

6. ANALYSIS

The telecommunication industry (both fixed-line and mobile) has been analysed according to the Telecommunication Technology Transfer Model of Chapter 4. Through such an evaluation one can identify problems in the industry and determine whether the technology transfer model is attempting to solve them. The industry will now be described on the hand of blocks/ combinations of blocks within the model below.

6.1. Identification of Stakeholders or Interest Groups (1)

The survey done in Sekhukhuneland showed that the rural citizen was never included in the group of stakeholders. It is a very dangerous mistake to make when one wants to be certain that new technologies will be accepted when implemented and installed.

In this regard, Telkom is making use of stakeholders meeting (technical, Commercial, and Marketing) and a Technology Application Review Committee. The company is however not involving the traditional (rural community) in new designs, technology choices, and implementation. Telkom does allow inputs from the rural community through demand forecasting, marketing, sales, and international trends. Vodacom, on the other hand, doesn't involve the traditional (rural) community in new designs, technology, choices, and implementation at all.

The survey done in Sekhukhuneland provided a profile on the rural citizen. Such information can be very useful in determining the need for modifications of transferred technologies to interface with the local conditions. The profile is given below:

6.1.1. Advantages of Telecommunication to Rural Citizens

In the survey conducted in Sekhukhuneland the rural residents were asked to identify advantages telecommunication technology might have to offer them from their point of view. It is extremely important to know and understand the view of the rural community when technology is transferred. The following aspects were identified as advantages according to the rural community of Sekhukhuneland:

- A telephone is mostly used to socialize and keep in touch with friends/relatives living at hard-to-reach places saving travelling expenses.
- Telephones can, together with newspapers, be used as a job-seeking medium. The limiting factor accompanying this advantage is the illiteracy of many unemployed residents (only 22.48% of unemployed citizens can read and write). Telephones can however still provide up-to-date information on vacancies from relatives living in the cities without the former delay when waiting for a visit.
- In emergencies and illness, telephones can be used to summon police, ambulance or other needed services. Unfortunately two factors hinder people to benefit from this advantage. Firstly, the police are sometimes very slow to respond to the needs of the community and they are currently making use of a private "crime fighting body" called Mapogo. In the case of illness, a taxi is more often used to deliver the ill and injured to a hospital. Explaining to an ambulance your exact position in a township with limited records on street-names makes this request puzzling and

time-consuming. Telkom is also making use of aerial-photos and GPS systems (Global Positioning Systems) to locate houses for system maintenance. Secondly, the biggest problem limiting this advantage is the fact that many (12%) has been in an emergency situation before but couldn't use a telephone due to the fact that they were unaware of the contact telephone numbers to dial (As shown later in this chapter).

- Cellphones are often used in the self-employed situation (painters, plumbers, truck drivers ext.) for finding supplies and tendering for new contracts.
- It is time- and cost effective to order and do inquiries on availability of stock by telephone rather than travelling. It is especially helpful for "tuckshop" (Rural Café) owners.
- At nighttimes the safety in the rural community is unsure and residents can use a telephone instead of travelling, usually on foot, to contact relatives or friends.
- People can use a telephone to find items, which aren't randomly available (e.g. motorcar spares, electrical appliances, medicine, ext.). These items can be ordered through relatives working in big cities and be delivered with a visit.
- Through telephones, scholars can obtain information on tertiary study bursaries not always available in rural secondary schools. This advantage opens up a whole new world of opportunities to the rural community's youth. The fact that very little information is available at secondary schools makes this use almost a necessity.
- With a telephone at home, parents can be called from school when problems arise and can also be better informed on the progress of the child.
- Cellphones can be used in the case of a car-breakdown. Leaving a motorcar unattended (while seeking for a public telephone) is not advised because the car, or parts thereof, might get stolen.

6.1.2. Employment and Income

South Africa has a high unemployment rate and Sekhukhuneland is no exception. Figure 6.1 shows that 47% of the population is unemployed (according to research results).

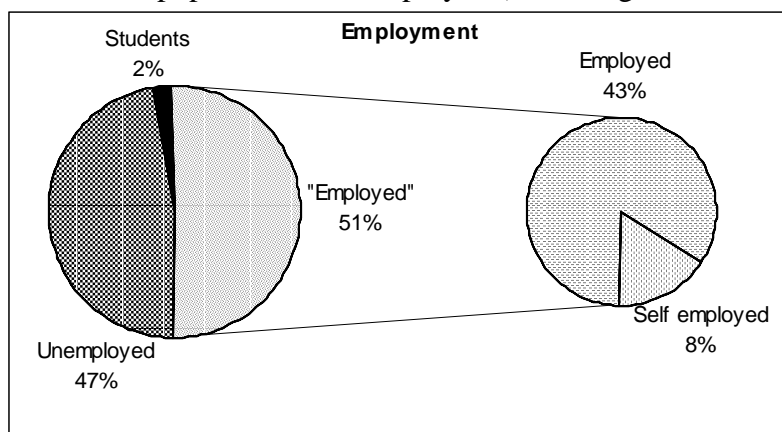


Figure 6.1. The employment status of Sekhukhuneland's population

Of the 51% employed citizens 8% had to put their entrepreneurial skills to work and create self-employment. This means that only 43% of the population were able to obtain official jobs at nearby farms, mines, or business centres. The opportunities for a career in Sekhukhuneland are limited and many move to bigger cities in search of better job opportunities. This causes a per-capita-income distribution shown in Figure 6.2.

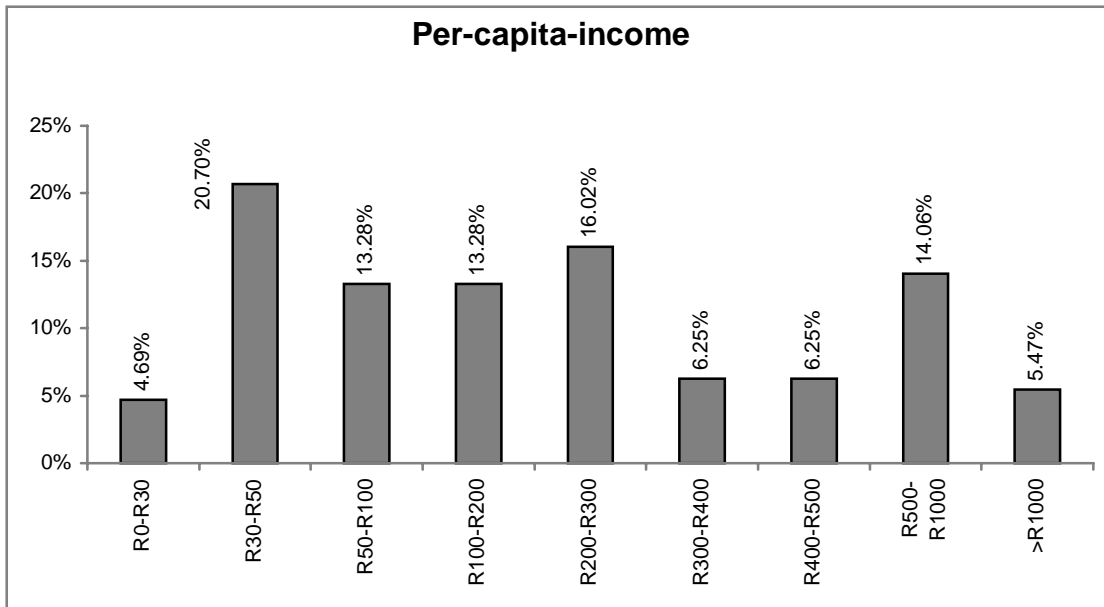


Figure 6.2. The per-capita-income distribution in Sekhukhuneland

The average household income in Sekhukhuneland is R1492.61 per month. Households have an average size of 6 people that brings the average per-capita-income to R260.55 per month per person. The size of families is predictable by the social status the community attach to having many children. The author would like to remind the reader that Sekhukhuneland were chosen as a region for research with one of its criteria being high level of household income. Many other rural areas in South Africa have much less to spend each month.

6.1.3. Housing

The type of housing that a person use can definitely play a role in the telecommunication technology used because it is also a shelter for the fixed line telephone device. Although Telkom does not put any restrictions on the type of dwelling, the citizen must have a permanent address. It does however acknowledge the fact that some dwellings impede the installation process.

It is therefore important to know what the population call home. Sekhukhuneland's rural community is still mainly living in informal/shack (40,47%) or traditional (14,97%) dwellings as indicated in Figure 6.3. Thanks to the RDP (Reconstruction and Development Program) program of the government, 33,07% of the population are already living in their own houses together with 8,65% renting a house. The remaining 1,95% is living in backyards, rooms, hostels, and flats while only 1,17% is homeless. The rural roads

infrastructure is totally unsuitable and Telkom is making use of aerial-photos and GPS systems (Global Positioning Systems) to locate houses for system maintenance.

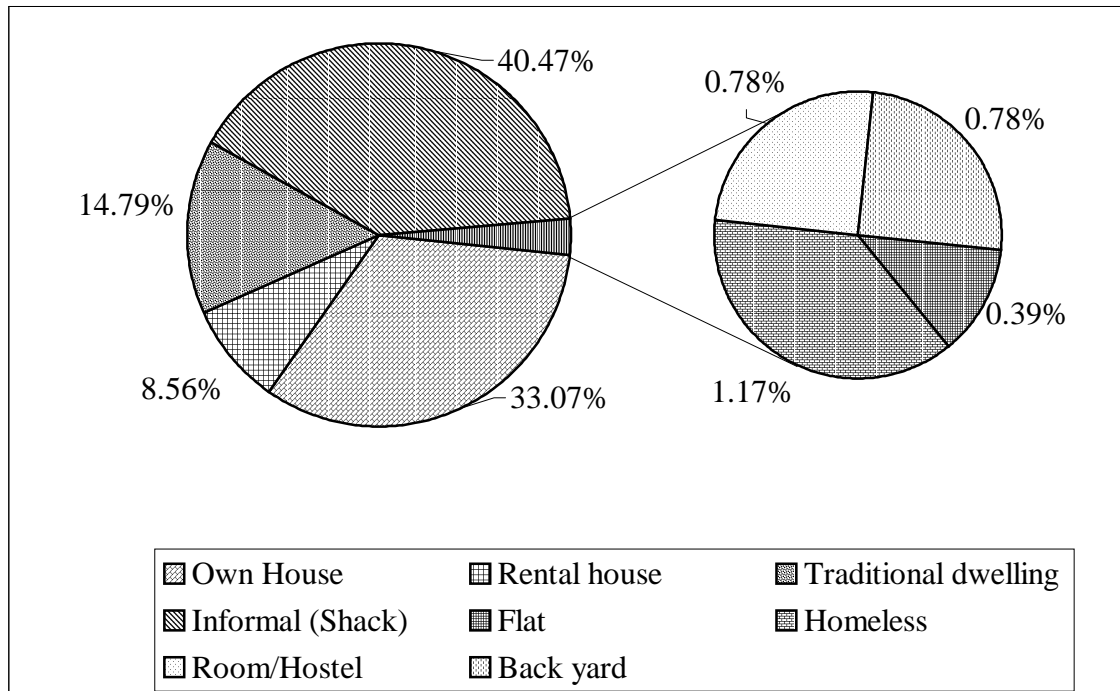


Figure 6.3. Housing in Sekhukhuneland

6.1.4. Level of Education

The level of education together with people’s awareness on technology plays the most important role in the technology utilization and it is extremely important that one knows the educational profile of the end user (rural population). The awareness of the population will be dealt with later in this chapter. In Figure 6.4, the population of Sekhukhuneland’s educational level is shown. The data collected in the survey correspond with the information collected in the national Census by Stats SA (The Statistical department of South Africa).

