

Survival of National Research and Education Networks (NRENs) in a competitive market of Africa: A Case Study of the Zambia Research and Education Network (ZAMREN)

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Abstract

The proliferation of not for profit associations called National Research and Education Networks (NRENs) on the African market particularly in the area of Broadband Internet provision has made commercial Internet Service Providers (ISPs) develop apprehensions against NRENs. What is happening is that NREN's are being viewed as competitors by commercial ISPs. However, the truth of the matter is that commercial ISPs should consider NRENs as incubators of technology users that will grow their market base. In the absence of this realisation by commercial ISPs, NRENs are likely to face stiff competition which will in turn adversely affect the survival of NRENs. This paper suggests measures that NRENs should employ to survive in a competitive African market.

Keywords: Survival of NRENs, Competitive market of Africa, NRENs, ZAMREN, ISP

1. Introduction

In Africa and particularly Zambia, the area of Internet provision has in the past years been dominated by commercial ISPs until fourteen years ago. The first NREN to be established in Africa was Kenya Education Network (KENET) in 1999 and the second one being Tertiary Education and Research Network (TENET) of South Africa which was established in May 2001. During the period when there were no NRENs, commercial ISPs had been reaping huge profits not only from cooperate organizations but also from education and research institutions. For example, in Zambia, the cost of 1Mbps of bandwidth before the establishment and operationalisation of Zambia Research and Education Network (ZAMREN) was between US Dollar five thousand to six thousand (\$5,000 to \$6,000). This has now dropped to US Dollar nine hundred (\$900) and is further likely to drop once the AfricaConnect project is completed. This

development has created apprehension among commercial ISPs and has also resulted into a very stiff competition among commercial ISPs.

In general, NREN's Internet commodity is subsidised through donor and Government support established through partnerships within the country and outside the country. For example, the operationalisation of the Zambia Research and Education Network (ZAMREN) was supported by the Netherlands Government through its agency, NUFFIC through a total funding of about Euro two million two hundred forty nine thousand, while the UbuntuNet Alliance is providing peering services at the London and Amsterdam Internet Exchanges (Martin,2012). The Government of Zambia through an ICT regulator, Zambia Information and Communications Technology Authority (ZICTA) funded the cost of last mile connectivity for University of Zambia, Copperbelt University and Mulungushi University at a total cost of US Dollar five hundred twenty (US\$520) and a further US Dollar three hundred sixty thousand (\$360) for the AfricaConnect project. Zambia Electricity Supply Corporation (ZESCO) is providing 1.5Gbps bandwidth for local transit at no cost and the three major public universities, University of Zambia, Copperbelt University and Mulungushi University are also supporting ZAMREN in different forms.

Other notable NRENs that have been established through similar mode of funding like ZAMREN and are thriving in Eastern and Southern Africa include the Kenya Education Network (KENET) of Kenya, received a total of funding of US Dollar one million for its establishment from USAID and the Tertiary Education and Research Network (TENET) of South Africa, which was established through grants from the Andrew W. Mellon Foundation and the Atlantic Philanthropies totaling about US Dollar two million.

NRENs develop many specialised and advanced services for research and education communities as well as developing a pool of world class technical experts (ASPIRE, September 2012) which commercial ISPs find hard to provide. An example of an advance service which NRENs have installed and are providing to their users is the Education Roaming (EDUROAM). This service provides accessibility to ICT services to mobile users wherever the service is available without a user having to pay for connectivity. Furthermore, NRENs provide capacity building in form of skills transfer to most of their member institutions through different technical trainings at almost no cost to the institution. The concept of skills transfer is meant to empower institutions to manage their network resources well and also to offer user support. By their nature, NRENs are well placed to form linkages with other NRENs within Africa and outside Africa which supports capacity building as well as accessibility to aid. All this is lacking in commercial ISPs. Any technical support and training that commercial ISPs offer has to be paid for by the client.

As a result of the above, NRENs are able to provide low prices for broadband Internet connectivity to education and research institutions which traditionally have low Internet budgets and some are in geographically difficult areas which commercial ISPs cannot reach.

2. About Zambia Research and Education Network (ZAMREN)

Zambia Research and Education Network was registered in the year 2007 as a not for profit association and was operationalised in June 2012 when ZAMREN was connected to UbuntuNet Alliance PoP in South Africa. ZAMREN is the first and until now, it remains the only NREN land locked/linked to operate a cross border network connecting to UbuntuNet Alliance PoP via Mtunzini U-HUB (Martin, 2012). The bulky carrier of ZAMREN's Internet commodity is the CEC Liquid Telecom as known in Zambia. It has six (6) full time employees. Its network is currently concentrated in three provinces/regions, namely Lusaka, Central and Copperbelt.



