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CASE NOTES – SOUTH AFRICA'S POLICY INCOHERENCE: AN UPDATE ON THE KNYSNA WI-FI PROJECT

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ABSTRACT: In the past, the main obstacle against building network infrastructure was the cost. Technological advances, however, have meant that building a functional, low-cost network is possible. Knysna is the first municipality in South Africa to achieve this. The problem is not the infrastructure but the connection to the larger networks of the mobile and fixed-line operators. The incumbents' incentives are to prevent interconnection (or at least to delay it) on the basis of maintaining their dominance. In the telecommunications sector in South Africa, the only way to overcome this problem is via regulation. Yet regulation has to balance two sometimes competing interests – investment in infrastructure and competition. The Knysna Uni-Fi project has operated outside of any enabling regulation for competition and investment and this has negatively impacted upon its commercial success. Any regulatory intervention imposed upon the market has to balance the interests of competition and investment. In the South African market, given the huge dominance by the incumbents, that balance must change to favour new entrants. Until this takes place Knysna is not a replicable model for South Africa.

Introduction

The starting point of this paper is that the South African Government has so many conflicting priorities that it has been overcome by policy incoherence between 2000 and 2004.[1] Despite the official policy commitment to liberalisation of the sector, opportunities to enable competition both through the licensing of competitors and through the creation of institutional arrangements that would allow for effective regulation of the sector have been constrained. The uncertainty created by this environment has not only not been conducive to foreign investment, but also left local service providers unclear on their individual rights and the direction of sector development as a whole. While the 2001 Telecommunications Amendment Act reneged on the liberalisation timetable agreed to in the 1996 Telecommunications White Paper, dashing expectations of increased competition within the sector, an *ad hoc* set of Ministerial directives issued by the Minister in September 2004 appeared to compensate for this. With the hurriedly drafted convergence legislation intended to deal with the by then demonstrably negative policy outcomes of the first phase of reform stalled in Parliament, these policy directives were perceived as an interim measure to liberalise the sector. Included in this set of directives was one that

1 In a paper written by Alison Gillwald (Gillwald, 2005), she argues that South Africa's policy intentions of affordability and accelerated sector development were nullified by implementation plans that emphasised the maximisation of state assets through the protection of the vertically integrated incumbent, first for the privatisation and subsequently for the IPO, at the expense of competition.

allowed Value Added Network Services (VANS), to compete against the incumbent and to self-provide their facilities, which they had been required by law to acquire from the incumbent. However, despite a gazetted interpretation of the directives by the regulator, the Independent Communications Authority of South Africa (ICASA), that removed any possible ambiguities, the Minister issued a press release the day before the directives were to come into force in 2005 indicating that VANS operators could not self provide. Notwithstanding this legally tenuous situation the VANS operators chose not to challenge the press release. The press release of January 2005 marks a watershed in the history of telecom reform in South Africa. It marks the culmination of the incoherent policy statements issued by Government.

During this period of incoherence, the municipality of Knysna decided that it could no longer pay the exorbitant rates of Telkom. It put out a tender for the creation of a separate network to supply its internal needs, mainly connecting its local branch offices. The municipality also had wider social objectives such as the provision of free voice and Internet access to the community. As such there were two phases to the Knysna project: firstly, connecting the various branches of the municipality and secondly, delivery of free Internet and voice calls to those within the community.

The Knysna Uni-Fi project took place within a context of policy incoherence. The success of the first phase of the Knysna Uni-Fi project speaks to the possibilities that could occur on a wider scale, but that policy incoherence has actively thwarted. It is precisely because Knysna ignored the machinations of both the regulator and Government that it was successful.

The culmination of the policy of incoherence coincided with far-reaching (though unintended) changes to the sector. Mobile operators, for example, have become the new dominant players, with over 20 million subscribers in 2006 and resorting to incumbent tactics to delay and obfuscate the regulator. Opportunities for affordable access through Wi-Fi and more recently WiMax developments have been inhibited by licensing constraints and the lack of spectrum allocation. In short, the sector has moved from being dominated by one set of interests (Telkom) to being dominated by several inter-linked sets of interests, but with the same outcomes: high retail and wholesale prices, limited access and usage and reduced deployment of job creating activities such as business process outsourcing. All of these factors naturally have negative consequences for the economy as a whole.