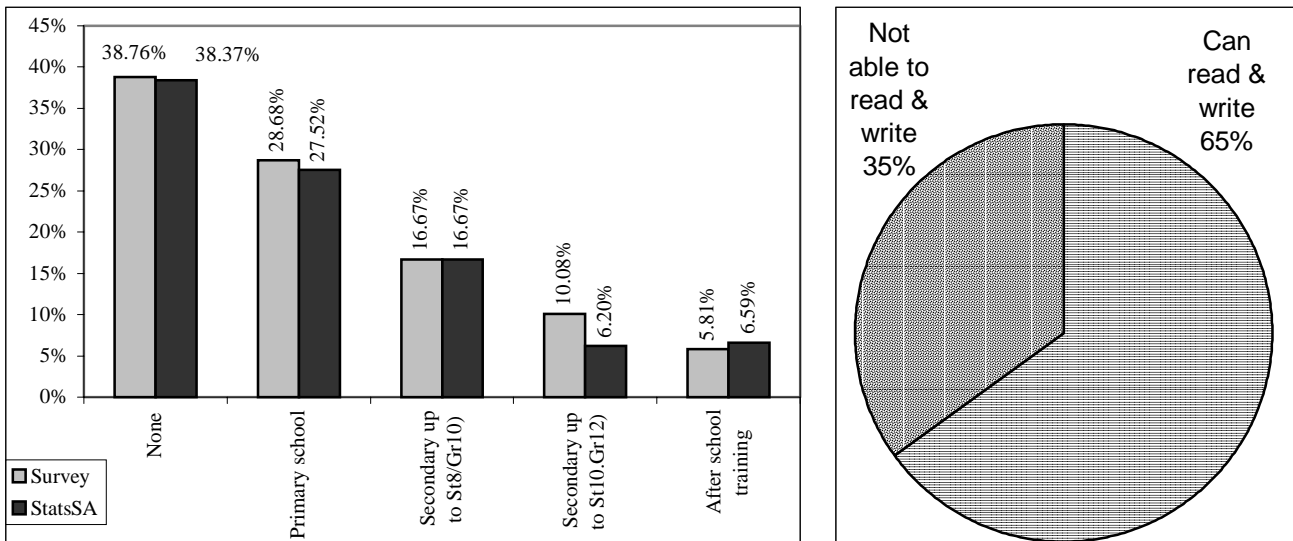


Figure 6.4. The level of education for the people of Sekhukhuneland

A significant proportion (38.76%) of the population have never had any official education. It does however seem that a bit of self education occurs when comparing the number of illiterate people to the number of people being able to read and write (see Figure 6.4). 28.86% of the population have acquired primary school education, 16.67% primary school education up till St8/Gr10, 11.63% primary school education up till St10/Gr12, while only 3.49% of the population have attended any past school studies. The impact that a citizen's level of education has on his or her ability to fully utilize the technology to their advantage will be shown later.

To know the type of person involved, one should always obtain as much information possible about him or her. A general profile of the Sekhukhuneland population is shown in Figure 6.5. Here one can see that more people, almost three times as many, have cellphones (28.29%) than fixed line telephones (10.85%). This is because of a misperception of the price difference for calls and the author will try to explain this phenomenon later during block 30 ("Install and implement technology, inform users, & implement it gradually in chosen regions") in the technology transfer model.

Only 6.59% of the population has ever used a computer. This can be attributed to the fact that many (38.76%) have never been to a school, as well as the fact that many schools have only recently obtained electricity. At home, already 66.28% of the population have electricity but only 4.65% uses a geyser for warm water, 31.01% an oven or an electric stove, 8.91% a microwave oven, and 17.05% for cellphone battery charging. This implies that the greater majority is using electricity only to light up their homes. This might be caused by the low per-capita-income (average of R260.55) of the population and that they simply cannot afford the other electrical appliances and these are still seen as luxuries.

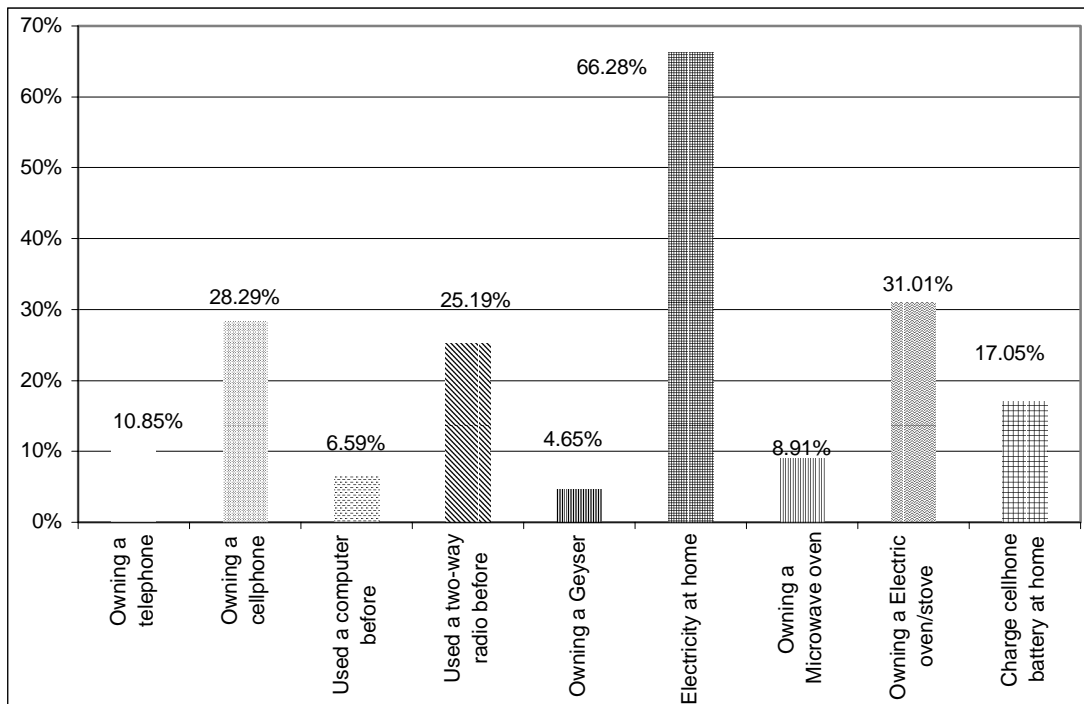


Figure 6.5. A general profile of Sekhukhuneland's population

Most citizens have electricity and because of the fact that some uninformed rural citizens still believe that electricity is needed at home before an application for a personal telephone can be placed. Telephones operate from an independent power source supplied by Telkom and the user doesn't need electricity in the dwelling for a fixed line telephone to be functional. This is but one example of poor customer awareness found in rural South Africa (Sekhukhuneland).

6.2. Identify and Define Development Problem (2)

This function in the technology transfer model is often fulfilled by the regulator, as is the case in South Africa. Actions to solve the defined development problem are then controlled through governmental regulations (discussed during block 4 of the technology transfer model "Determine all applicable governmental regulations and also conduct an impact analysis (4)" below).

The government acknowledge the critical importance of access to telecommunication to achieve certain social and economic development goals. Affordable telecommunication services for all, citizens and businesses throughout South Africa, should be the centre of the vision and the purpose of the policy.

The challenge is to get a fine balance between offering basic telecommunication services to underdeveloped areas (both urban and rural) and to furthermore offer a competitive high-level service to fulfil in South Africa's needs for economical growth. The vision should therefore incorporate these two apposing goals in an integrated network.

In 1994 the South African government realized that universal access to telecommunications services was a precondition to social and economic development. They studied the experiences of other countries and took note of the conditions and

preferences of the South African people regarding how best to embark upon a workable and supportable plan to ensure that telecommunications services would eventually become available to all South Africans [22].

A study conducted by SATRA's consultant (ITC Consortium) determined, among other findings, that the current telephony penetration level is sharply skewed towards white households [20] (i.e. only 2% of rural and 29% of urban black households have a dial-tone, while the 85% of white households have telephony). It follows that even when Telkom meets its obligation to roll out 2.6 million lines by the year 2001, 3.3 million of black households' will still remain without telephony [20]. The telecommunications companies in South Africa can make a huge difference in this area and their involvement is briefly discussed below.

Telkom: The Telkom Foundation has been proactively involved in improving the quality of life for South African communities, with a total commitment of R100 million over a five-year period [37]. The foundation focuses on education job creation and childcare.

Telecommunity is a program aimed at rural customers consisting of a mobile van-type vehicle that travels to rural communities offering customers the opportunity to order service, pay bills, and carry out most other service activities making Telkom accessible to more and more customers throughout South Africa. Telkom invested R10 million for installing first-time telephone lines free to 20 248 disadvantaged communities [37].

Telkom donated R25 million [37] to five disadvantaged universities for science and technology projects. They are: The University of the Western Cape, The University of the North, MEDUNSA, The University of Durban-Westville, and The University of Fort Hare. Over the past three years the Telkom Centre for Learning (CFL) has delivered more than 2,5 million learning days of training [58] to Telkom employees. During the periods 1997 to 2000, a total of 74,48% of these employees have been black, and have received training in the areas of management and life skills, technology, marketing and call centres.

Telkom's PrepaidFone enables customers on a tight budget to have absolute control of their expenditure on telephone charges. 471000 people [59] have signed up for PrepaidFone since 1998 when Telkom became the first communications service provider in the world to offer a prepaid phone service on a fixed network. A CallAnswer (a voicemail facility) service to PrepaidFone users is also available. PrepaidFone has got the following advantages for the rural area user [60]:

- The user makes all calls without being at risk of spending more than he/she can afford.
- No credit-check on application.
- Vouchers available at affordable prices: R35, R60, R100 and R150 [60].
- Optional PIN (Personal Identification Number) code is available for complete security.
- Service is available in Zulu, Xhosa, Sesotho, Afrikaans and English.

Vodacom: Knott-Craig had a vision for Vodacom to be dedicated on providing millions of previously disadvantaged South Africans with meaningful and affordable access to telephones for the first time. When Vodacom's license was issued, one of the conditions also was that cellular telephony would have to address the infrastructure imbalance

between the developed- and rural (traditional) sector of South Africa. Vodacom Community Services worked hard in disadvantaged communities to enable many people to make their first phone call ever. Members of the community were franchised and trained to become phone shop operators. The R100 million [22] community services project aimed to deploy 22 000 phones by mid 1999 and subsidize phone calls at half the commercial rate. Hospitals in townships became more effectively managed.

Vodacom had jointly developed a new community phone unit with Siemens and Psitek called a Sigi. These individual units pre-loaded with airtime paid for by the operator, would take Community Services another step closer to putting a phone service in place on every street corner in townships. Sterkspruit is a sprawling city with a population of 350 000, eleven schools and hundreds of businesses [22]. Until October 1996 Sterkspruit did not have one single telephone. The closest phone was 40 minutes away in the town of Zastron. In November 1996 Vodacom's phone shop operators in Sterkspruit, bought 50 Sigi's [22]. These have been deployed at taxi ranks, spaza shops and the Empinisweni hospital.

Vodacom community services put disadvantaged people in touch with their century, through its pilot telecentre project launched at a rural school in the Free State town of Senekal. Ithabiseng High School accommodates 2 073 children and 53 teachers [22]. The school has only six classrooms with electric power and operates from 07h00 to 21h00. The principal's office is the only one equipped with a phone line and a fax machine. In areas with no access to conventional telephone lines the Sigi-Pro can connect to fax machines and computers and then transmit voice and data traffic over Vodacom's cellular network. By upgrading many community phone shops into Telecentres similar to the one launched in Senekal, thousands of disadvantaged people will be able to walk into Vodacom Telecentres to surf the net and communicate via e-mail and faxes.

In August 1999, Vodacom made cellular accessible to anyone who can afford R10 per month with the launch of R120 [22] Vodago Incomer voucher, dropping the entry level to its lowest level ever and making cellular accessible to low-income users. This product provides the subscriber with a one-year airtime window for free incoming calls and free calls to voicemail and emergency services.

MTN: In rural areas, MTN installed 7 500 GSM pre-paid community payphones [23], which include our unique, world first "hands-free" feature. Through this reliable and affordable service, people in these areas are able to enjoy improved social and economic well-being, as well as enhanced safety and security. MTN is currently pioneering a more advanced community phone set to revolutionize payment methods in business.

With MTN being the first South African network to launch the prepaid option in 1996, cellular access was put within the reach of a wide sector of the population, including the disadvantaged rural communities [24].

MTN is pro-active and dynamic, channelling funds and resources into the development of previously disadvantaged areas. As a result, 300 communities [38] throughout South Africa have been connected. The heavily subsidized Community Payphones Program has also created jobs, skills training, economic empowerment and social upliftment.

Cell C: Cell C has pledged to spend at least R1 billion [33] on contracts aimed at supporting black empowerment, employment equity, and human-resources development and training commitments. The pledge forms part of the Saudi-backed operator's license on receiving its operating license on June 26 [32] from the Independent Communications Authority of South Africa (Icasa). In terms of the pledge, Cell C and Icasa are to develop a joint economic plan. Cell C is also obliged to develop a customer service code of conduct which would be approved by Icasa, and to put measures in place to ensure that it interacts with customers in their preferred official languages [33]. The new Cell C network has also promised to provide remote or under-serviced areas with home zone services at discounted tariffs.

6.3. Define Needs (Short- and Long-term), Based on Cultural Value System, Availability of Resources, Socio-Economic Factors, etc. (3)

The telecommunications industry is not making use of the Need Capability matrix to determine the needs of the rural communities. The situation can still be improved by incorporating this method and actively evaluate their customers' desires. Almost no work is being done by the telecommunications industry to determine the capability of the rural community. Knowledge on the capability might enable the industry to make use of local unemployed citizens in the installation and implementation process.

Vodacom's phone-shop operators have formed an association to represent rural citizens and Vodacom has regular contact with the rural community in order to ascertain the needs of their rural customers. Vodacom does however also rely on the fact that the equipment in Vodacom's phone-shops are manufactured by Siemens and they undertake their own research and development to develop equipment most suited to the rural user.