Figure 1: Map of Zambia showing Provinces

Currently ZAMREN has a total number of twenty active members and seven passive members. The passive members are those institutions which have applied for membership and have paid for their full membership but were not accessing any of ZAMREN's network services. While active members are those institutions that have applied and paid for their full membership and were accessing ZAMREN's network services.

The total international capacity for ZAMREN stands at 200Mbps while its local Google cache capacity varies between 60Mbps and 100Mbps. ZAMREN is poised to grow its membership base to thirty (30) by 31st December, 2013. Figure 1.0 below shows ZAMREN's active membership and their current bandwidth utilisation.

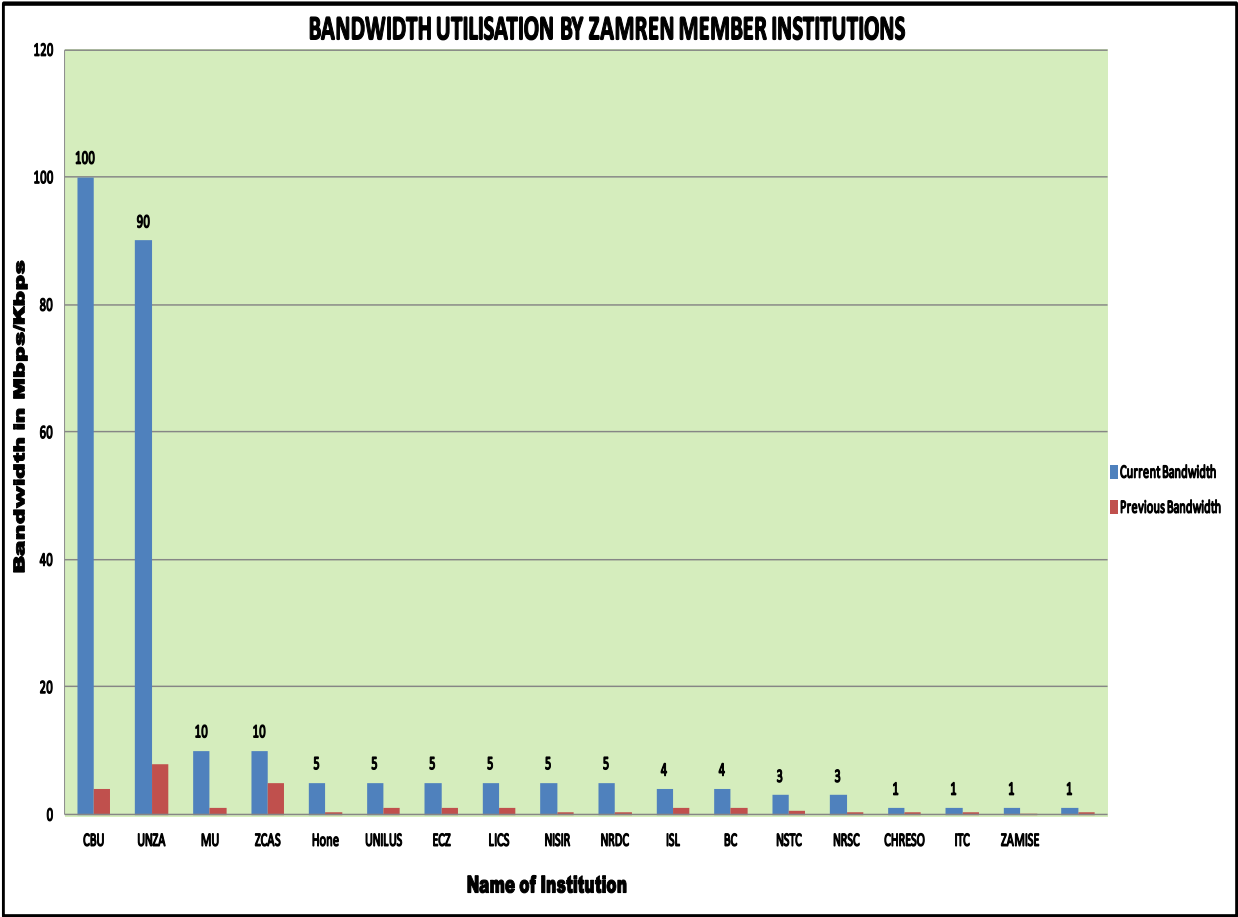


Figure 2.0: ZAMREN’s membership and bandwidth utilisation

3. The Problem

Since the formation and operationalisation of ZAMREN, Zambia has seen an increase in the uptake of Internet among education and research institutions. In the past, bandwidth was exorbitant for most education and research institutions (Mbale, 2006) and the highest bandwidth was procured by the University of Zambia (UNZA) at 8Mbps, Copperbelt University (CBU) at 4Mbps and Mulungushi University (MU) at 1Mbps. The rest of the institutions used to procure bandwidth in Kbps. With low bandwidth pricing being offered by ZAMREN the scenario has now changed with the least institution procuring 1Mbps of bandwidth while the Copperbelt University is leading with 100Mbps. The Internet is provided only at workplaces while most users of this Internet have become mobile and they want to be connected all the time and anywhere. Because of the good speeds that ZAMREN is providing, users want an NREN network that is available, reliable and usable (ARU). Institutional users need more support from technical staff to enable them use the Internet fully while their technical staff also require more skills to manage the bandwidth. On the other hand we see commercial ISPs providing WI-FI Internet through the use of Dongles and 3G to all mobile users while NRENs do not provide this service to mobile users.

Arising from the above, commercial ISPs view NRENs as their competitors who are there to take away their much dominated market share for some years now. On the other hand, NRENs aim at making broadband Internet connectivity affordable for the education and research institutions and also to incubate students to become potential consumers of Internet for commercial ISPs upon graduation. Commercial ISPs are also lowering bandwidth prices to remain afloat creating a situation where bandwidth pricing will no longer be a factor but services being offered. Additionally, commercial ISPs are working hard to win back their lost customers with other incentives that would lure the customers to their side.

4. The Approach