The key question when analysing the Knysna Wi-Fi project is at which point the network breaks out to join other networks, specifically access to the Internet. Otherwise, the network merely provides a local network (for example, much along

the same lines that a VANS operator would provide a network for a fast food chain with 30 branches). This has the benefit of reducing cost to the municipality but not of achieving the other objectives of providing access to the local community and reducing the digital divide.

A key part of the Knysna business model was the commercial re-sale of services. This component relies upon interconnection with the incumbent operators and no amount of innovation at a local scale is going to reduce the high prices that the incumbents will exact at the point of interconnection. In Knysna's case, the only way to bypass the incumbent operators is to build its own national network, which is financially non-feasible.

The dominance of the mobile operators means that there is no commercial solution to the problem of interconnection for models such as Knysna. The incentive for the mobile operators is to exclude new entrants by charging high termination rates. This puts greater emphasis upon a regulatory solution such as cost-based interconnection pricing.

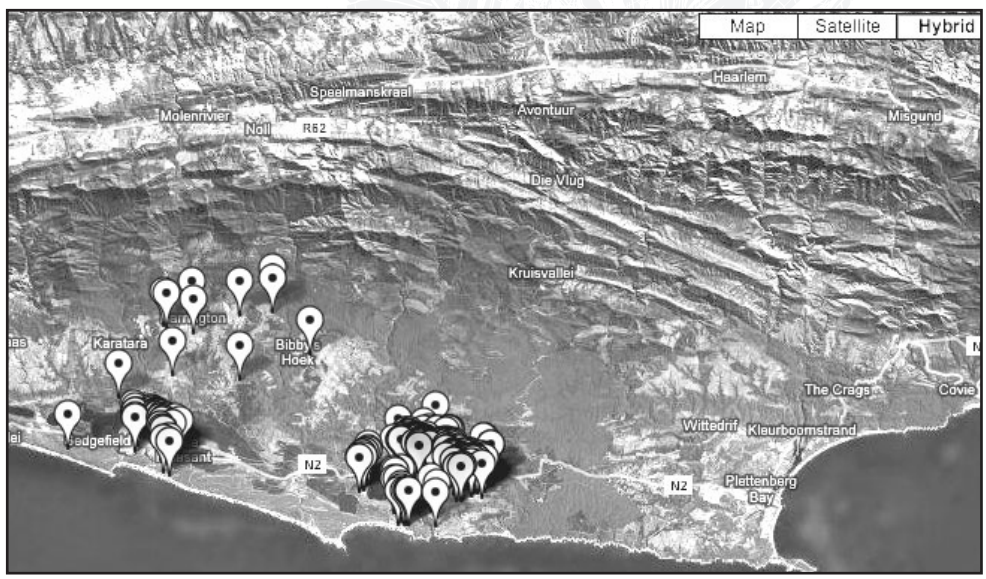
The long-term conclusion, then, is much less optimistic. The likelihood of Knysna being a replicable model is low because access to the national network comes at such a high price. The only alternative is for a regulatory solution, which puts more strain on an already stressed regulator.

This paper starts by analysing the circumstances in which the Knysna Uni-Fi project was started and the innovations that made it such a **municipal** success. It discusses the partnership between the local authority of Knysna on the one hand and infrastructure and services provider UniNet on the other. The Uni-Fi project now provides quality communication services at affordable rates to the Knysna community. With this initiative Knysna became the first city in South Africa with Wi-Fi coverage. The paper then argues that Knysna cannot claim to be a **commercial** success because of the regulatory environment in which it finds itself. Three operators who are incentivised to prevent low-cost interconnection – a fundamental requirement for the commercial replicability of Knynsa – dominate the South African telecommunications environment. The only solution available is a regulatory one. The paper ends with a brief call to action on the part of the regulator.