Telkom is trying to determine the rural citizen's needs through demand forecasting, marketing, sales, and international trends. Telkom does however also try to provide all services everywhere and rural technologies therefore follow the normal network evolution.

6.4. Determine All Applicable Governmental Regulations and Conduct Impact Analysis (4)

In this section the fixed line telecommunication situation will be briefly discussed because of adequate information being available for an example of how governmental regulations can influence and function as a control mechanism in the industry.

Telkom feels that penalties should be in line with deployment cost and that it's targets should be in line with reality. Targets are not always balanced and not realistic to deployment and demand.

Regulator Influencing the South African Fixed-line Telecommunication Industry:

Since the promulgation of the Telecommunications Act of 1996, Telkom has faced significant challenges. Through Black Economic Empowerment strategies and the outsourcing of non-telecommunications infrastructure, Telkom has contributed to the government's achievements related to job creation, debt reduction, an improved public service and reduced inequalities in the communications industry [22]. According to Victor Moche (Group Executive) many of the accomplishments would not have been achieved

without the legislative framework that has been in place to guide the telecommunications sector.

A number of targets were spelt out in the license issued to Telkom in May 1997, which gives the Company the exclusive right to provide public switched telecommunications services (PSTS) for a five-year period. Penalties become payable should Telkom fail to achieve any of the 16 license targets [61].

In its first year of the exclusivity period Telkom achieved five of its 10 demanding service targets and all six of its network rollout targets, as specified in the license. The R3, 3 million [61] paid to SATRA (South African Telecommunications Regulatory Authority) in respect of the five targets it missed was calculated according to the formulas contained in the license. A comprehensive report on their performance during this period, the 1997/98 financial-year, was submitted to SATRA on 30 June 1998. This report included the penalty calculation of R3, 3 million, which Telkom paid in its 1998/99 financial year.

A penalty of R3, 3 million sounds alarming to any business no matter the size. Telkom however is in a position where the installation of a DECT system to provide service to a rural citizen costs in the region of R4 000 to R20 000 per customer depending on the geographical profile of the area. Many rural areas have a high churn-rate where clients often only pay between R80 – R120 before churn or don't pay anything and get disconnected after 3 months. When one considers the fact that during the 1997/98 financial-year Telkom connected over 20 000 rural user using DETC technology (between R 80 million and R400 million) the penalty of R3.3 million is not one of Telkom's biggest concerns. Telkom does however actively try to fulfil governmental regulations in fear of not being granted a fixed line telecommunication license if failing to meet the target proposed.

Telkom has submitted a report on its performance during the second year of its license, the 1998/99 financial-year. This was handed over to SATRA on July 1 1999 and showed a marked improvement in respect of service quality. Eight of the 10 service-quality targets having been exceeded. The two service targets not attained were missed by a very small margin, so although penalties will be payable, the overall amount will be significantly lower than for 1997/98. In addition, Telkom again achieved all six network-targets. At the same time it added, on average, over 1 370 new customers to its network every day [61].

The two targets the Company missed in 1998/99 related to the percentage of business and residential faults cleared in less than 48 hours, where it achieved an 85 percent and 82 percent rating respectively [61]. The two major contributing factors for having missed targets over the past two years include cable theft and a historical lack of adequate network maintenance.

The government then embarked on the path referred to as Phase I [22]. A good measuring stick, to assess how far South Africa has come in reaching its Phase I objectives, is to look at accomplishments pursuant to the list of Telkom objectives put forth in section 2 of the 1996 Telecommunications Act. The act has the following purpose:

6.4.1. Promote Universal and Affordable Provision of Telecommunication Services (a)

During the past three years, the Universal Service Agency (USA) has launched 75 [22] Telecentres, one each in the following Provinces: Northern Cape, Eastern Cape, Free State, Northern Provinces, Kwa Zulu Natal and Northwest. Telecentres provide a means and location for people residing in under-serviced villages to learn about and use telecommunications products and services.

The Act established the Universal Service Fund (USF) to provide Telkom with funds to extend its public switched telecommunication services to areas and communities, not being served.

The first three years of Telkom's transformation has resulted in a net increase of 1.6 million access lines [22]. Of these, just over 1 million lines were installed in under-serviced areas. In addition, residents located in 2 091 villages and 8,911 priority customers (hospitals, schools, and libraries) were provided with service for the very first time. In order to provide access to the hundreds of thousands of South Africans on the go, Telkom provided 86 107 public pay telephones.

6.4.2. Promote Provision of a Wide Range Telecommunication Services in the Interest of Economic Growth and Development of the Republic (b)

Telkom's license required it to upgrade its network from analogue facilities to digital technology by the year 2001 and has converted more than 98.7% of its access lines to digital technology by the end of March 2000. Digital technology now enables Telkom to provide products and services to customers including: CallAnswer, ForwardCall, WaitingCall, ConferenceCall, Direct-a-Call, IdentiCall, HomeFree, SpeedCall, Direct-a-Call, Billing for Caller Pays Paging, VoiceLink, and Prepaid Phone.

6.4.3. Make Progress Towards Universal Provision of Telecommunication Services (c)

At the end of Telkom's third year of exclusivity (2000), the Company has made substantial progress towards the provision of universal telecommunication services (see Table 6.1.) [22].

End of 2000 cumulative number of lines installed and targeted			
	Cumulative number of lines	Target number	Exceeding target by
New subscriber lines	1540176	1316466	223710
Public payphones	86107	68247	17860
Underdeveloped areas lines	998612	915863	82749
Villages provided with telephones for first time	2038	1710	328
Priority customers	13748	10820	2928

Table 6.1. Cumulative number of installed Telkom lined with targets (2000)

6.4.4. Encourage Investment and Innovation in Telecommunications Industry (d)

Restructuring of South Africa's telecommunications sector in 1996 brought about the Strategic Equity Partner (SEP in May 1997), a consortium of SBC & Telekom Malaysia, for Telkom. Along with an influx of technological expertise, the SEP invested over R5,7 billion for a 30% stake in Telkom, representing the largest direct foreign investment in post-apartheid SA [22]. The SEP brought with it human investment in the form of 75 full-time experts with continuous knowledge transfer. Over the last 3 years, from April 1997 to March 2000, Telkom has invested over R25 billion in new telecommunications infrastructure and services whilst continuing to upgrade the existing infrastructure. Telkom will continue to invest in new telecommunications infrastructure and services at an annual rate of R10 billion.

Telkom's infrastructure investment, along with implementation of digital technology, is providing customers with new and innovative ways to communicate and conduct business. Some examples include: Private Networks, Internet, Valued Added Network Services, Satellite Services, Cellular, and Radio Trunking.

6.4.5. Encourage Development of a Competitive and Effective Telecommunications Manufacturing and Supply Sector (e)

The PBX and corporate networking market in South Africa is extremely competitive. Numerous manufacturers and suppliers are competing in the market, such as: Siemens, Samsung, Teleboss, TR Services, Teleplus, Phillips, Plessey, Alcatel, Nortel Meridian, OmniLink, Dimension Data, Transtel, and Blue Sky [22].

6.4.6. Promote Development of Telecommunication Services, Which are Responsive to Needs of Users and Consumers (f)

Telkom established separate sales and employee organizations to address the needs of residents, small-to-medium sized businesses, corporate and public pay telephone customers has enabled Telkom to focus on the unique needs of each segment. Since the implementation of the Act, Telkom has introduced the following new and/or enhanced services for residences: CallAnswer, Caller Pays Paging, Smart Access, Remanufactured Telephone, International FreeCall, Prepaid phone Service, Voicelink, Automated Collect Call, Symphony Cordless Phone, WorldCall, Call Catcher, Traveler Services, SmartMoves, Welcome Kit, Telkcommunity, and Dial Inn. Services for Businesses include: Large PABX, PRIMENET, Equant Services, Telkom/AT&T Frame Relay Service, QuickConnect, Analogue NTU, Channelised E1, CyberTrade, ISDN Advice of Charge, FaxAnswer, TeleVoting, and Sonnet [22].

6.4.7. Ensure That, In Relation To Provision of Telecommunication Services, The Needs of Local Communities and Areas are Duly Taken Into Account (g)

Telkom appreciates the diversity of many cultures in South Africa and has embarked on a program to consult with local leaders prior to entering an underserved area for the first time. Traditional leaders, mayors and/or local councillors are consulted, information and education forums are held for future customers, and site locations are discussed for public

pay phones and DECT mast sites [37]. In 1998 Telkom began a customer service campaign to conduct business in all eleven South African official languages.

The reader is furthermore referred to the Involvement and Assistance to Previously Under-served Rural Communities

6.4.8. Ensure that Needs of Disabled Persons Are Taken Into Account in the Provision of Telecommunication Services (h)

Telkom together with an advisory group identified categories of people for whom special provision must be made like: persons in wheelchairs, poor-sighted and blind persons, hard of hearing and deaf persons, aged and frail persons, and illiterate persons [22].

6.4.9. Ensure Compliance With Accepted Technical Standards in Provision and Development of Telecommunication Services (i)

6.4.10. Ensure Fair Competition Within Telecommunications Industry (j)

Licenses issued by the Minister and/or The South African Telecommunications Regulatory Authority (SATRA) contains fair trading practices, which should be complied with by the various operators upon issuance.

6.4.11. Promote Stability of Telecommunications Industry (k)

6.4.11.1 Rural telephone quality of service

Telkom is delivering an excellent service in the rural areas of Sekhukhuneland as indicated in Figure 6.6.

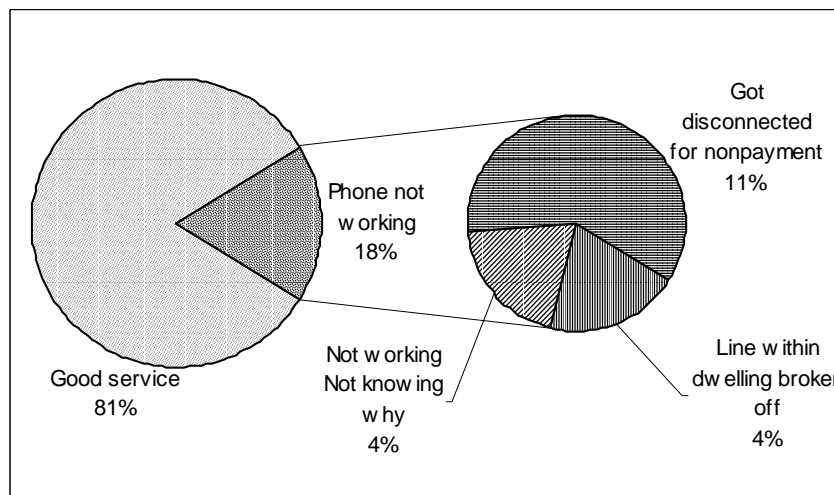


Figure 6.6. The quality of fixed-line telephone service in Sekhukhuneland

If one considers that 11% of the population owning a personal telephone got disconnected for non-payment the remaining 89% can be divided into two groups. One who never had any problems (81%) and the other 8% had problems but because of poor fault recovery awareness hadn't reported the problems yet. The licence target demands that Telkom repair

84% of all reported faults within 48 hours. Telkom is currently exceeding this licence demand. Awareness is one of the biggest problems limiting rural telecommunications as will be shown later. Telkom noted through service quality surveys that many faulty telephones in rural South Africa are cases of improper budgeting by the customer (service being temporarily ended due to overdue accounts) or vandalism on networks (cable, solar panels).

6.4.11.2. Ordering telephones

According to Telkom's statistics 92% of lines are installed within 28 days, and 99% in 120 days, after an order is accepted by Telkom (i.e. Telkom has the necessary infrastructure in place).

The survey done in Sekhukhuneland indicated that 22.87% of the population wanted a telephone but hasn't filled out an official application. They didn't understand the procedure to follow and the regulations involved when applying for a telephone line. 13.57% have filled out an official application and awaits installation with an average waiting period of 626 days (1 year, 8 months, and 22 days) already.

6.4.12. Encourage Ownership and Control of Telecommunication Services By Persons From Historically Disadvantaged Groups (I)

It is Telkom's policy to promote Black economic empowerment by enabling Black Suppliers to meaningful participation. Telkom furthermore recognizes the previously disadvantaged communities and will provide businesses from such communities' preference in the procuring of goods and services. Over a year-and-a-half, beginning in May 1997, Telkom has started doing business with over 460 black suppliers. During the first 6 months of the fiscal year ending September 1998, Telkom has spent R256 million on emerging black businesses. A further R626 million [22] has been spent on large suppliers with a significant black shareholding.

Management and staff of Telkom are being transformed to reflect the racial and gender make-up of South Africa. People from historically disadvantaged groups are now very much involved in the ownership and control of Telkom. Telkom also hired its first black CEO, Sizwe Nxasana, in March 1998. In 1993, Telkom's Board of Directors consisted of 9 White and 3 Black men [22]. At the end of 2000 the picture looked significantly different. Telkom's Board of Directors consisted of 2 white men, 4 black men, 2 black women, and 2 representatives each respectively for Telekom Malaysia, Labour, and SBC.

