Gleaning from Pro-Poor ICT Experiences to Address Challenges Faced by Uganda's Nascent Research and Education Network

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Abstract

Research and Education Network for Uganda (RENU), was started by the forum for Vice Chancellors of Universities and heads of Research organisations, in January 2006. In its first seven years it laid an operational foundation covering institutional identity, legal framework, awareness creation, articulating the rationale for national research and education networking (NREN), initial membership development and experimenting with collaboration through formation of the bandwidth consortium, supporting access to library e-resources and related technical skills development for member institutions.

However, RENU still faces many challenges to its goal of supporting ICT-enabled research collaboration and higher education transformation to attain WSIS goal No. 3 by 2015 (ITU, 2011).

NRENs, like Pro-Poor ICT projects, *are mechanisms for addressing a type of ICT access-gap* to reduce development lag, so parallels can be drawn between the two mechanisms such as:

i. Similar purpose to address development needs through innovative use of ICT.
ii. Similar aim to bridge an aspect of ICT access and utilisation gap.
iii. Common strategic challenges such as policy environments not conducive to needed interventions and infrastructure costs that are too high for target communities.
iv. The need for suitable operational models that enable success and sustainability.

In a resource-constrained environment, pro-poor ICT is a rich source of principles, lessons, experiences and best practice that can shape the strategy to move RENU to sustainable operation. Through a desk review of literature, including a study done in 2005(WOUGNET, 2007) on pro-poor ICT initiatives in Uganda, this paper identifies experiences and lessons that can shape RENU's plan for addressing its strategic challenges and specify an action framework for becoming fully operational.

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Keywords: access-gap, cooperative, sharing-model, competitiveness

1. Introduction

1.1 Introduction to the study

Through an 8-step process, this study aims to identify experiences, lessons and best practice that can help address the current challenges that RENU is facing, especially those that are of a strategic nature and to specify an action framework for making RENU fully operational.

1.2 Method of work

The method used is an eight-step process comprising the following:

i. Carrying out an internal review within RENU by reading many of the documents accumulated in RENU's repository and this was supplemented by talking and listening to RENU staff and board members.
ii. Carried out an external review which involved visiting and talking to some RENU member institutions, line government agencies, partners, potential member institutions and other RENU stakeholders. At least ten campuses were visited, among other organisations.
iii. The information gathered from the reviews was analysed to establish issues, strengths, weaknesses, opportunities and challenges.
iv. From this information, strategic challenges were identified.
v. Meanwhile, there were two steps of review of literature namely pro-poor ICT literature and key performance factors drawn from reviewing websites of three established NRENs and literature on competitiveness.
vi. The strategic challenges were combined with experiences, lessons, key performance factors and/or best practices.
vii. The above information was considered together with basic value chain analysis to define an action framework for RENU.

1.3 Overview of National Research and Education Networks (NREN)

National research and education networks (NRENs) are a globally acknowledged mechanism for ICT-enabled support for Research and Higher Education Collaboration. Establishment of an NREN in each country is part of WSIS target No.3[1] which is linked to millennium development goal No.8 and can also be a follow-on action for goal No.2

NRENs have been a major driver of research development and education transformation in many developed economies. Where they have been fully harnessed, NRENs have caused extensive growth of the information society, knowledge-based economies and also resulted in much greater

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utilisation of the Internet for economic purpose as well as more affordable access to the Internet for end users.
Research and Education Network for Uganda (RENU) is Uganda's Nascent NREN that was established by the forum of Vice chancellors and CEOs of research organisation during a 2-day workshop in January 2006.

2. RENU Background.

In this section an institutional background that is specific to RENU as Uganda's national research and education network is provided, covering vision, purpose, objectives, current operational status including achievements, general challenges identifying those that are of strategic nature.

2.1 Phase-2 Vision and Mission

Vision: During this second phase, RENU envisions Ugandan Researchers & Universities leveraging ICT to be fully integrated into, proportionately contributing to and benefiting from, the Global Knowledge Society.

Mission: RENU's mission is to progressively harness ICT to enable optimum research collaboration, and transform the delivery of teaching and learning, for faster social-economic development.

2.2 Purpose

The high level basis for NREN development in Uganda is three folds:

- First of all, the primary basis is the millennium development goals through the targets and performance indicators specified by the World Summit on the Information Society (WSIS) Geneva plan of action[1].
- Secondly, NREN development is linked to Uganda's national ICT policy and the Policy for ICT in the Education sector -2006.
- Thirdly and specifically, Uganda's NREN started as a result of a resolution made by the forum of vice chancellors and heads of research institutions during their meeting in January 2006, when they resolved to create the Research and Education Network for Uganda (RENU) as a vehicle to support collaboration among research and higher education institutions (nationally, regionally and globally) in pursuit of the common aim to enhance research output and higher education delivery for the faster development of Uganda.