The UNI-FI Project in Knysna

Knysna is situated in the Western Cape province of South Africa. The Western Cape is South Africa's third most populous province and economically the second most important after Gauteng. Knysna is a small community of around 40 000 permanent

residents. Its major income is derived from tourism and timber. The map below locates it on the Western Cape coast. Its nearest neighbours are George and Plettenberg Bay. It is connected to other towns and cities via the N2 highway, which runs right through the town's central business district. The 'teardrops' represent Wi-Fi locations around the municipality of Knysna. The furthest Wi-Fi spot is in Sedgefield, about 20 kilometres away from Knysna.



Source: UniNet Mapping Software http://maps.uninet.co.za/map.php

Public-Private co-operation with local government

The Knysna Wi-Fi project is best described as a public-private partnership (PPP) between the town council of Knysna and UniNet. The town council of Knysna put out a public tender that was innovative in that it included both local Government as well as commercial requirements. The local Government requirement was for all the branches of the municipality to be connected, including geographically isolated branches such as Sedgefield, which is about 20 kilometres from Knysna (UniNet, 2005). Commercial requirements included the ability to provide free VoIP calls and Internet hotspots within the municipality.

UniNet proved to be able to deliver the best pricing and quality guarantees (Jarvis D, 2005 personal interview, 04 November). It adopted a two-phase approach, with the first phase being the connecting of the branches of the municipality and the second phase the provision of commercial services. The network in this case is the property

of UniNet. UniNet maintains the infrastructure installation, the linking-up of clients, the billing and the revenue streams.

However, in view of the special relationship with the city of Knysna, more is at stake here than the usual commercial Wireless Internet Service Provider (WISP) selling its services. The council is the largest client and its key aim is to lower the municipality's communications costs. UniNet guarantees Quality of Service (QoS) to the municipality. But it also has to meet certain obligations with regard to universal access and social and economic development of the city. There is, after all, a significant poverty gap in Knysna (Jarvis D, 2005 personal interview, 04 November). UniNet has certain network obligations in the informal settlements and rural areas around Knysna.

The council, too, has obligations, in the form of monthly payments to UniNet. The 'last-mile managed services' that UniNet delivers have been split into various levels, where the first level is pure connectivity from point A to point B etc. for a network of 62 points – in other words, the creation of a virtual private network (VPN). UniNet also provides other layers of service such as Internet or VoIP (Jarvis D, 2005 personal interview, 04 November). The council can make free use of these services within its own network. For connections outside the network, UniNet in each case places these service layers in a separate agreement. A major requirement for the success of the partnership is the support of the council in building the network. This takes the form of making the high-lying areas such as (water) towers around Knysna available to UniNet. For a local provider such support is essential, as one cannot otherwise gain access to these strategic spots (Jarvis D, 2005 personal interview, 04 November). Lastly, the safeguarding of the infrastructure is also taken care of by the council. The land on which the structures are erected remains their property, after all, and the council is also dependent on the infrastructure (Jarvis D, 2005 personal interview, 04 November).

Open source, Open Standard Philosophy

The underlying philosophy of this project is based on the Green Paper for telecommunications of 1995 (Republic of South Africa, 1995). The provisions of fair and universal access in particular were used as a source of inspiration in realising the project (Republic of South Africa, 1995). This document became the White Paper and ultimately informed the Telecommunications Act of 1996. UniNet also had a vision of increasing the social, economic and political participation of local communities with regard to access to communication networks. This is especially

true for communities that were disadvantaged by the traditional service providers. By offering affordable communication services, UniNet wishes to make a contribution to decreasing the inequality in access.