Affirmative Action

In November 1993 Telkom negotiated an Affirmative Action Policy and Telkom has made a difference in areas such as race ratio's and gender distribution according to occupational levels.

Employment Equity Act, 1998

The purpose of the Employment Equity Act is to achieve equity in the workplace by promoting, in the first place, equal opportunity and fair treatment in employment through the elimination of unfair discrimination. And secondly, implementing affirmative action

measures to redress the disadvantages in employment experienced by Black people, women and people with disabilities [22], in order to ensure their equitable representation in all occupational categories and levels in the workplace.

6.4.13. Promote Empowerment and Advancement of Women in Telecommunications Industry (m)

Telkom had 13% female managers at the end of December 1999 and women also represented 23% of the total workforce [22]. Women have also been recruited as student engineers and technical bursary students in order to make the technical and engineering functions more representative.

6.4.14. Promote Small, Medium and Micro-Enterprises Within Telecommunications Industry (o)

Telkom applies a strategic intervention principle in the course of conducting its business, which includes advising Black Suppliers prior to tenders being issued in their product category. Large businesses supporting Black Suppliers and implementing acceptable Black Economic Empowerment policies are also given preference [22]. Telkom further tries, where appropriate to split contracts into smaller components, for instance, per region or item to enable Black Suppliers to participate. Telkom goes even further and involves itself through relaxing payment conditions to Black Suppliers by reducing the payment cycle to 10 working days [22], thus assisting them with their cash flow. As part of Telkom's capacity building initiatives some tenders have been set aside for the exclusive participation by Black Suppliers only.

6.5. Define Capabilities That the Company/Country Has in Specific Field (5)

Telkom currently has inter-firm R&D agreements with Tellumat, Dimension data, Plessey, and Siemens to name but a few strengthening their capabilities. These agreements are mostly contractual based.

The Telkom laboratories at Derdepoort Pretoria, consists of two sections [16]. One section is concerned with system evaluation, environmental engineering, and instrument services, while the other is concerned with hardware and software development. These laboratories design and develop telecommunication systems, terminals and related equipment for use by Telkom and other clients. In its R&D, Telkom maintains close contact with universities, technikons and the local industry to ensure the best utilization of resources.

Vodacom's Joint Economic Development (JED) plan was based on the principles of boosting research and development. Achievements include R&D activities undertaken by Siemens and tertiary education investments of the SUNSAT micro-satellite research programme [63]. The research done by Siemens includes the development of Sigi's (Siemens GSM Telephone Interface), the world's first pre-paid GSM community phone, and vehicle tracking, a unit that can be installed in vehicles for multiple purposes besides tracking.

6.6. Form Mission, Goals and Objectives, Based on Needs, Capabilities, Expectations, Tradeoffs, Priorities and Aspirations (6)

A research project was conducted by MTN on telecentre needs and services in the Northern Province with the support of the International Development Research Centre (IDRC), a Canadian donor organisation. The research project attempted a community based information needs analysis at six telecentre sites in the Northern Province. The research is part of a wider process of developing the telecentre. The aims are: To determine which services are most wanted in rural areas, develop new services that are needed, build support for Telecentres and involve the community more closely in the running thereof, develop a plan that should make the telecentre successful (profitable and contributing to the community), establish a 'learning system' to measure the impact of the telecentre, and adapt it to be more successful.

Rural Citizens Spending Money

If one analyse the spending pattern of rural citizens one can grasp something of what the community needs and to what they would assign a high priority.

Telkom feels that a household with a monthly salary less than R300 cannot afford a personal fixed-line telephone. People are already spending too much as one shouldn't allocate more than 5% of one's monthly income to telecommunication. Currently the rural population of Sekhukhuneland is spending 12.06% of their monthly income on telecommunication (both fixed-line and mobile).

The mobile telecommunications industry is similar with eight in ten mobile phones sold to prepaid cards users such as township youths, market traders, taxi drivers, and street hawkers during 2000 in South Africa. While in Sekhukhuneland the rural citizens are still spending 5.1% of their monthly household income on beer, SAB (South African Breweries), the continent's largest conglomerate, believes that beer sales are falling as consumers opt to spend their limited disposable income on calls [2]. This phenomenon also occurs in a wider sense as in Africa half the population survives on less than \$2/day, while the average mobile bill is \$1.16/day [2].

Rural citizens are spending more of their limited household income on telecommunication but still spending far too much on unproductive activities such as the national lottery. 4.77% of all households' income is being spent on the Lotto in Sekhukhuneland. The DA's (Democratic Alliance) chief spokesperson on trade and industry, Nigel Bruce said "the disgraceful situation of the state lottery monopoly is effectively taxing the poor, enriching the operating company and its foreign shareholders, and failing to disburse funds in any quantity, after a year of trading, to the charities it deprived of the ability to fund themselves". The Department of Trade and Industry Minister Alec Erwin hoped however to pay out R380-million [64] during the 2001 financial year to charities and other deserving institutions from the proceeds of the national lottery.

A problem does however exist that out of about 4 500 applications for funding received, only 215 applications for funding came from charities, 3 sports and recreation, and 6 for arts, culture and national heritage [65]. The national lottery operator, Uthingo, has also expressed concern at the prospect of over R70-million [66] in unclaimed prize money going back to it because winners have so far failed to come forward.

6.7. Define Standards to Choose & Evaluate Technology (7)

Standards need to be defined to measure the impact transferred technologies have on South Africa's situation. The choice of a standard is crucial and should be considered carefully. Using quality of life as an indicator for South Africa seems to be an option but the best standard will differ for each application and a combination of several standards might be most appropriate.

In rural South Africa productivity is low and the transfer of technology may not easily improve it. Automation and high technology is not always the answer to the declining productivity in the case of LDCs. Living standard in rural areas is poor, malnutrition persists, and diseases like malaria and AIDS incapacitate the working force leading to the decline in productivity [7]. To improve productivity, the quality of life in the South African rural areas needs to be improved.

According to ASSA (the Actuarial Society of South Africa) 5,3 million people [67] were infected with HIV in South Africa during 2000, 236 000 were living with Aids, 139 000 people were estimated to have died of Aids (26 percent of all deaths in 2000), and about 64 000 babies were infected by their mothers. The ASSA's Aids and demographic models [68] called ASSA2000 projects that without change in behaviour or medical interventions, a further five million people can be expected to die of Aids over the next 10 years.

US ambassador to the United Nations (UN) Food and Agriculture Organisation (FAO), George McGovern, was furthermore concerned about the productivity of agriculture in Africa. He said that about 7 million farm-workers died in Africa of HIV/Aids since 1985 and more than two million children would be orphans at the end of the current decade [69].

6.8. Search and Generate a List of Different Potential Types of Technologies Which Will Best Satisfy LDC's Needs Given Its Capabilities, Maximizing Social Welfare, and Allocating Its Limited Resources Wisely & Conduct Technology Assessment to Determine the Future of Technology and Future Technologies (8 & 9)

Vodafone Group, the biggest wireless company in the world, is a shareholder in Vodacom. Generation of a list of alternative technologies to solve a problem will naturally start with its shareholder but Vodacom will consider any technology, even unavailable from Vodafone, as long as it is suitable to the South African situation and needs.

Methods used by MTN are unfortunately unavailable.

Telkom is making use of three different approaches to find available technologies before deciding on an alternative namely: RFI - Request For Information, RFP - Request For Proposal, and Technology Scan.

RFI - Request For Information

A RFI was sent out to technology suppliers when a certain problem arose (which must be solved internally in the company) to try and find a solution. This is not always the case that a new technology needs to be transferred to solve the problem but certain suppliers might include their new software updates or even new technologies in a possible solution.

RFP - Request For Proposal

In a RFP the suppliers are requested to put in a tender to solve the problem as an external contractor. A RFI can also be transformed into a RFP if no possible solutions to a problem can be found to be implemented by the company's own workforce.

Technology Scan

In a Technology scan, employees are actively searching for all possible technologies to solve a certain problem or fulfil a certain need. The Technology Scan is done using any medium (personal interviews, electronic mail, mail and telegrams, Internet, magazines, official documents, and other publications) possible.

Telkom do technology forecast in the form of continuous evaluation of international trends, technology lifespan trends, and cost recovery period calculations.

6.9. Identify Sources for Technology Transfer / Apply Management and/or Statistical Techniques to Narrow Down Possible Alternatives (10 & 11)

Telkom is making use of a full bidding process where no specific preference is given to any country or region.

Because of the fact that Vodacom is partly owned by Vodafone Group, this relationship naturally means that there is technology transfer between Vodacom and it's shareholder. Generally, Vodacom will use technology from any source as long as it is suitable to the South African situation and needs.

6.10. Evaluate and Develop Domestic Capabilities Needed for Technology Utilization (12-16)

Many LDCs such as South Africa is in a position where design and development occur in conceptual designs and setting compatible specifications to interface the new technology with the current infrastructure. Telkom is performing limited in-house research and development but they do have human capabilities to specify strict specifications assuring effective functioning of the technology in the bigger system. If the necessary manpower is not vested within the company partnerships can be formed with the utmost care being taken. If this coalition is not managed wisely it could worsen the dependency status of the LDC at a very high social and economical cost.

According to COSATU (Congress of South African Trade Unions) the government strategy of introducing foreign business management into state-owned enterprises as was done with Coleman Andrews at SAA (South African Airways) reflected a blind belief in the efficiency, effectiveness, and principles of private-sector management [70]. Andrews' contract led to corruption, and benefited only the rich minority, whilst doing nothing for the poor majority. This was also done at a very high economical cost. Public Enterprises Minister Jeff Radebe confirmed in the National Assembly that Coleman Andrews' salary package had been more than R200 million [70] during his two-and-a-half years as SAA chief executive. Radebe also said that nine expatriate consultants hired by Andrews earned a further R118 million [70].

This is a clear indication of what effects a coalition, when not managed wisely, can have on a LDC. The dependency status of South Africa was not improved through these examples and it was also done at a very high social and economical cost.

6.11. Select Technology and Technology Source (17 - 24)

Possible alternative technology sources were identified in block 10 and 11. Telkom Selection is based on international standards, cost, Black Economic empowerment, local content etc. In some cases (Radio technologies) the world operates in 3 regions where compatibility is the decisive parameter. In such cases only equipment compatible with Telkom's current technologies are evaluated which falls in line with Europe. If any other region makes equipment for South Africa, Telkom is willing to consider procuring from there as well.

Vodacom considers any technology, which will suit local conditions but specific preference is however given to technologies available to be supplied by their shareholder Vodafone. Vodacom is willing to use any technology from any source as long as it is suitable to the South African situation and needs. Information in this regard concerning MTN is unfortunately unavailable.

Both Telkom and Vodacom exclaim the fact that technologies should be first evaluated (both hardware and software) in terms of ease of adoption and the ability of South Africa to modify and develop its own technologies (block 17 of the technology transfer model). This also accounts for compatibility requirements that need to be fulfilled (18).

It does however sometimes happen that regulations influence the technology selection process. The DECT (Digital Enhanced Cordless Telecommunications) and TDMA (Time Division Multiple Access) systems aren't profitable to Telkom in connecting rural areas. This is because of the characteristics of rural areas such as: low population density and low-income groups normally with low profile call behaviour. The regulator does however force Telkom to conduct rural development and network extension for well-considered reasons. Unfortunately DECT and TDMA systems are the only technologies available to solve rural telecommunications infrastructural problems presently, and Telkom is currently also making use of it in Sekhukhuneland.

Telkom is evaluating transferred technologies on a quarterly or an annual basis depending on the type of technology involved (23). The guidelines and standards used have been defined previously in the transfer process.

6.12. Prioritise All Possible Regions and Choose Region(s) Which Will Benefit Most From Technology Application & Transfer Technology From Most Desirable Source (24, 25)

Service providers should aim at the right areas when doing network expansion or any technology applications in any region for the first time. This is often the case with technology application in rural areas and South Africa is no exception. Before the new and appropriate technology is actually transferred from the most desirable source (25), South Africa should determine the region where the technology will be installed and utilized. A few relationships were tested during the survey done in Sekhukhuneland for pre-installation prioritisation of regions. It was hypothesized that if differences in telephone

use could be explained on the basis of the different economic and social characteristics of the villagers, then it would be possible to predict which region, then without service, would benefit most from gaining service. Villages with a high potential to benefit should then be placed high on a priority list for new rural network investments. The results are shown below:

6.12.1. The Role of the Rural Citizen's Level of Education in Telecommunication Utilization

One of the research postulates was to examine the relationship between educational level of the end-user and personal telecommunication. The author will attempt to show that the end-user at a higher educational level will benefit more from a means to telecommunication than one at a lower level of education. It will also be shown that the need for a telephone or a cellphone increase with an increase in level of education.

When comparing level of education with a need for a means to telecommunication in Sekhukhuneland, a Chi-Square probability value of 0.0001 was found (high statistical significance). Figure 6.7 shows the distribution of the need for a means to telecommunication (defined here as a personal telephone/cellphone) for the population of Sekhukhuneland at different educational levels.