2.3 Goals, Objectives and Targets

2.3.1 Overall goal

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The overall goal of RENU is to facilitate & enhance ICT-enabled research and education (R&E) Collaboration among Ugandan HEIs & RIs plus collaboration with their regional & International peers.

2.3.2 General Objectives

a) Promote and facilitate research and education networking among Uganda Universities and Research organizations.
b) Create stronger negotiating positions to get better terms in seeking policy adjustments and negotiating R&E partnerships.
c) Explore ways of cost reduction for ICT resources through cooperative negotiation pooling and optimal sharing of resources.
d) Explore ways to collaboratively develop new value-added services as operating environment and available means vary, in support of higher education and research networking in Uganda.

2.3.3 Specific Objectives

a) Ensure that member R&E institutions fully benefit from the AfricaConnect project.
b) Connect all universities, colleges and research institutions to an affordable country-wide high speed fibre-backbone for cheaper & faster national, regional & international collaboration.
c) Facilitate more affordable access to global information & research resources for Uganda's R&E institutions.
d) Serve as a research partner, a test-bed centre and support for developing, deploying & evaluating emerging R&E-enabling technologies.
e) Support capacity development for member institutions in the areas of network engineering, e-learning, content development and content sharing.

2.3.4 Targets and performance assessment

The overall target for NRENs in relation to millennium development goals (MDGs) is specified by the world summit on the information society (WSIS) target No.3 which is "to connect *all* scientific and research centres with ICT" by 2015 (ITU, 2011). Progress towards this target is gauged basing on three performance indicators namely:

i. The proportion of public scientific and research centres (*including colleges & universities*) with broadband Internet access.

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ii. The presence of a national research and education network (NREN) whose quantitative performance is gauged by its aggregate bandwidth (in Mbps) in relation to total number of users.
iii. The proportion of public scientific and research centres with connectivity and Internet access through an NREN.

In the case of Uganda, a sizeable percentage of colleges and universities are private but substantially contribute to the growth of research output and higher education delivery and should therefore be taken into account when setting targets and planning for NREN membership.

2.4 RENU Current Operational Status

2.4.1 RENU's Achievements so far

In the first seven years of its existence, RENU has attained the following achievements:
Established an NREN identity by obtaining Legal and Regulatory documents : MAA, Registration as a not-for profit entity, being recognised by the Ministry of Education and Sports (MoES), Ministry of Information and Communications Technology (MoICT), obtaining an operating license for a national private network. All the above provide basis for legal operation as an NREN.

It has also enlisted 14 member institutions and developed national, regional & international partnerships such as Uganda Communications Commission (UCC) – the national telecommunications and broadcasting regulator, National IT Authority for Uganda (NITA-U), the consortium of Uganda University librarians (CUUL), UbuntuNet Alliance, KENET – the Kenyan NREN, TENET – the South African NREN, Surf Net the Netherland NREN, DANTE, NRSC and IEEAF. RENU has also met the specified requirement for being a participating NREN in the AfricaConnect project.

2.4.2 RENU's Operational Challenges

The Challenges that RENU needs to address include:

a) The unjustified controversy surrounding RENU identity which seems to stem from confusion caused by wrong interpretation of RENU registration and how accounts were initially kept. This was compounded by having private universities (about 70%) among RENU member institutions. The issue of accounting can easily be addressed while having private universities in RENU membership is covered by the foundation documents and can also be easily justified. This position is also supported by the scope specification as given in clause 74 of Measuring WSIS Target No.3.
b) Sub-optimal management of stakeholders' expectations resulting in lethargy and resistance to providing support to RENU.

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c) Changing priority over the years, w.r.t support for ICT in HEIs (even the wording of WSIS targets' was changed slightly to remove specific reference to Universities & colleges, on page 8, target 2) (ITU , 2011) .
d) Conflict of mandate between NREN & other sector players w.r.t delivery of ICT targets to HEIs & RIs. This has been evident when engaging government agencies but was also anticipated by the ITU (2011) op cit "Measuring the WSIS Targets" report (p.4), which recommends either pre-setting the scope for sectors or ignoring and working with the overlap. The report noted that the latter is a more realistic and results oriented approach.
e) Poor cash flow due to a misconstrued operational status (treated by the tax authority as a normal for-profit company w.r.t. tax status). The same lack of clarity on RENU ownership model, business model and corporate identity contributed to resistance of some government agencies to support it and the degeneration of bandwidth consortium agreement with a commercial telecommunications company into a non-functioning partnership that resulted in cash flow limbo.
f) Grossly distorted local connectivity market, where the price of local point to point links is disproportionately priced, in comparison with international links of the same capacity.
g) Failure to achieve synergy from cooperative engagement and collaboration due to sub-optimal human networking.