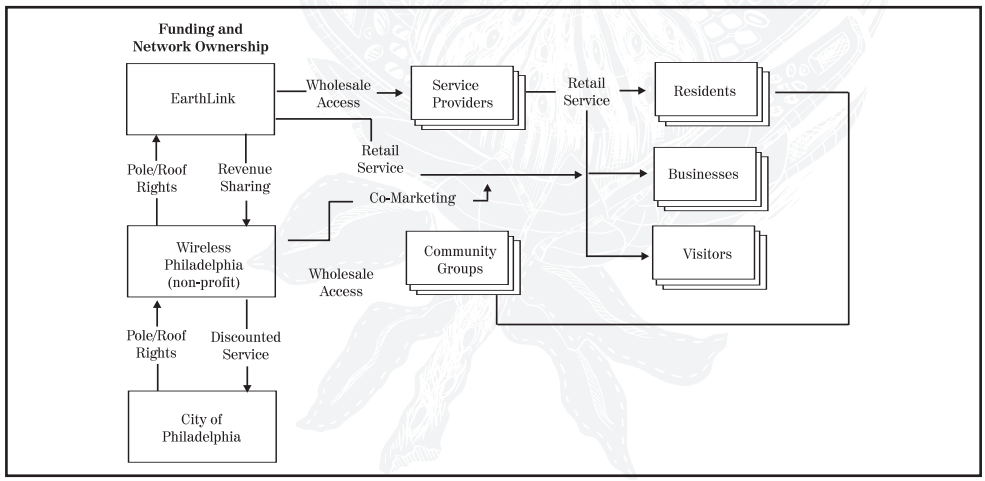
The local connection network in Knysna is based on Wi-Fi. And despite the technical limitations it is still the preferred network due to the underlying 'open source, open standard' philosophy (Jarvis D, 2005 personal interview, 04 November). The business model and systems of UniNet are also based on this community-driven approach. It was chosen over WiMax not because this standard was not available at the time, but because of critical considerations. For example, WiMax is significantly more expensive than Wi-Fi, and the Customer Premises Equipment (CPE) using WiMax has limited functionality (Jarvis D, 2005 personal interview, 04 November). WiMax is driven by large chip manufacturers, operators and the like that want to push their standards on the market. With Wi-Fi, on the other hand, there is no commitment to a single set of providers. The only real advantage of WiMax lies in its non-line of sight ability, which removes the need for high points for the antennas. This advantage has to be weighed against the low cost of installation for Wi-Fi in comparison to WiMax (Jarvis D, 2005 personal interview, 04 November).

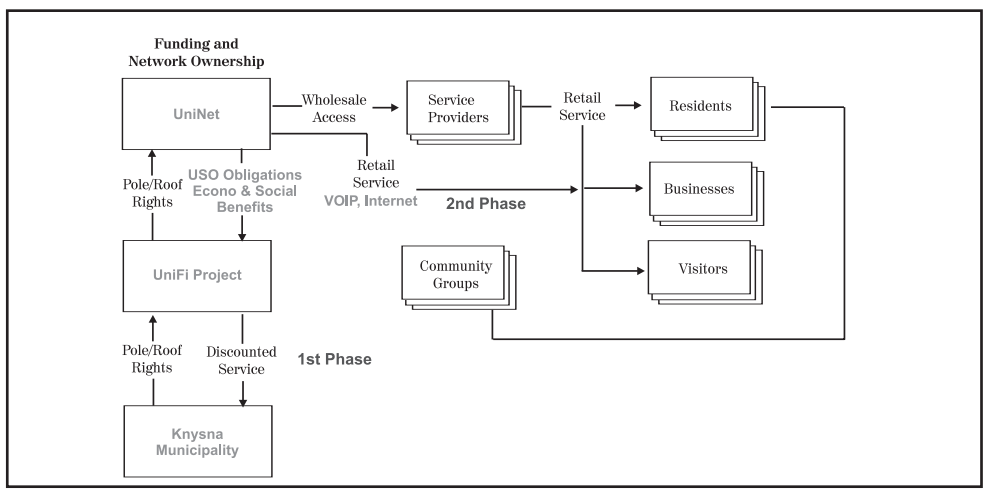
Origin of the Business Model

According to David Jarvis, UniNet grew from the idea of installing educational video channels via satellite in informal settlements. The first experience was gained with a wireless project in Maputo, Mozambique. As Internet Service Provider (ISP) a model was designed in which the needs of the city were taken into account. This resulted in a business model that strongly resembles the model of Wireless Philadelphia (Jarvis D, 2005 personal interview, 04 November). In 2002, UniNet was established in Cape Town as a Black Economic Empowerment (BEE) ICT operation. UniNet was to be the medium through which the business model was to be applied in practice. To that end, a Value-added Network Service (VANS) licence was awarded to the initiative. The figure overleaf depicts the business model of Wireless Philadelphia as a reference model to explain the Uni-Fi project. Naturally, this comparison needs to be qualified. Wireless Philadelphia has much more experience and covers a much larger area, and the points of departure of the two projects are totally different. On the one hand we have a prosperous metropolis, wealthy and in an urbanised area. On the other hand, a development context, small-scale, rural and with a substantial part of the population living in poverty. Neither do we see explicitly, in the Knysna project, the non-profit component, and co-ordination and

training by the community. It does show, however, how one more or less identical model is arrived at from two totally different perspectives.