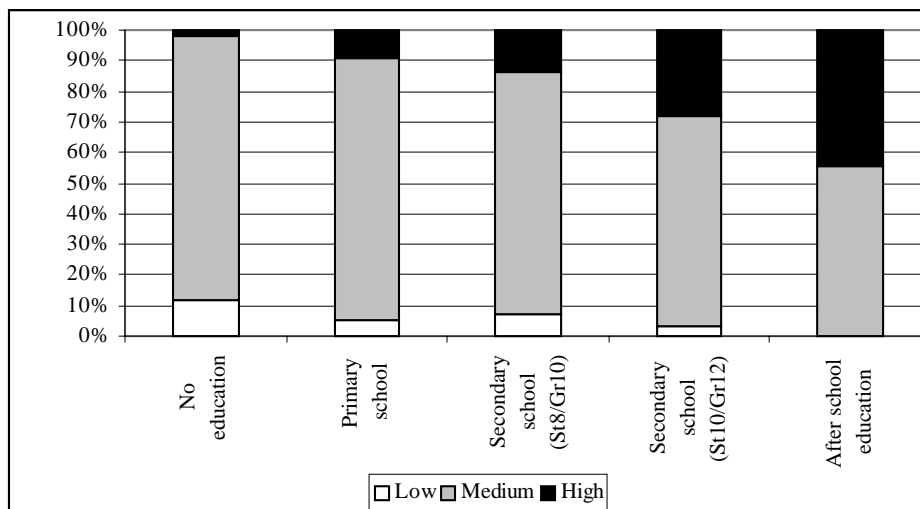


Figure 6.7. The need for telecommunication (fixed-line or mobile) for people at different levels of educational

It is clearly shown how the magnitude of the need increases with an increased level of education. The black indication-bars shows a high need for telecommunication while the grey and white bars show medium and low needs respectively. As the level of education increases so to does the proportion of people regarding telecommunication as highly needed (black indication-bars). The proportion of the population at each level, regarding the need for telecommunication as low, decreases with an increase in level of education. The people with a medium need for a means to telecommunication decrease as they get better literate to the advantage of the people with a high need for telecommunication.

This relationship can be stressed even further when looking at the percentage of people at each educational level, which prefer to have no telecommunication. Individuals wishing for no personal telephone/cellphone are shown in Figure 6.8.

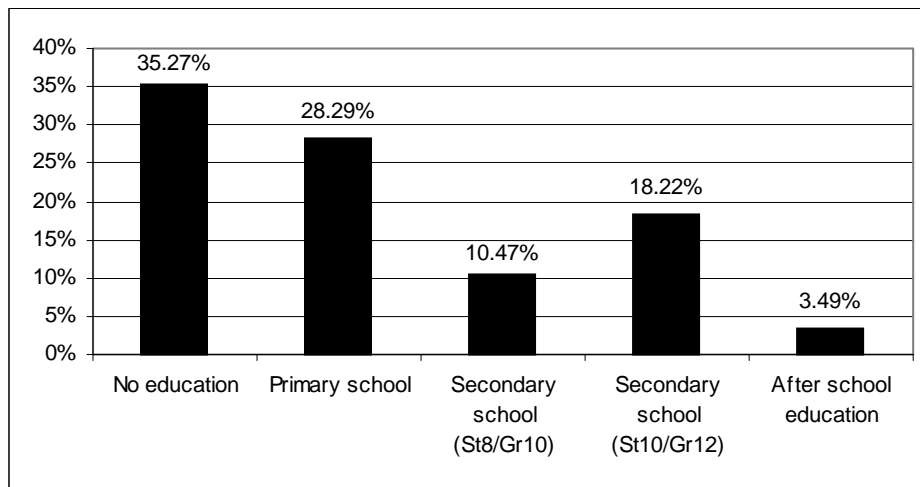


Figure 6.8. Percentage of the population wishing for no personal telecommunication at all

A Chi-Square value of 0.0485 shows statistic significance between the educational level and the characteristic of an individual disliking the idea of owning a personal telephone or cellphone. The percentage of people wanting neither a telephone nor a cellphone decreases from 35.27%, of the population who has never attended any formal education, to 3.49% of people with after school qualifications.

When one examines the educational level of people owning a telephone or a cellphone one finds the same indication. Figure 6.9 shows Sekhukhuneland's distribution of the population owning a telephone/cellphone in each of the different educational level groups.

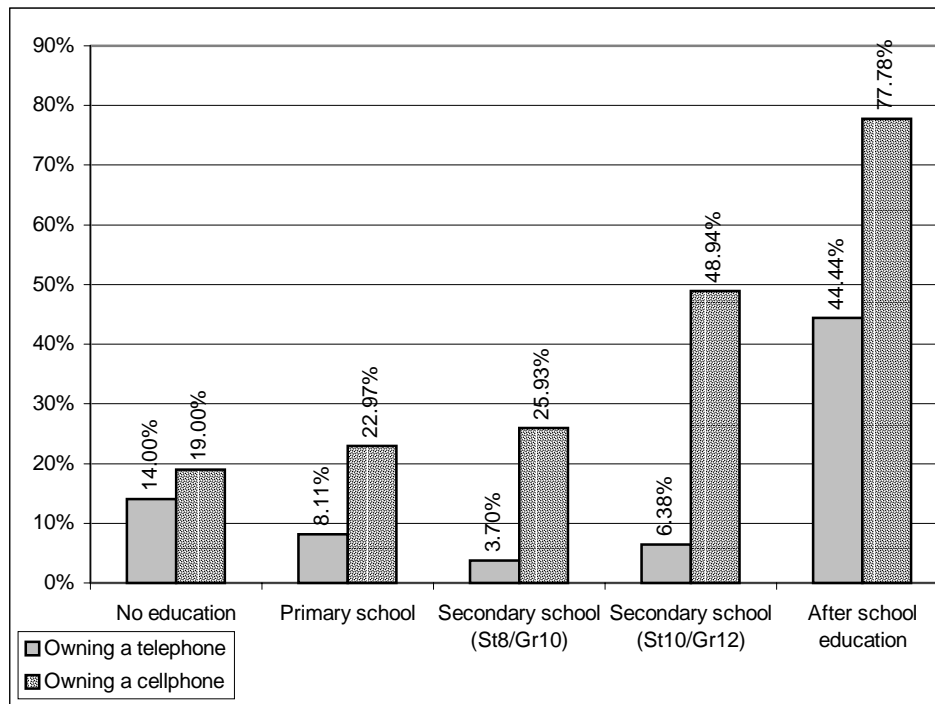


Figure 6.9. Education VS owning a cellphone or a telephone

The Chi-Square probability value for the relationship between level of education and owning a telephone indicated a statistical significance with a value of 0.0060 (Chi-Square < 0.05). In the comparison of owning a cellphone with the rural citizen's level of education the statistical significance was extremely strong and Chi-Square calculations delivered a value of 0.0001. This means that the probability of someone owning a personal telephone or a cellphone in a specific region increases as his or her level of education increases.

6.12.2. The Role of Rural Citizen's Monthly Per Capita Income in Telecommunication Utilization

Telecommunication services like all other infrastructural services don't come for free and the cost definitely influences the technology utilization. It plays a role especially for rural citizens not earning high salaries. The average household income in Sekhukhuneland is R1492.61 per month but because of large families with an average size of 6 people the per capita monthly income is low at R260.55.

Figure 6.10 shows the relationship between the per capita monthly income of Sekhukhuneland's population and their need for telecommunication.

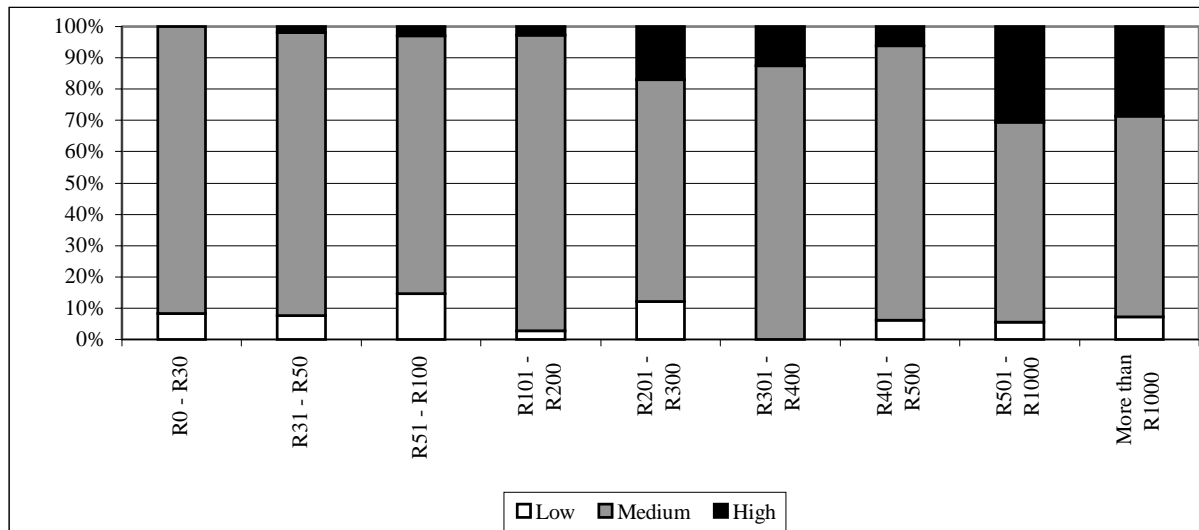


Figure 6.10. The need for telecommunication (fixed-line or mobile) for people at different levels of per capita income

Here, once again as in Figure 6.7, one can see an increase in the magnitude of the need for a means to telecommunication with an increase in per capita monthly income. The Chi-Square probability indicates a statistical significance with a value of 0.0017 when comparing per capita income to a need for telecommunication (fixed-line and mobile).

However, when evaluating the need for a personal telephone and a cellphone separately the results show that only cellphone use is clearly dependant on per capita monthly income. Figure 6.11 shows the distribution of the population in Sekhukhuneland owning a cellphone at different per capita monthly income levels.

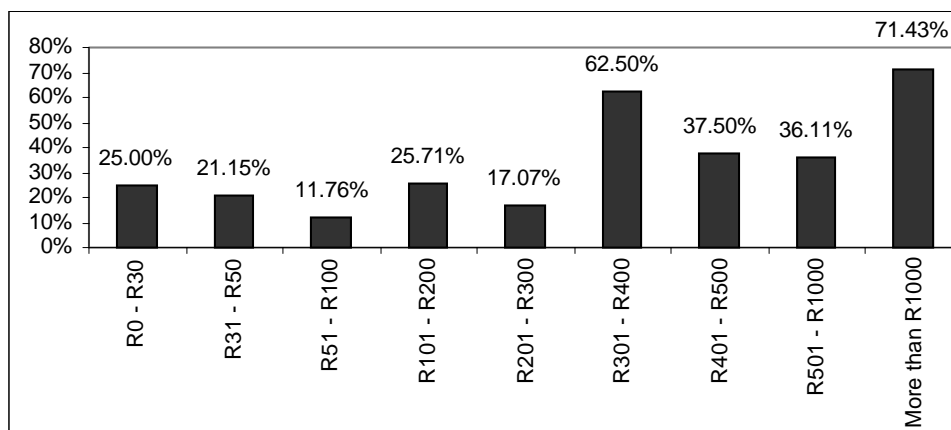


Figure 6.11. Per capita income as a function of owning a cellphone

With a Chi-Square probability value of 0.0001, owning a cellphone depends highly on ones per capita monthly income. Figure 6.11 shows that the percentage of people in respective per-capita-monthly-income-groups increase from 25% of people at a monthly per capita income less than R30.00 to 71.43% for people earning over R1000.00.

Evaluating fixed-line telephone together with per capita monthly income (see Figure 6.12) shows no statistical significance.