2.4.3 Strategic Challenges

The above challenges can be condensed into three strategic aspects as follows:

a) Absence of an optimal operating model that clearly defines RENU's business model, ownership model and yield optimal NREN performance in the Ugandan context.
b) Lack of strong ownership and buy-in by some member institutions.
c) Very high cost of access to local infrastructure (especially fibre).

3. Literature Review

3.1 Introduction

In this section, three categories of literature that were reviewed are introduced.

- A number of UNDP funded studies and publications on pro-poor ICT, several pro-poor project cases studies and a paper entitled "an extended sharing model to provide ICT services to the rural poor" were among those reviewed in this category.
- NREN and related literature such as "measuring the WSIS targets", reports and policies relating to ICT for education in Uganda and assessment of governance, infrastructure access and services for two established African NRENs and one established European NREN, were

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also reviewed (Farrell, G. ,2007; Gerste, R. and Zimermann, S. 2005; ZAMREN, 2013; KENET, 2013; Surfnet, 2013).

- A paper, an article and an essay on value chain analysis were also reviewed.

For each of the above three areas of literature review a summary providing Experience, Lessons learnt and best practice was prepared.

3.2 Pro-poor ICT

3.2.1 Experiences from pro-poor ICT studies and initiatives

From the various pro-poor ICT initiative case studies, it is clear that experiences varied from country to country and from project to project. It is thus clear that in determining factors like ownership model, business model and choice of partners, there is no one-fits –all solution. However some experiences were fairly consistent in a number of cases reviewed and these include:

Over-reliance on solutions based on imported technology and innovations often results in partial ability to address challenges. For instance, the pro-poor project reported by DHAN foundation that worked with solutions developed by a local university was able to achieve much *improved infrastructure sharing* and substantial *per-unit cost reduction* in a much shorter time. The project also *benefitted from identifying an appropriate business model* that involved decentralising last-mile provision. It was further observed that *government was reluctant to support needed policy adjustments* for fear of depleting revenue from commercial telecommunication enterprises. This and other factors also gave rise to *hostile incumbent* telecommunications operators who viewed universal access initiatives as encroaching on their territory.

For many pro-poor ICT projects, financial sustainability is frequently a challenge and due to inappropriate project conception, many times the pilot phase is not long enough to provide adequate testing of concepts and often results in failure to observe important lessons.

It was also noted that three variants of community-based cooperative (CBC) ownership models can be adopted depending on the local conditions and operating environment and these are community-based rural local authority-owned; community-driven cooperative enterprise (CBCE) model and community-driven hybrid model (with a combination of community and private investors' ownership). Projects have noted the intrinsic weakness and failure of donor-funded initiatives and therefore have considered the need for incentives to encourage members or users to invest in CBCE

3.2.2 Lessons from pro-poor ICT projects and studies

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The following is a sample from the many lessons that have been learnt by the pro-poor ICT development community:

- In many developing countries, the issues that impede the impact of ICT in development are usually not ICT related, so focus should be put addressing basic development needs and achieving higher economic levels and then ICT usage and growth will be a by-product[4].
- There are a number of advantages associated with Community Ownership for universal access ICT initiatives and these are:
    - Mobilising resources at low or no cost, say through voluntary labour or highly subsidised costs or self-help locally known as *"bulungi bwansi"* which can be translated as Nation's welfare. This ethos is dying out though.
    - Require a much lower return on investment (RoI). Emphasis is put on benefit to the community. Typical RoI for commercial enterprises is 20% while for CBCE it can be between 0 and 5%.
    - For CBCE, services are needs-based and priced according to community means.
    - Surplus is re-invested to grow coverage and introduce new services.
    - Able to address needs unique to members.
    - Experience, skills and knowledge level growth to serve the sectors.

It is important to note some fundamental differences between NRENs and PP-ICT projects and most give NRENs some opportunity advantages:

- Some member institutions, especially those with high enrolment are urban, though a reasonable number of research stations can be rural.
- NREN member institutions tend to have more predictable budgets than pro-poor projects.
- Usually R&E institutions are capable of better management and levels of knowledge.
- NRENs and public R&E institutions have traditionally had easier access to donor support.