Comparison of Wireless Philadelphia and Uni-Fi Project business models





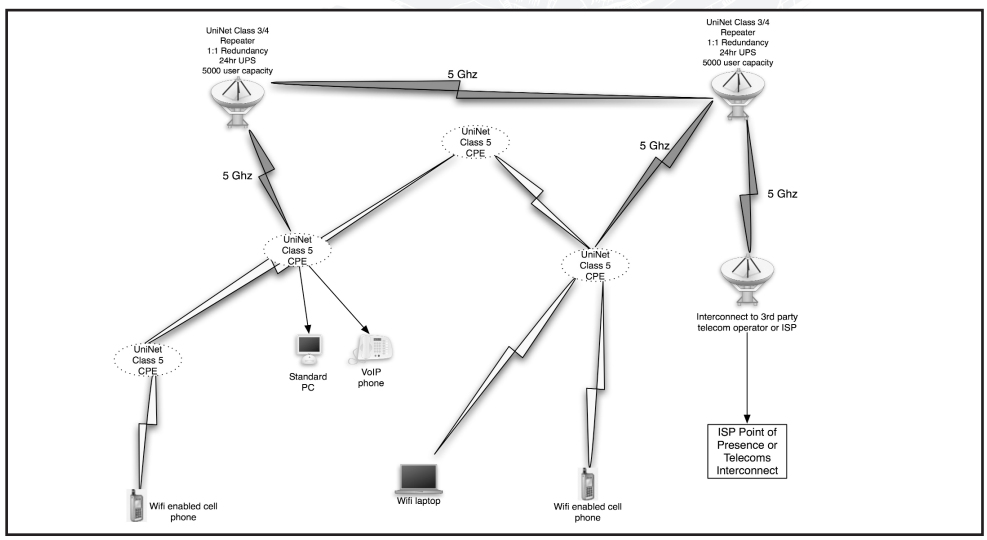
Source: Based on a presentation by Richardson, G. (2005)

Network Specifications and Services

UniNet designs and builds private network infrastructures and software in co-operation with local partner RedLinX. The Metropolitan Area Network (MAN) in Knysna was built on the basis of an improved Wi-Fi standard that can also be viewed, as regards functionality, as a kind of pre-WiMax (Jarvis, 2005). The first phase was the city network, which was concluded in October 2005. Sixty-two town council connections were connected using 1Mbps connections. CPE consisting of one

5.8GHz fixed-wireless directional antenna (802.11a) was used. In addition to this, the repeaters (point-to-multipoint) had a range of 16km. The point-to-point backbone network can bridge up to 100km by making use of 2 x 45km antennas, line of sight. In addition, each CPE also has one 2.4GHz sector antenna (802.11b/g) for the local hotspot with a reach of 1,5km. In the last segment an extra fixed line is also provided. The network uses little power and works on solar energy.