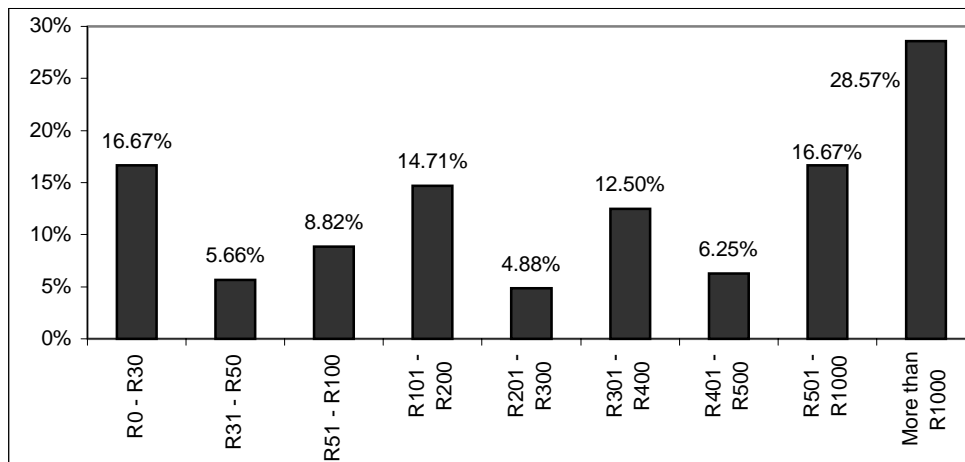


Figure 6.12. Per capita income as a function of owning a personal fixed line telephone

A Chi-Square value of 0.2513 indicates no statistical significance between owning a fixed-line telephone and income (per capita). This means that regions with a high per capita income is not necessarily better potential clients to fixed line telecommunication service providers than regions with a low per capita income. The reason for this phenomenon is twofold:

- Governmental regulations forces Telkom to install land lines without allowing the service provider to perform pre-implementation-evaluation on the client's monthly per capita income for churn rate predictions purposes (concerned with affordability), and
- Many rural citizens are not adequately informed on the call costs and they therefore prefer a mobile phone rather than a fixed-line telephone.

The rural citizens level of awareness on call costs is hindering the fixed-line technology utilization because many are not making use of telephones believing that cellphone calls are cheaper than fixed-line telephone calls (found in the research). Not enough is done to inform rural citizens on call costs. Because of the poor status of rural citizen call cost awareness many are not making use of telephones nor cellphones believing that they can't afford it without knowing the actual call costs.

Only 3.10% of the population knows the cost of both a fixed line telephone call and a cellphone call (see Figure 6.13). While only 9.69% of the population knows the cost of a fixed line telephone call, 44.19% complained. For cellphones, 8.53% of the population is informed and again a bigger percentage (20.16%) complains about cellphone call costs giving call costs as a reason for not having a cellphone.

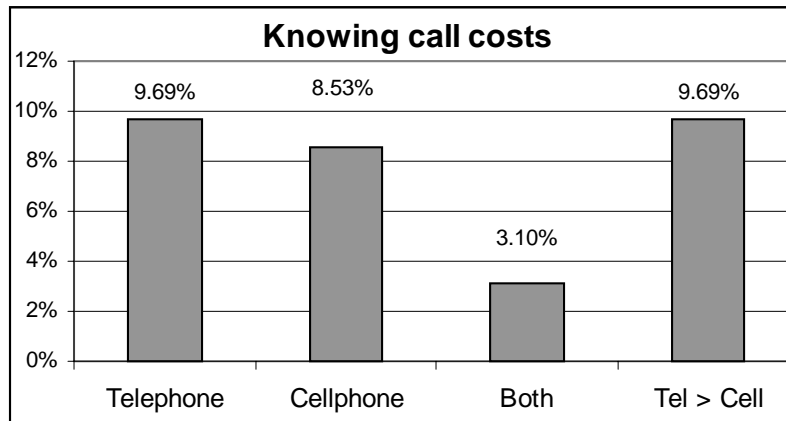


Figure 6.13 Rural citizens' knowledge on call-costs

Telkom informs the illiterate/uneducated rural citizen about the cost of a telephone call through a marketing campaigns and their sales force. This method is not effectively improving rural customer's price awareness when considering the fact that only 9.69% of the population knows the cost of a call on fixed line telephones.

In the mobile telecommunication industry much more can be done to inform users on call costs. Vodacom advertises its products and services on television and on radio. Vodacom does however feel that because it is a private company and not a public telecommunications operator, there is no obligation on Vodacom to inform the greater public about the cost of its services. This clearly explains why only 8.53% of the population is informed on cellphone call costs.

The problem indicated by the Chi-Square value of 0.2513 on statistical significance between owning a fixed-line telephone and income (per capita) can be caused by the fact that many rural citizens are under the impression cellphone costs are cheaper than fixed line call costs (rightmost bar in Figure 6.13). This lack of knowledge is partly responsible for the strong statistical significance indicated between owning a cellphone and an individual's per capita monthly income (Chi-Square probability value of 0.0001) Cellphone and telephone call costs are compared in Table 6.2 [84].

Service	Peak Cost	Off-Peak Cost
Fixed line to fixed line	R 1.24	R 0.62
Fixed line to mobile	R 1.60	R 0.86
From cellphone	R 2.60	R 0.75

Table 6.2. Long distance fixed line, and cellphone call costs [84]

The call costs of phoning from one fixed line to another are shown only for an even further explanation. Here one can see that Telkom (Fixed line to mobile) calls are cheaper than mobile phone (From cellphone) calls except for Off-Peak calls to cellphones. Here fixed line telephones are more expensive than mobile phone call costs by only 14% compared to a 63% price difference during peak time. During weekdays Telkom offer a "mid-peak-period" (from 18:00 to 20:00), which is active during cellphone peak time with a cost of R1.14 (128% price difference). The fact that mobile phones are cheaper than fixed line

telephones for a specific time can cause confusion but if one also takes into account that mobile call costs are charged per minute and fixed line calls per second (from the second minute onwards), the last minute becomes cheaper only when the user uses more than 53 minutes thereof.

The main reason for rural citizens being under the misperception that cellphone calls are cheaper than fixed telephone calls is however because of Vodacom's Community Phone shops (Vodacom's public telephones). Many rural citizens make no distinction between calls from Vodacom Community Phone shops and privately owned cellphones.

The cost of calls from Vodacom Community Phone shops is subsidised by Vodacom (costing 70c/minute to the user) in line with their licence conditions, whereas the cost of Vodago calls is at the full commercial rate. In September 1993, one of the biggest challenges facing South Africa's new democratic government was a massive backlog in infrastructure. While the country's first-world component enjoyed the benefits of superb infrastructure, the majority were excluded. In Vodacom's GSM cellular license one of the conditions was that cellular telephony would have to address the imbalances of the past.

People in previously under-serviced areas (areas where there are less than one telephone line per hundred people) are clocking up over 70 million minutes of airtime a month from Vodacom's community phone shops. Consequently, Vodacom committed itself to deploying 22 000 subsidised telephones to be used by people in areas with the greatest need of telecommunications services. These areas are essentially traditionally under-serviced areas.

Affordable subsidised rates also become available through card operated payphones, installed at local shops, spaza, clinics, community centre and tribal offices, installed and maintained by MTN. Local entrepreneurs are appointed as card distributors in their area, creating additional income and wealth.

It is because of the fact that many rural citizens are ill informed and under the impression that cellphones are cheaper than fixed-line telephones, that only cellphones and not Telkom telephones are owned significant more as per capita monthly income increase. If the rural community is made better aware of the actual costs people will undergo a mind-shift from cellphones to fixed-line telephones. The total need to telecommunication will remain the same (as in Figure 6.10) and the population will still, according to statistics, be significantly in a greater need of telecommunication as their monthly per capita income-level rise. The cellphone industry can also benefit from launching a call cost awareness campaign because many (20.16%) rural citizens are uninformed on call prices, and blames high call costs for not having a cellphone.

To summarize: It is possible to predict which region will benefit most from technology improvements, or benefit most from gaining service for the first time. They should enjoy higher priority when doing rural network expansion. These are villages with:

- A high average level of education
- A high average monthly income (per capita)

6.13. Develop Appropriate Educational & Training Systems (26)

Rural schools are often ill equipped with infrastructure like running water, electricity and telephony. The telecommunication industry can uplift the situation by getting involved and by appointing high priority to rural educational institutions' installations and maintenance. The telecommunication companies of South Africa are actively involved in education and their involvement will briefly be explained below.

Telkom: To date Telkom is the largest sectoral trainer in South Africa. Telkom has positioned itself for competition through a highly progressive human resources development program which has seen more than 88% [58] of its employees trained each year through the Telkom Centre for Learning (CFL). A recent independent survey by PMR Magazine stated that Telkom was rated South Africa's most active company in terms of training and job creation. This statement was made with agreement of 25 trade union leaders [58], senior government officials and business associations such as the SACOB (South African Chamber of Business), AHI (Afrikaans Handels Intituut), and NAFCOOC (National African Chamber of Commerce).

With Telkom's 88% training it rates better than the international benchmark of communications companies which offer training to 85% [58] of their employees annually. Currently Telkom is supporting over 1,500 students at tertiary education institutions in South Africa [37]. The bulk of these students are enrolled for engineering, information technology, marketing, and finance courses. During vacations, learners are given practical training and exposure to Telkom. In Telkom's bursary program [37], 65% of such students are black, 35% are white and 34% are female. Telkom furthermore increased its 5-year training budget by 150%.

In 1997, Telkom committed R2,3 billion [58] over a period of five years for training and human resource development at the Centre for Learning (CFL). To date, the Telkom Foundation has spent R13 million connecting 1,300 schools to the Internet in an effort to allow scholars access to technology. Each school receives a computer, a printer, free Internet dial-up connection, free monthly rental, R150 telephone rebate and training for two teachers. Telkom also donated R20 million to place more than 2000 computers in disadvantaged schools throughout the country, R30 million to a Maths, science & technology project for secondary schools, R20 million to fund university students whom cannot afford to pay tertiary course fees themselves through TEFSA (Tertiary Education Fund of South Africa), and R10 million for fifty full scholarships in the field of Engineering/IT at the Multimedia University in Malaysia.

Vodacom: In July 1999, former President Nelson Mandela attended an earth-turning ceremony in the former Transkei when Vodacom announced their plans on building a R7 million [22] school and clinic.

MTN: MTN is continually being developed through specialized staff training, as well as through alliances with international training and development companies. They furthermore have a long-term strategy, which includes the founding of a corporate university providing staff with shared ongoing knowledge resources.

MTN currently funds the Centre for Telecommunications Learning at the Peninsula Technikon in Cape Town, which produces some 30 engineers [23] and technicians each

year. MTN's sponsorship of SUNSTEP (the Stellenbosch University Schools Technology Education Project) introduces thousands of primary and secondary school pupils to electronics, encouraging them to choose Science and Technology as a career.

MTN is investing in a Science and Technology Centre at Century City in Cape Town and is planning for the installation of a Geosphere. The Geosphere is a huge globe of the world constructed from satellite images. It allows an almost unlimited number of educational computer programs to be projected onto it, covering topics such as demographics, environment, migrations, weather patterns and even simulations of the impact of development on our planet.

As a national sponsor of cricket and game sponsor of tennis, MTN promotes intensive development programs, and supports a vast range of other sports (soccer, rugby, corporate golf and netball).

6.14. Install and Implement Technology, Inform Users, & Implement it Gradually (27)

Telkom sometimes force manufacturers to develop equipment for local conditions on specific application of technology or modifications. Telkom provides the specifications for develop to local conditions. Telkom may provide local development and technical solutions for limited deployment but modifications to foreign technologies are seldom done "In-house". Normally manufacturers, local agents, or other 3rd parties modify transferred technologies. Examples thereof are: 48 Volt DC rather than AC power supply, lightning protection, and external housing (boxes).

One of the biggest problems in the technology transfer process however exists in the block 27 of the technology transfer model namely the informing of end-users. Aspects from Figure 4.7 from Chapter 4 are discussed below on the bases of the South African situation.

On the left hand side of Figure 4.7 the end user becomes involved through an awareness campaign. This involves user knowledge determination, informing and training sessions, and continuously observing changing needs to be integrated into easy-accessible information databases for future reference.

There are clear indications that both fixed line (Telkom) as well as mobile (MTN and Vodacom) telecommunication service providers are not effectively doing enough to inform the rural citizen on technology advantages and use. This is an aspect of the technology transfer process, hindering the technology utilization and one that needs adequate attention urgently. The situation about rural citizens' call-cost-knowledge for both fixed-line and mobile telephones has been discussed earlier.

6.14.1. Safety and Access to Telecommunication

The emergency service is extremely helpful in rural areas where people often don't have personal means of transport. The crime rate in rural areas are usually high and can lead to citizens being in need of emergency services.

More information needs to be given to rural citizens on the usage and advantages of telephones in case of an emergency. Figure 6.14 shows the population of Sekhukhuneland

and statistics on being in an emergency before. This could have been any emergency were the presence of the police could have drastically improved the situation.

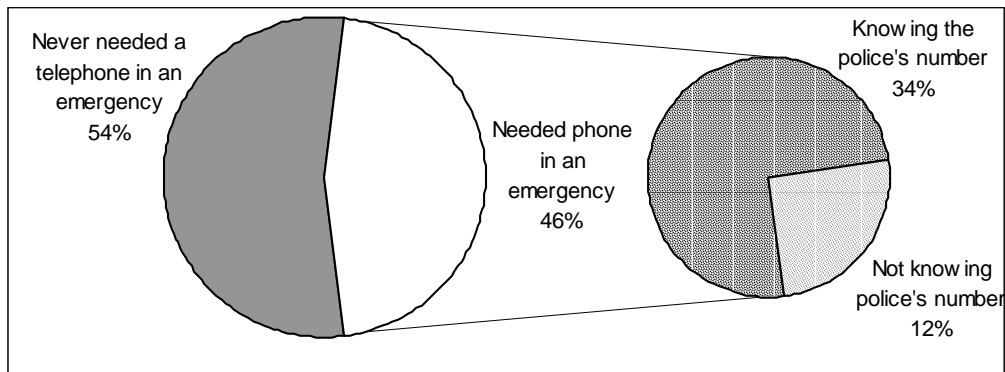


Figure 6.14. The knowledge on the police’s telephone number of the people who needed a telephone in an emergency before in Sekhukhuneland

Figure 6.15 shows all people who needed a telephone in an emergency before in Sekhukhuneland. Of the population who was formerly confronted with an emergency situation 25% didn’t know the police’s number. Of the 75% aware of the police’s telephone number, 12% didn’t have access to a working telephone.