Realising the above problems, the researcher decided to conduct a survey to elicit client's views from amongst ZAMREN members through a questionnaire and a total of thirteen questionnaires were sent. The specific objectives of the survey were to obtain the views of ZAMREN members on the services being offered by ZAMREN, their levels of satisfaction with services being offered by ZAMREN, the period they had been with ZAMREN and the reasons they had been changing ISPs, if they were happy with ZAMREN's Internet provision and pricing, the amount of bandwidth they procured before ZAMREN and the bandwidth they were procuring from ZAMREN, if their complaints were being handled professionally and technically, if they could rate what mattered to them in terms of (bandwidth pricing, stable Internet connection, value added services and technical support) and if they could recommend ZAMREN to other education and research institutions that haven't joined ZAMREN.

A different questionnaire was sent to three Chief Executive Officers (CEOs) of Kenya Education Network (KENET), Tertiary Education and Research Network (TENET) of South Africa and Tanzania Education and Research Network (TERNET). The CEO's questionnaire was based on the period the NREN has been in operation, mode of funding for the start up of the NREN and the current, the total bandwidth capacity for the NREN and whether the NREN had backup for international link and its capacity, if the NREN was in position to provide Internet to mobile users using 3G, WI-FI and Dongle technology, staffing levels, staff retention and motivational strategy in place for the NREN, the NREN's employee turnover and the services that the NRENs provided to distinguish them from commercial ISPs.

The outcomes of the two questionnaires form the basis for discussion of this paper.

5. The Outcome

The study established that for NRENs and in particular ZAMREN to survive in this competitive market, there must be a paradigm shift and the following must be considered:

- i. NRENs need to change their focus from low pricing strategy to service based strategy. NRENs stand better chances of locking their members because, NRENs are education and research associations by nature and who understand their client's need better than commercial ISPs.
- ii. For NRENs to survive in this harsh market, NRENs should plan for provision of stable Internet connectivity through acquisition of two commodity links where one commodity link is a back up to another link. TENET and KENET have both back up links. TENET

links are 10 Gbps on WACS spending about USD 250,000 per month and 10 Gbps on SEACOM for maintenance only and spending about USD 50,000 per month (IRU type capacity). KENET links are TEAMS at 1200Mbps spending about \$ 19,791 per month and SEACOM at 750Mbps spending about \$ 9,492 per month. Currently, ZAMREN has only one commodity link which runs from Lusaka to Johannesburg in South Africa. This obviously puts ZAMREN at a disadvantage position as most commercial ISPs have two or more commodity links. And most of ZAMREN's member institutions who responded to the questionnaire echoed the same sentiments that they wanted a stable Internet connectivity with dedicated bandwidth and that Internet bandwidth pricing was not a factor when choosing which ISPs to contract. ZAMREN's benefit is that it provides dedicated/uncontended bandwidth while most commercial ISPs provided shared/contended bandwidth and in some worst scenarios Internet bundles with bandwidth capacity limitations of 256Kbps and these often suffer from congestion due to high contention.

