly because it focuses on institutional subscribers) and IWAY – the youngest and a subsidiary of Telecom Namibia, which comes out of a United Nations Project (UNOPS) to speed the spread of ICT facilities in the country. Telecom Namibia has established a wholly-owned subsidiary (Infinitum) as a wholesaler of bandwidth and all ISPs operate on the fibre-optic backbone of Telecom Namibia.

The corporate market (all companies operating in Namibia), the government and other organisations in the country are estimated to total between 15,000 to 20,000 active workstations (Hesselmark and Miller 2002, 27). The government's intention to spread ICTs via Multi-Purpose Community Centers (MPCC) in all 13 regions of the country by 2004 is still to be realised. So far none of these has surfaced. Generally, it seems the Internet remains largely an urban-based activity. However, if the installation of Schoolnet's wireless Internet and the crucial function of ISPs works as planned, they will dramatically reduce connectivity costs for a large number of rural schools and therefore hasten the bridging of the digital-divide of rural communities in Namibia.

5.3 Mobile Telecommunications (www.mtc.com.na)

Mobile phones were first introduced in April 1995. This introduction was a result of a business partnership between Namibia and Sweden. Mobile Telecommunications Ltd (MTC) is a joint venture between Swedfund International AB, Telia International AB and Namibia Post and the Namibian Government. In July 2001, MTC reached a customer milestone of about 100,000 customers. At the end of 2002, MTC was estimated to have over 155,000 customers, with MTC Tango (prepaid cellular package) and MTC contract as the main products. Hesselmark and Miller (2002, 19) estimated that 85 percent of the total subscriptions were prepaid. MTC insiders suggested that the number of active prepaid accounts is much lower, as people are unable to afford the charges (MTC official, pers. comm). MTC's tariffs are viewable at its Internet page above. These tariffs are slightly lower than in South Africa.

According to the Telecommunications Policy and Regulatory Framework (Ministry of Information and Broadcasting 1999, 29), "MTC has been given a fifteen year licence with a licence fee for the first five years under the provision of being the sole licensee". The framework notes that since the mobile phone market is rapidly growing, the potential of liberalising the Namibian market is foreseeable. At the moment, there is no competition in the

Namibian mobile telephone market. Like Telecom Namibia, MTC also enjoys a monopoly. Nevertheless, a tender for a second operator will be issued this year. The geographical network coverage of MTC service is shown in Figure 3 below. The company estimated a coverage of about 65 percent of the total Namibian population – in other words, a percentage of those living within a reach of a mobile signal. Although on average the coverage is about 30km², in most parts of the country, the network coverage is about 15km². The estimation of coverage is based on the 2001 population and housing census data.