In other words, from the 34% of the total population who’ve been in an emergency and knew the telephone number for the police, 12% didn’t have access to a working telephone. This means that 4.08% ($12\% \times 34\% = 4.08\%$) of the total population have been in an emergency situation where they knew the police’s telephone number but had no access to a working telephone. For the remaining 95.92% of the population no technical or positional problems hindered them from making use of a telephone’s advantage to use it during a mishap.

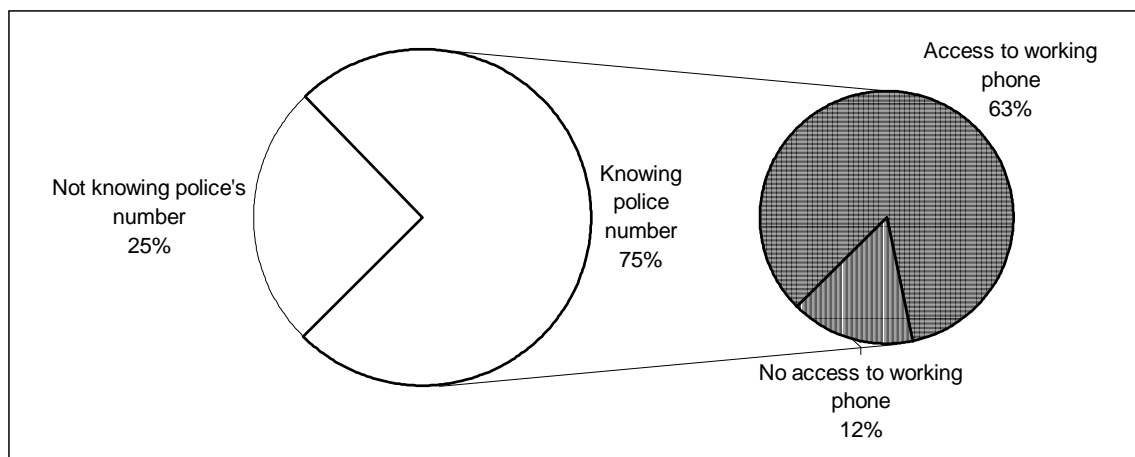


Figure 6.15. Of the proportion who needed a telephone in an emergency before, their access to a working telephone when knowing the police’s telephone number

The biggest problem limiting this advantage in actual fact is that 12% of the population has previously been in an emergency situation but couldn’t use a telephone because they lack

knowledge on the right telephone number. Technical or positional issues (4.08%) were therefore not largely to blame.

The situation in the mobile phone industry is even worse. Both mobile telecommunication service providers also offer a free emergency service. This service provides the user with access to a crisis centre (24 hours a day) able to analyse the situation and summon the needed emergency services (police, fire brigade, an ambulance, or other emergency help). This service is free and easy to access by dialling 112 even without a SIM card or PIN number.

MTN and Vodacom use this service for material and informing distribution on advantages of their free access to emergency services. While the emergency 112-service can have many advantages to the rural citizen, only 4.11% of the MTN customers and 16.44% of the Vodacom customers were aware of the service and its benefits.

6.14.2. Fixed-line Telecommunication

Not enough is done to effectively inform rural citizens. Telkom inform rural citizens about new services and products through their marketing campaigns and sales force. Telkom doesn't conduct any periodic research to determine rural citizens' knowledge on available services and products. Demand forecasting, marketing, sales force, and international trends are used to determine needs and capabilities of the rural community. Call centres at Telkom function as a database to store inputs from the rural community during the use of an existing technology, which can provide useful information and feedback when designing new systems/processes.

6.14.2.1. *Telkom's Services From Which Rural Citizens Can Benefit*

Telkom "PrepaidFone" is a private residential service, which is the world's first prepayment service on a fixed-line telephone network [71]. "PrepaidFone" is also a service identified by Telkom as being one from which rural citizen can benefit.

Telkom's Prepaid Phones holds the following advantages to the rural citizen [72]:

- No credit vetting is done when applying for this service.
- No need for a postal address.
- Add money to balance by means of a recharge voucher
- Weekly rental deducted from account being cheaper than normal personal phone rental
- No monthly bills that might be higher than what a rural citizen budgeted for.
- Optional PIN code will allow user to control the use of the telephone. Through "MultiPIN" additional users can be added to one PrepaidFone line
- Free call barring
- Voice prompts in: Zulu, Xhosa, Afrikaans, English and Sesotho.
- Affordable recharge vouchers (in R35, R60, R100 and R150 denominations)

Despite all these wonderful advantages, many rural citizens are poorly (or not at all) informed. Only 31% of the population are informed about Telkom's prepaid telephone service (see Figure 6.16).

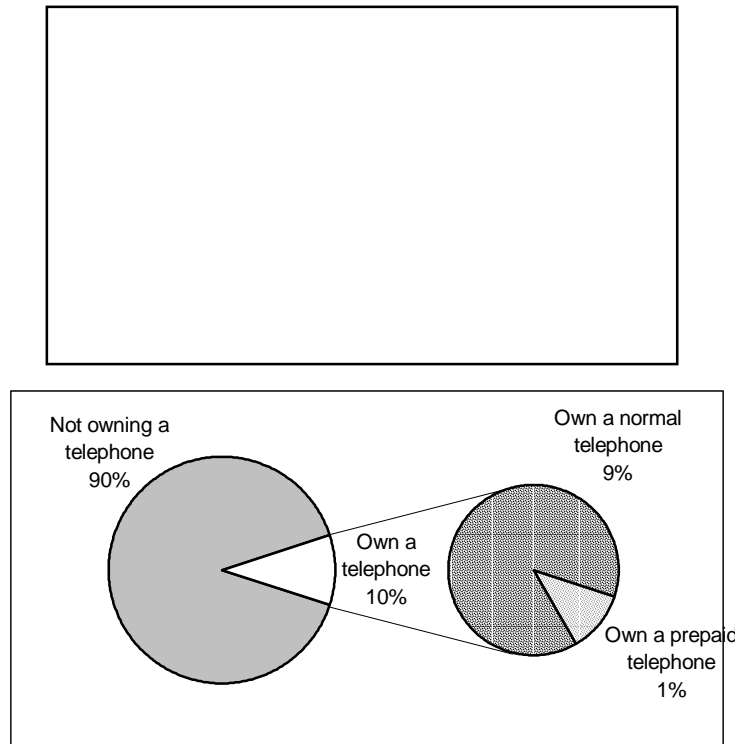


Figure 6.16. Use and knowledge of Telkom's prepaid telephones under rural citizens

Figure 6.16 show that although many know about the service, many still remain uninformed about the advantages it holds. Without knowledge on the "PrepaidFone" advantages, very little (only 10% of the telephone owning population) are benefiting from it.

Telkom's PrepaidFone is unfortunately not the only service from which rural citizens can benefit where limited awareness is hindering the utilization and effective advantages. Interviews conducted with corporate personnel from Telkom, indicated a few services that are viewed by the company as being services from which rural citizens can benefit. These products were designed because of a market survey that indicated a specific need amongst rural citizens. These products are also aimed at people with a low income-level to lower necessary financial commitment. The products also maximise communication services with minimum capital outlay. These include the following:

- **Homefree** - a personal 0800 number enabling family members, when away from home, to call home from any telephone in South Africa 24 hours a day without paying a cent. Charges are billed to the Homefree account. An optional caller PIN feature also offers added security [73].
- **BlockCall** - prevents some category calls (National & international calls, International calls only, Cellular & Telkom Premium Rate services, Telkom Premium Rate services & International calls & Cellular, Telkom Premium Rate services & International calls, or all outgoing calls) from being made, with PIN protection, without affecting incoming calls preventing unauthorised use of telephone leaving emergency and free call numbers still connected [74].

- **Call Answer** - a voice-mail facility that answers calls and takes messages for a user being out or busy with another call. No extra equipment needed, no maintenance (lightning cannot damage mailbox), assured confidentiality (PIN protected), and takes messages even when telephones or lines are faulty [75] (often the case in rural areas).
- **WorldCall** - WorldCall products namely the WorldCall Charge Card, WorldCall Universal Card, WorldCall Automatic, and WorldCall Operator Assist enables the user to stay in touch when travelling in South Africa or overseas by simply dialling an access number from almost any tone-dial phone [76].
- **Phonecard** - a pre-paid, fixed value microchip card enabling users to make calls from green Telkom Cardphones (public payphones) without the need for cash (coins). Available in denominations of R15, R20, R50, R100 and R200 [77].

The survey conducted in Sekhukhuneland found that some people didn't want a personal fixed line telephone at home because of not having control over telephone calls made from the phone by children, relatives, and/or friends. The BlockCall service will solve the problem instantly at an affordable price. Potential clients may also fear being responsible for costs occurred when collect calls are made to their personal telephones. This again is only a threat because of people not being adequately informed when using the technology.

The drawback however is that very little effective customer awareness is present about these products/services. Figure 6.17 shows the percentages of the population, which are informed about the products and their advantages. The information diffusion into the rural area for Phonecards was an exception and done extremely successful having 72.87% of the population familiar with the product and its advantages. For all other products less than 6.20% were informed about advantages or familiar with them at all. Once again the level of knowledge the user has obtained about products and services is limiting the advantages to both the rural citizen as well as the service provider.

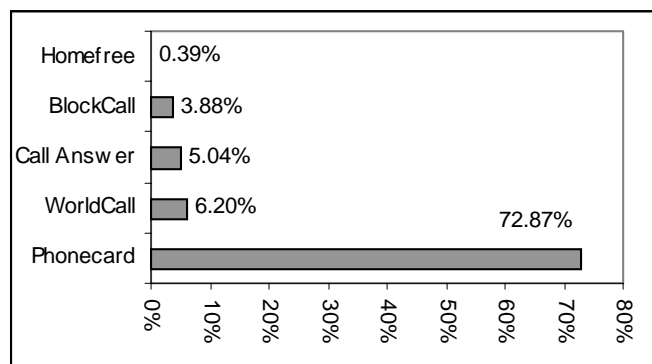


Figure 6.17. The level of knowledge for Sekhukhuneland's population on products/services from which rural citizens can benefit

Telkom Internet is another service indicated by Telkom as being a service from which rural citizens can benefit. This might be the case but with the low per capita monthly income levels and low level of education 93.41% have never touched a computer. The majority of the population are therefore not computer literate and this fact limits the advantages that Telkom Internet has to offer.

6.14.3. Mobile Telecommunication

Vodacom conducts research on the views and attitudes of all people falling within its confidential target market. It will be shown below that inadequate awareness is present with rural citizens on services and aspect concerning mobile telecommunication.

6.14.3.1. SMS (Short Message Service)

SMS (Short message service) is almost a cellphone equivalent of paging or e-mail. Sending an SMS is straightforward and nowadays very user-friendly. Sending an SMS is very useful for sending a message in one direction, at a reduced cost, while not being able to make or receive voice calls [78].

Vodacom informs rural users on the use of SMS through commercial advertisements broadcasted on radio and television in both rural and urban areas. Very little rural citizens are however aware of SMS let alone the advantages it holds. The knowledge of SMS is limiting the use and thus the practical effective advantages thereof. Of the rural population owning cellphones, 34.25% are completely uninformed about SMS and while 64.39% are familiar with SMS, 35.62% never used the service because they did not know or understand how. A fraction of only 28.77% cellphone owning citizens are therefore able to use SMS.