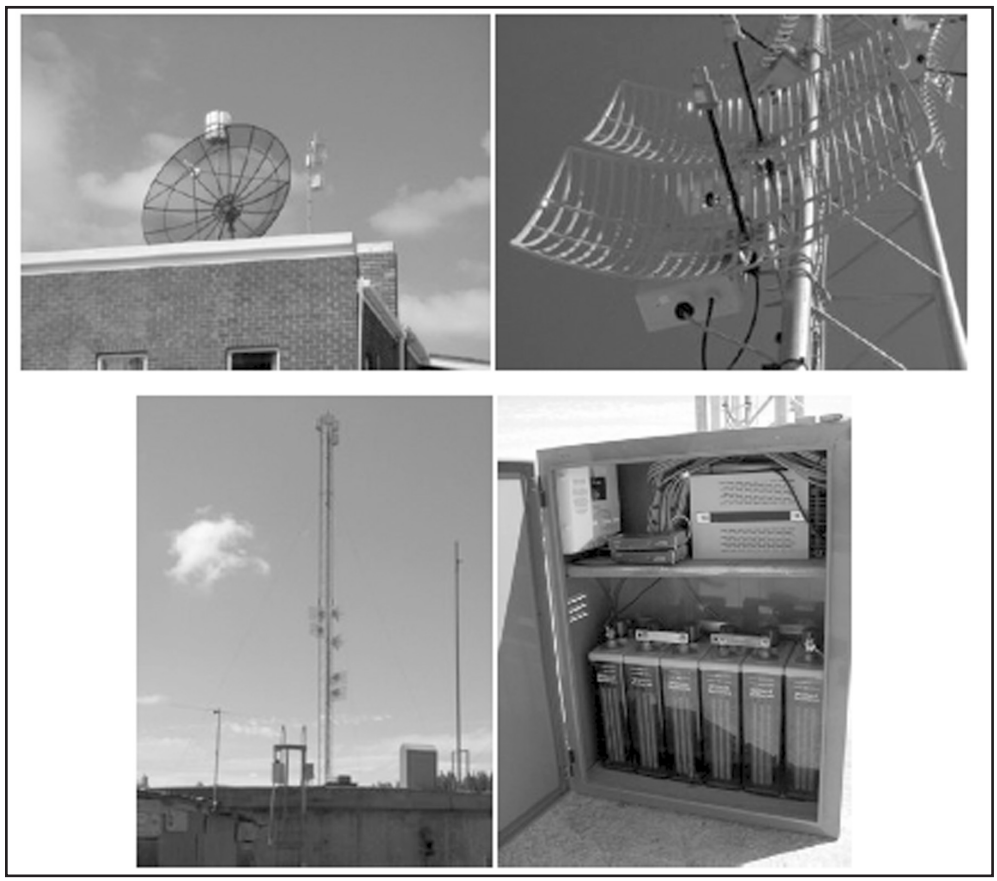
Network Topology Knysna



Source: Based on a presentation by Jarvis (2005)

The council uses the VPN connectivity for Internet, an intranet, and VoIP Emergency calls are also conducted by means of the same network. The figure above shows a schematic representation of the network.

As a second phase of the Uni-Fi project, the commercial network was delivered at the end of 2005. It provides access to broadband services to all residents of Knysna and at the moment covers 90% of the area. The commercial objective of the project is twofold: Firstly, to provide private users and consumers with free VoIP and low-cost Internet. Secondly, to provide wholesale services for ISPs. This has been the least successful component of the project. Local ISPs viewed UniNet as a competitor rather than as a wholesale service provider (UniNet, 2005, p.46). Ironically, it became vertically integrated by offering retail and wholesale services – precisely the tactic adopted by Telkom, though on a far larger scale. UniNet is now looking to sell its retail services and only offer wholesale services to solve this problem.



From top left to bottom right: Photo 1: UniNet satellite dish for international communication on a building in the city of Knysna; Photo 2: Directional, 5.8GHz point-to-point grid (backbone infrastructure); Photo 3: Repeater tower with 5.8GHz grids for fixed wireless and 2.4GHz sector antennas for local hotspot; Photo 4: Switch, energy source and batteries with charger.



From top left to bottom right: Photo 5: Omnidirectional reach through a combination of different sector antennas; Photo 6: UniNet Cape Town manufacturing; Photo 7: Community Library of Knysna with broadband installation; Photo 8: Sender-Receiver CPE; Photo 9: Informal settlement in Knysna with UniNet broadband coverage; Photo 10: Residential area in Knysna with UniNet broadband coverage.

Policy and Regulatory Aspects

At the time that the contract was awarded, under the 1996 Telecommunications Act, UniNet had a VANS licence with which it was able to offer network services, but not to build its own infrastructure. Prior to September 2004, Telkom argued that VANS remained obliged to offer services via Telkom's infrastructure or that of the other

Public Switched Telecommunications Service (PSTS) operators, and that they may therefore not provide their own infrastructure (Republic of South Africa, 1996).

A second problem was that Knysna did not have a Private Telecommunications Network (PTN) licence. Strictly speaking the city did not need one because Knysna was regarded by ICASA as a "contiguous piece of land" and there is consequently no interconnection with other networks (Du Plessis H H, 2005 personal interview, 11 November).