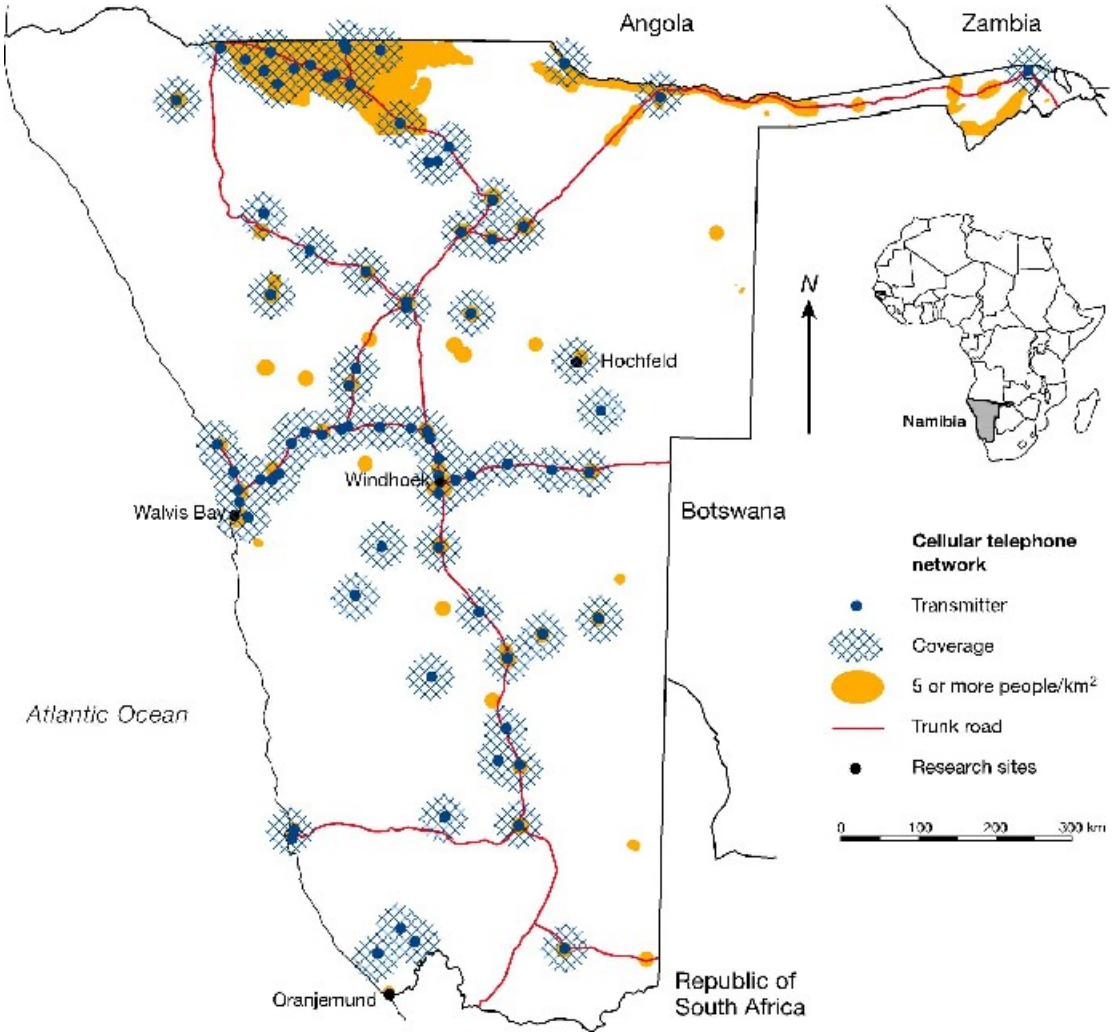

Figure 3 Cellular Telephone Network Coverage. Source: Modified from Mendelsohn et al. (2002); MTC (2001)

5.4 Conclusion

Available evidence indicates that the current telecommunication industrial set-up is driven by deliberate government policy to maintain a monopoly. In other words, the supply pressure on the economy rather than demand conditions seems to shape the innovation process in this industry. Nonetheless, most of the telecommunication (company) developments in Namibia

have been sanctioned by relatively autonomous government companies and individual entrepreneurs' bid to manage their business efficiently and strategically. As outlined earlier in Figure 1, a variety of forces seem to be playing a role in the process of technology adoption. A clearly liberalised, market-led institutional framework established by government directive to ensure a competition-free e-business environment will encourage the sustainability of the drive towards an IS. Although a tender for a bid will be announced soon, the telecommunications sector is not scheduled for competition until late 2003. It remains to be seen, once the ICT policy is adopted and gazetted, how modern technologies will generate a shift in rural households' occupations and economic activities.

6 Discussion

The nature of the case studies, and their complexities, would lead one to expect significant conclusions. Factors that promote and factors that impede innovation are, as I have tried to show, extremely complex and operate at different levels. Broad promotional factors may conceal specific processes, while apparent impeding factors may obscure what is in fact an innovative process. The way these processes are emerging suggests a Reflective Innovation system of Information Society production, where infrastructure is increasingly and rapidly deployed at a rate faster than (demand in broad sense) what the society can actually afford. The major weakness in the diffusion process is the inability of the government to fund science and technology R&D activities – to fund them so that R&D would be closely fixed to private sector needs and policy implementations. Thus, the adoptions of modern technologies, although with high financial investments in some sectors, they are unable to engender real growth which trickles down to the poor regions. The government's Science and Technology Policy takes up this matter by developing specific sector-integrating strategies: mining, trade and industry, fisheries and forestry, agriculture, training and human resources, energy and water, and information and communication technology strategies (MHEVTST 1999a, 31-40; 1999b), but they fall short of outlining specific ways in which each regions' endowment may successfully be developed within such a region's economic ability.

In consideration of the external and internal factors and the levels of interaction between economic players, it should be possible to set goals on national innovations and not just on technology transfers from one region to another. Telecommunication infrastructure has speedily been deployed in the country without any substantial demand triggering it. This is not to argue that technologies seem to be adopted without any market demand, but rather it is to argue that initial ideas and their assessment, deployment and eventual adoptions are caused by reasons other than demand and supply factors alone.

It is recognisable that local development in general is a dynamic process which must be nurtured comprehensively by policy. In its dynamics, development requires a concerted effort: networking economic players and ensuring that the weak regions are strengthened and made more attractive. If there is no policy action underpinning technology and economic development, innovation diffusions can be very selective processes. Similarly, in seeking implementation of modern technologies and economic policy for regional development, these 'things-first' must be settled with particular involvement of all regional and local development actors. Research findings suggest that state-owned enterprises are leading in innovation adoption although increasingly private and civil initiatives are becoming stronger forces of innovation diffusion. Broadly said; whereas political and economic factors appears to be those which encourage this trend, historical legacies and regional policy inadequacy seem to impede innovations. Overall, the process of innovation adoption and diffusion seems sporadic. However isolated the adoption of modern technologies may be, they have a significant impact on regional development and they are signs of an Information Society in the making.

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