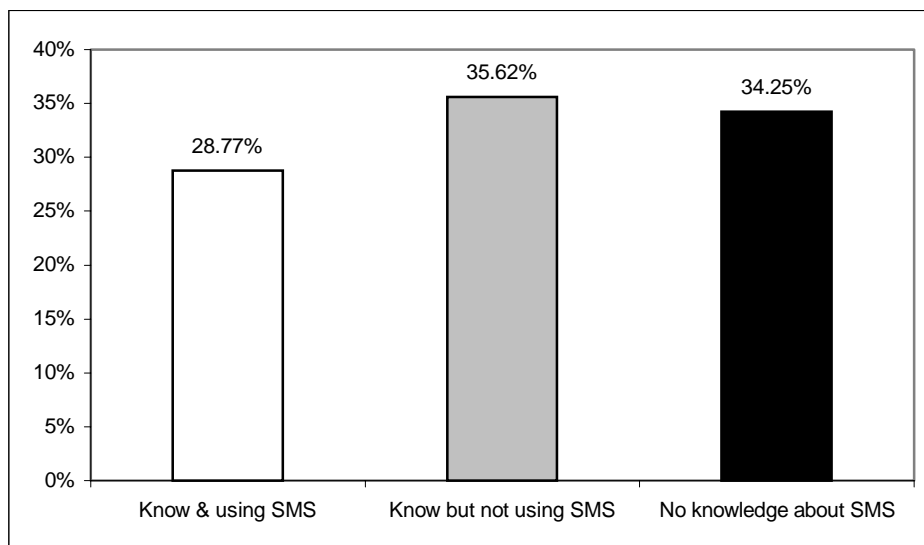


Figure 6.18. The rural citizen's use and knowledge of SMS (Short Message System)

The SMS situation (Figure 6.18) is a perfect example of how a lack of knowledge on a specific technology can limit advantages to the end-user.

6.14.3.2. Knowledge on charging cellphone batteries

Rechargeable batteries power mobile phones. These need to be taken care of by following definite guidelines, which will ensure efficiency and maximize battery-life. Guidelines include [79]:

- Never charge batteries for more than a week
- Do not leave chargers connected to the AC power supply when not in use
- Temperature extremes affect batteries' ability to charge. Always try to keep batteries between 15°C – 25°C.
- Only charge battery when battery is fully discharged
- Fully charge battery before disconnecting charger

Many rural citizens are uninformed about these guidelines (especially the last two) and shorten their batteries' life expectancy by charging incorrectly. This limits the utilization of technology over time and shortens its lifespan. Figure 6.19 shows the rural citizens level of knowledge on battery care and use. More than half (52.94%) of cellphone users are uninformed about proper battery use and care guidelines.

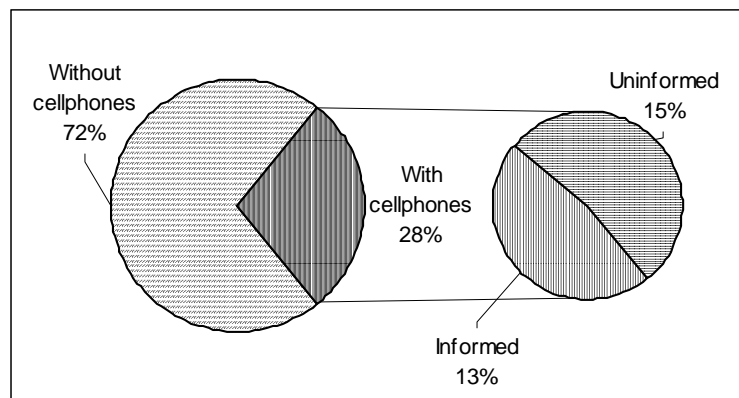


Figure 6.19. Knowing how to charge a battery

Aspects that might however also limit charging conditions are the type of dwelling or access to electricity. Many (40.47%) still live in informal dwellings (Shacks), with little thermal isolation. Informal houses can have internal temperatures reaching over 35°C. Not having access to electricity is another aspect that can affect charging patterns. Rural entrepreneurs are charging cellphone batteries for citizens without electricity at home at 500% profit margins whilst also not following charging guidelines.

6.14.3.3. Use of Bank Cards for Airtime Purchase

Vodacom claims that it is informing rural citizens about the use of plastic-bank-cards for purchasing airtime. In Sekhukhuneland, 49% of the population owns bank accounts. Of this fraction 56.69% have Standard Bank accounts, 18.90% are banking with First National Bank (FNB), and 10.24% at ABSA. Others are Nedbank, General Post Office, Peoples Bank, and NBS.

Some 0.79% is under the impression that they are banking with United Bank and 0.79% with Allied Bank, who have merged together with other banks to form ABSA. Another 0.79% indicated E-Bank, which does not exist in South Africa. This indicates that rural

citizens are not always actively using their bank accounts. The reason therefore can be social where rural citizens distrusts activities they don't understand or cannot see.

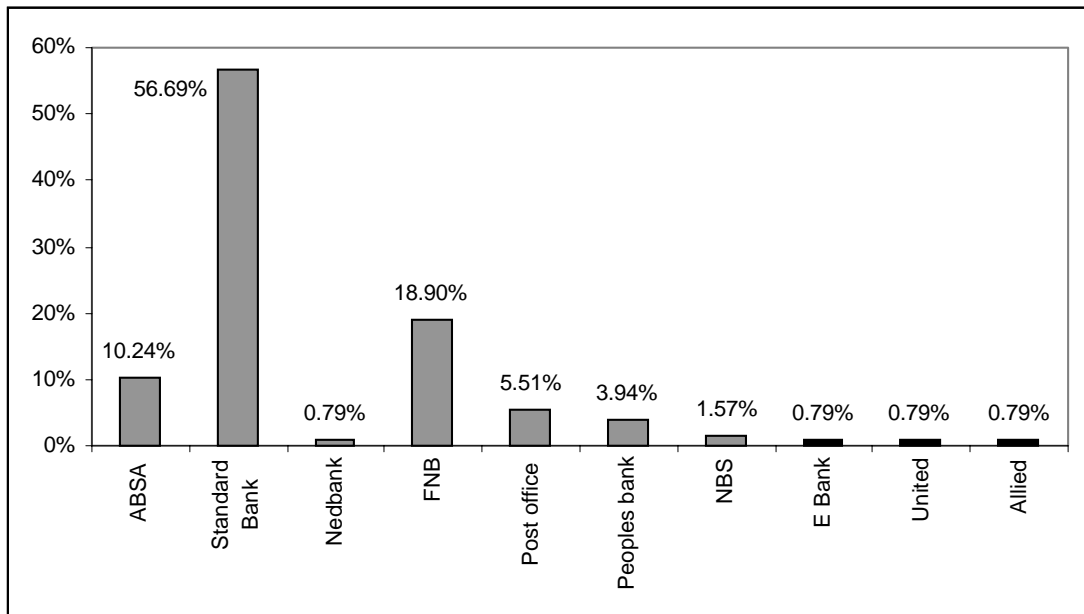


Figure 6.20. Sekhukhuneland's banking preference

Buying airtime for a prepaid cellphone is now also possible using his/her bankcard together with an ATM (Automatic Teller Machine). ABSA and First National Bank (FNB) are offering a service that enables users to purchase airtime for prepaid cellphone users making use of the MTN network. Standard Bank and Nedbank offer this service to Vodacom clients. This enables users to purchase airtime any time of day and night. It does often happen that a tuckshop run out of airtime cards and then the villagers have to wait for new supplies. Using one's plastic bankcard eliminates this problem. Rural citizens also often work difficult hours and ATM machines can then be very useful to acquire vouchers after-hours.

The users are however not informed enough about using this technology to their advantage. Vodacom advertises being able to purchase airtime, using ATMs through whatever medium Vodacom's Advertising department feels will reach the target market. The survey conducted in Sekhukhuneland indicated that all cellphone owners in the rural areas also own bank accounts. Of the population 28.29% owns cellphones from which 60.27% owns prepaid cellphones. Out of the prepaid cellphone owners, only 2.27% has ever used their bankcards to purchase airtime for mobile phones (see figure 6.21).

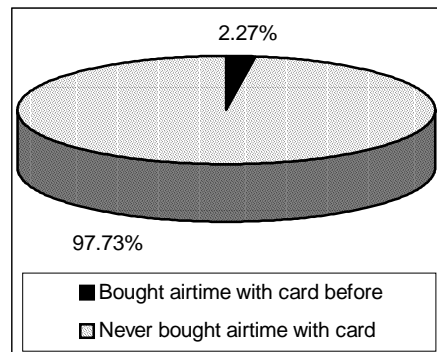


Figure 6.21. Profile of prepaid cellphone owners on purchasing airtime with plastic bankcards at an ATM

Knowledge on bankcard usage for airtime recharging is limiting this part of technology utilization to rural citizens.

6.14.3.4. Cellphone Maintenance & Repair

The effective utilisation of the technology depends to a large extent fully on the level of knowledge vested within the user. The information obtained by a user can also extend or shorten the life of a cellphone (see battery care above). This include aspects such as replacing batteries or repairing the cellphone physically when components go faulty (aerial, LCD (liquid crystal display), cellphone covers, ext.) The survey conducted in Sekhukhuneland indicated that 67% knows where to buy new cellphone batteries. Knowledge on repairing a cellphone is at a lower level where 50.39% knows where to repair a cellphone, 35.94% are uninformed, and 13.67% are under the impression that a broken cellphone can't be repaired (see Figure 6.22).

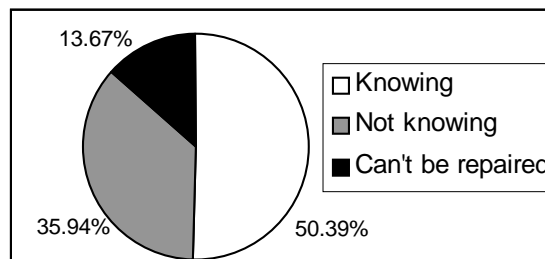


Figure 6.22. Cellphone maintenance knowledge for rural citizens in Sekhukhuneland

This means that 13.67% of the population will dispose of a cellphone when a technical failure occurs. In the case of a technical failure, rural citizens might not be in a financial position to replace the cellphone but would still be able to repair it. If not financially able, the uninformed population (35.94%) will terminate the use of their cellphones (if not informed by the 50.39%). This shortens the effective usable period of a cellphone.

This section has shown that the knowledge of the rural citizen can seriously hinder telecommunication technology for the end-user as well as the fixed-line and mobile service providers. Rural telecommunication will never be effectively operated without active

“hands-on” awareness campaigns and the industry is cutting it’s own throat by not supplying adequate attention in this matter.

6.15. Conduct Technological/Need Assessments and Forecasts & Evaluate Transferred Technology (28-36)

Telkom is evaluating current transferred technologies on a quarterly or an annual basis depending on the type of technology involved. Telkom has qualified human resources able to perform limited in-house research and development and set specifications to assure effective functioning in the current infrastructure. When the situation arise where the need change and the technology is made absolute, suppliers, manufacturers, local agents, or other 3rd parties modify transferred technologies. It seldom happens that Telkom staff modifies a technology to suit changed and newly defined need.

Telecommunications and South Africa’s Needs Concerning the Natural Environment

Environmental issues are becoming ever increasingly important. During 2000, more than 400 million phones were sold globally, a 45% increase on 1999. In 2001, mobile phone leaders expect over 500 million units to be sold worldwide [80]. Because cellular phones are not yet recyclable, manufacturers cannot re-use the rare metals for future phones. Plans are however already underway to allow for limited recycling. Environmental issues are becoming more important to South Africans. The telecommunication industry are also involved and the influences on each of the service providers are briefly discussed below.

Telkom: Telkom actively deploys technology with a low environmental impact, especially in ecologically sensitive areas such as Cape Point in the Western Cape and in the Kruger National Park. Telkom took its environmental commitment even further by implementing an Environmental Management System (EMS) that spans the full spectrum of their operations in 1998. Telkom's environmental system, based on ISO 14001 standards [58], is aimed at ensuring that, in their drive to provide all South Africa's people with access to a telecommunications network, the environment is not negatively impacted. The system includes integrating environmental consideration into all of Telkom's planning activities and business decisions.

Vodacom: In an effort to limit the impact of cellular technology on the environment, Vodacom in Cape Town erected (March 1997 [22]) the first cellular mast in the world to be disguised as a cocas primosa palm tree. The entire structure is recyclable, making it a truly 'green' tree. The masts have even been disguised as a lighthouse in Port Elizabeth and as techno pine trees in Johannesburg.

During April an archaeological find was unearthed during the construction of a Vodacom base station at Willow Glen in Pretoria. Our environmental policy includes a commitment that Vodacom will minimize the impact of its installations on the cultural and historical landscape. When the bones were discovered, indications were that they could be archeologically significant. The University of Pretoria's Physical Anthropology research group was called in and continued their research on the find enabled by a grant from Vodacom.

Vodacom announced that it received the international ISO 14001 environmental management certification in July 1999 [22]. To keep this prestigious certification, Vodacom has the following three obligations to fulfil:

- Proactive legal compliance with environmental legislation
- Prevention of pollution
- Improvement of our environmental performance

MTN: MTN was the first cellular telecommunications company to receive the prestigious ISO 14001 for their Environmental Management System [23]. The MTN Cape Whale Route was recently awarded the British Airways Tourism for Tomorrow Award for its development of eco-tourism. Environmental programs in the Cape include the Jackass Penguin, the Black Oyster Catcher and the conservation of Cape Flora. MTN is also a sponsor of the Endangered Wildlife Trust, contributing to key projects such as the Wild Dog, Hyena, Kalahari Lion and Rhino Darting Programs.