However, UniNet and not the municipality built the network infrastructure, and there was interconnection without a PTN licence. This was the basis for Telkom to oppose the Uni-Fi project and for ICASA to confiscate equipment.

In the context of the opening up of the market for more competition, the Communications Minister, Ivy Matsepe-Casaburri issued a ministerial decree that from 01 February 2005 VANS would be allowed to transmit voice traffic over their own networks. In the same ministerial statement it was also stipulated that it was possible for VANS, PTNs and mobile telephone service providers to resell the surplus capacity on the network. ICASA, who was hoping to further accelerate market liberalisation, interpreted these stipulations widely by stating that VANS could build their own infrastructure to provide for their needs, independently from Telkom.

This ministerial decree formed the basis for the Uni-Fi project in Knysna. Unfortunately, the effect of policy incoherence was that a press statement was released on 31 January 2005 stating that it was never the Minister's intention to allow VANS to become self-sufficient. This came as a surprise to ISPs and gave rise to enormous confusion. The argument, which smaller ISPs such as UniNet supported, was that the press statement issued by the Minister had no legal force in the face of the ministerial determination (McCleod, 2005). According to Jarvis the confusion was therefore spurious and merely served as ammunition for Telkom.

He was correct. The press statement by the Minister had the affect of shutting down any self-provisioning plans by ISPs. But the affect was farther reaching than mothballing business plans. It entrenched the belief amongst ISPs that there was no point in challenging the Government because the rules of the game changed to suit Telkom at every point.

This meant that UniNet became the only ISP to openly defy the authorities and build its own network. Prior to the press statement of 31 January 2005, this would have been sufficient to close the Uni-Fi project down. But three factors meant that the incumbent largely ignored the project. Firstly, the Electronic Communications Act was in draft form. The purpose of the draft bill was to align South Africa with the

global technological trend towards convergence. The traditional vertical licensing structure would be abandoned in favour of a horizontal simplifying structure with only three categories of licences: network, services and broadcasting. Under this framework it was quite possible that UniNet would get a network licence as well as a service licence.

Secondly, a sea of change had occurred with the balance of power transferring from the fixed-line operator to the mobile operators. After 1999, the number of subscribers on mobile networks had shot through the roof, while the Telkom subscriber numbers languished. Any network with hopes of competing with the incumbents would have to connect to their networks. The alternative was to offer access to a very small number of people – an anathema to an industry that is all about network externalities. If UniNet was to be commercially viable, the overwhelming majority of people within Knysna would have to own two phones (or have access to two phones): a VoIP phone for calls on the UniNet network and a mobile phone for calls to everyone outside of the geographic area of the UniNet network in Knysna. This is not a likely scenario in a community, where there are high-income disparities.

The third factor was that the mobile operators had hiked interconnect rates by 515% between 1999 and 2001 (ICASA, 2007). The increase was based on the threat of competition from the third mobile operator, Cell C, which was finally licensed in 2002. While the hike was not directly intended to exclude other new entrants, this has been the effect.

The net result was that the Uni-Fi project was caught between a rock and a hard place. On the data side it is forced to use the Telkom network at some point to gain access to the Internet. Providing an Intranet would save the Knysna municipality a lot of money, but did not make the Uni-Fi project any more commercially viable in the long term. On the voice network, it is reliant upon interconnection to either the Telkom network or to the mobile networks, at highly inflated prices.

Regulatory Theory

Nearly all regulators realise that the most effective mechanism to achieve affordable pricing and high penetration levels is competition. Competition delivers on these policy objectives by encouraging innovation and allowing the process of creative destruction to take place:

> "A commonsense appraisal of real-life experience – the comparison of productivity growth in countries with and without competitive market systems; Microsoft's

> efforts to use its dominance of the PC operating systems market to deny potential competitors access to related markets and to venture capital; the rapid introduction of new electric generating technologies when competition was opened up in the electricity market; the innovative services offered by the airline industry when competition replaced regulation; the flood of innovations when the monopolies of BT in Britain and AT&T in America were successfully challenged – all suggest that competition means a fiercer gale of creative destruction of old technologies than does the cosier world of cartels and monopoly"(Stelzer, 2007, p.143).