- iii. On services, NRENS need not offer the same services as commercial ISPs who have fixed service portfolios such as webhosting, e-mail hosting and relaying, anti-virus and spam filtering. These are traditional services and virtually offered by all commercial ISPs. However, most correspondents to the questionnaire said that ZAMREN's services were outstanding as ZAMREN was able to provide capacity building through trainings and technical support to its member institutions, the services which they could not obtain from commercial ISPs at no cost. And one of the most outstanding services which member institutions had shown a lot of zeal to have soon was EDUROAM. This service provides connectivity to Internet based services wherever the service was deployed within the country and outside the country at no cost to the user of the network. This service distinguishes ZAMREN from other ISPs. ZAMREN has deployed this service in three institutions, UNZA, CBU and MU with the assistance of its NUFFIC project partner and plans are under way to deploy it in other member institutions.
- iv. Robust services such as federated identity must be considered by NRENS. This is a unique service and it should be treated as a must have service by NRENS to survive in this competitive market. Other upcoming services of commercial value to member institutions which NRENS need to embrace fast are the Cloud Computing (CC) and High Performance Computing (HPC).
- v. NRENS must also pioneer the use of dongles through their mobile Internet users by partnering with chip designers. While this is a huge challenge, the truth is that most NRENS provide Internet services to their users only at their workplaces while commercial ISPs provide Internet services to their mobile users anywhere and anytime through WI-FI, 3Gs, 4Gs and Dongles. This is a challenge to NRENS as Internet users desire to have access all the time. The question is "What should NRENS do in this case?"
- vi. Whilst NRENS may provide stable connectivity through back up links, distinguished services but it does not take good care of its employees, the NRENS may suffer from high employee turnover. TENET and KENET offers good examples where their employee turnovers are one and two per year respectively. Employees need to be motivated and motivation is in different ways. As the case is with TENET and KENET where the two associations provide competitive salaries for their employees through benchmarking of salaries with other institutions of similar trade, other NRENS need also to learn from these two well established NRENS in Africa. Both NRENS provide mobile phones and

airtime to their employees to ensure that their employees are able to communicate with each other but also with their clients both locally and internationally. Appraisal systems must be put in place to ensure that innovative and high performance employees are rewarded for their hard work and innovative ideas. Exposure visits by staff members must be encouraged as this builds skills levels and also motivates employees to learn from others.

6. Conclusion

The results of this paper will help African NRENs to well position themselves and survive in a competitive market of Africa. For an NREN to survive, it ought to satisfy its member institution/s with one or all of the following:

- i. **Stable Internet Connection:** Intermittent Internet connection frustrates its users and this has been the main cause of institutions changing ISPs. Almost all the ZAMREN member institutions that responded to the questionnaire have changed more than one commercial ISP. It is important that NRENs should have two or more back up international links to ensure stable Internet connectivity.
- ii. **Advanced and Value Added Services:** Distinguishable services like EDUROAM, Federated Identity will soon make not only ZAMREN but other NRENs in Africa popular among the academic fraternity and student populace as more and more of this user type becomes mobile and desire to remain connected at no cost.
- iii. **Low Bandwidth Pricing:** While a tradeoff cannot be made between stable Internet connection and low bandwidth pricing, high cost of broadband connectivity on the other hand has been a hindrance to most institutions in Zambia to have Internet. The emergence of ZAMREN as an ISP has brought relief and the desire for member institutions to have more bandwidth at low cost thereby promoting the spirit of research and publication in Zambia.
- iv. **Technical Support:** The technical skills levels in most of ZAMREN's member institutions are very low to manage the increased bandwidth being provided by ZAMREN. By offering different trainings, ZAMREN is building the much lacking skills in its member institutions.
- v. **The use of dongles using either 3Gs or 4Gs should be pursued with a lot of vigour by engaging chip designers to explore this technology.**
- vi. **Retention strategy and staff motivation should be in place to avoid high staff turnover. The cost of training new staff and adaptation to the new environment by new staff is a cost to the NREN considering the nature of the operations and skills required to perform the job.**

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Biography

Stein Mkandawire is the current Chief Technical Officer (CTO) of ZAMREN in Zambia who is on a three year leave of absence from the Copperbelt University, in Kitwe Zambia where he served the University for close to ten years. He holds an MSc. in Data Communications and Software Engineering from Makerere University in Uganda, a BSc. in Computer Science and a Diploma in Mining Metallurgy both obtained from the Copperbelt University. His first publication was Managing Spam through mapping anti-spam software to e-mail policy. He is married to Cecilia Mwamba Mkandawire with four children, two boys and two girls.