Internationally, one of the main goals for municipalities to provide Wi-Fi networks is to encourage innovation and which, in turn, spurs economic growth (Van Audenhove *et al,* 2007). If creative destruction is going to be allowed to operate within the telecoms arena in South Africa, then dominant practices by incumbent operators that prevent competition have to be curtailed. Along with the market definition process as laid out in the EU's Access Directive, the open access model is gaining momentum as a potential solution to the problem of ensuring that new entrants are able to enter a market that exhibits high structural barriers to entry. Cave (2006) provides a cogent explanation of the process of getting new entrants to increasingly invest in infrastructure and thus lay the foundation for competition to incumbents (and thus for the process of creative destruction).

What is remarkable about the Knysna Uni-Fi project is that investment has taken place outside of any national framework for investment. In fact, the practical reality is that investment in the sector by new entrants has been actively discouraged, either through law or by policy fiat. However, as Cave (2006) points out, a hierarchy of infrastructure assets can be made based on the ease of replication. What is lacking in Knysna is the ability to break out into the national network and the key obstacle to this is the lack of any effective and enabling regulatory framework.

What is needed is a dynamic approach to regulation as demand changes and costs vary according to innovation. The recently released draft interconnection and facilities leasing regulations provide a step in the right direction by providing access to facilities of dominant operators, but these regulations exist in a policy and regulatory vacuum. There is no clear statement of intent by either the Government or the regulator to encourage access for new entrants.

Conclusions

Given the odds against municipal networks, it is remarkable that the Uni-Fi project has been at all successful. A significant factor in the Uni-Fi project's success is the

innovative attitude of the Knysna municipality. This article has been focused primarily on the technological innovations within the policy and regulatory strictures of South Africa's telecommunications reform process. But some of the innovations were around the structuring of the relationship between the municipality and the service provider and deserve mention. There was a high level of trust between the parties early on since the municipality was obliged to offer a deposit of over 70% of the contract value at the beginning of project in order for UniNet to purchase the equipment (UniNet, 2005, p. 40).

But the primary focus of this paper has been whether or not the Knysna model is a replicable one. Can the model be repeated in other municipalities around the country? From a technical point of view, the answer is affirmative. The technology is reliable and has a long track record. Financially, from the perspective of the Knysna municipality, the answer is also positive. They have reportedly saved millions, as well as received higher quality communications and with greater functionality.

From a commercial viewpoint, the answer is less clear. Certainly it seems that UniNet has made money out of the project. But the return on investment has also been disappointingly low. The main reason is that UniNet was relying on two streams of income: from the municipality and from businesses and consumers in the area. It is the second stream that has failed to live up to expectations. Local ISPs initially saw UniNet as a competitor rather than as a supplier. Small business also adopted a wait and see attitude – waiting to see if UniNet was a sustainable business in comparison to the established brand names.

However, it is the policy and regulatory environment that has mainly worked against the possible replicability of the Uni-Fi project. February 2005 represented the perfect opportunity to open the telecommunications sector to further competition. Yet Government prevaricated and the window of opportunity passed. The balance of power is now in the hands of three incumbents, each of whom is incentivised to act in concert and create high barriers to entry. The 515% increase in interconnection rates is a case in point (ICASA, 2007).

The three incumbents dominate the market to such an extent that a commercial solution to the interconnection problem is not possible. This means that the only mechanism to encourage sustainable, long-term competition is a regulatory one. On this front there are some positive developments. The Electronic Communications Act of 2005 has the potential to create the environment for competition but requires a highly resourced regulator. The regulator has recently released draft interconnection, facilities leasing and essential facilities regulations. Based on the

processes of Chapter 10 in the EC Act, the draft regulations allow intervention in markets where dominance and ineffective competition have been found.

The regulator has to balance competition and investment in the sector. At the moment, the balance is so skewed towards the incumbents that new entrants in the national market stand no chance. The national success of Knysna-like projects is dependent upon regulatory intervention that supports new entrants, and since there is little sign of any coherence entering the telecommunications policy at the moment, the replicability of the Knysna model is under question. ❑

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