3.2.3 Key recommendations and/or best practice

The following are some recommendations of what can be considered among best practice. Desirable policy and regulatory adjustment should take into account the following:

- Technology neutrality, open access to backbone infrastructure.
- Preferential consideration of "public good" requirements.
- Permit community (and academic private network) ownership.
- Operator neutrality for pro-poor ICT and NRENS is important.
- Identify limitations of existing approach (e.g. coverage or affordability).
- Need for appropriate legal framework to support desired partnerships (e.g. public and private institutions).
- Tax exemption for non-profit enterprises and a mechanism to ensure surplus is used for community development interests.

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- It is desirable to have a national support unit to guide community owned initiatives.
- Need for open access policy to guide public infrastructure use and favourable interconnection pricing.

3.3 About NRENs and ICT in Education

3.3.1 NREN Experiences

The following are some of the challenges faced by Uganda as it seeks to fully embrace ICT in education:

- Poor infrastructure and very high cost of bandwidth especially local infrastructure.
- Unreliable and low coverage of mains power.
- The reality of a resource-constrained environment.

The following have been noted as common benefits of the development of NRENs:

- Growth of ICT services market (through improved efficiency).
- Growth of use of ICT for Economic benefit (e.g. mobile money and out sourcing).
- Trigger research in and development of appropriate solutions to local ICT needs.
- More people can pursue continuing education and participate in research.
- Transformation of teaching and learning, especially of science subjects.
- Potential for outreach to primary and secondary schools.

3.3.2 Lessons from review of established NRENs

The following have been observed out of reviewing the operation of two more established NRENs in the Eastern and Southern Africa region.

Two governance levels have been observed namely the governing board and the management board. The governing board as the top decision-making body is charged with the responsibility to ensure that member institutions remain committed to collaborate nationally, regionally and internationally. It mostly consists of heads of member institutions. It is clear that the governance structure encourages members' buy-in, stronger ownership and growth of a cooperative culture. With regard to deepening sharing, one NREN was the first to establish cross-border interconnection to optimise sharing resources and reduce cost. The arrangement gave the partnering NRENs access to connectivity and content resources available in the neighbouring domains, thus enhancing price competitiveness through enhanced sharing. Another dynamic observed in connection with deepening infrastructure sharing, is the use of the power network to run fibre links between towns and to connect institutions that would have been harder to reach.

- Governance typically has 2 layers: Board of trustees or council as well as a board of management. This ensures strong buy-in through greater involvement and input by both member institutions and other stakeholders.

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- The development of the physical network follows member locations and demographic reality on the ground so as to optimise infrastructure sharing.
- Deepening sharing includes local content caching and NREN-driven cross-border interconnection.
- A needs assessment study selected campuses with student threshold of 2000 and the distribution and location of PoPs reflects the demographic reality in colleges.

3.3.3 NREN Best Practice

From the two operational NRENs located in the same regional REN zone as RENU as well as from a European NREN, the following practices were noted:

a) Combine Community driven principles with refined cooperative culture and enterprise work ethic to attain fast growth.
b) Focus on facilitating R&E collaboration; enhance sharing (For Surfnet & KENET infrastructure, information and roaming are aspects of enhanced sharing).
c) Encourage and reward technology innovation to sustain relevance.
d) Effectively and economically address high infrastructure and last-mile costs through ***extended sharing*** and *innovation*. [ZAMREN uses fibre over power-lines]
e) Nurture sustainability through careful development of partnerships and community involvement [Both ZAMREN and KENET have two-layer governance structures].
f) Let community have planning, financial and resource input.
g) Nurture cooperative/collaboration enhancing practices such as effectively meeting community needs, transparency through regular reporting, sustain value, ease of use and competitiveness.

3.4 An overview of Value Chain Analysis

In general, value chain analysis (VCA) assesses the following four major processes (ref. Value chain analysis for assessing competitive advantage © 1996 IMA; pp.5 – 22) for a commercial enterprise:

i. In-bound logistics
ii. Operations
iii. Out-bound logistics
iv. Marketing

3.4.1 Rationale for taking VCA into account

The purpose of value chain analysis is normally to ensure competitiveness and profitability for commercial organisations. However, some form of VCA would be helpful in determining an action framework for RENU to enable it address the needs and expectations of its member institutions effectively, even though it is a not-for- profit organisation. D. Dang,. Sultana, B and

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K. Umemoto, K. (2008), in proposing an extended sharing model to provide ICT services to the rural poor arrived at their basic action framework for implementing the *extended sharing-model* after doing appropriate value chain analysis in addition to the other steps they took.

3.4.2 Experiences from value chain analysis (VCA)

Basing on how D. Dang,. Sultana, B and K. Umemoto, K. (op. cit.), carried out the basic value chain to support the action framework for the extended sharing-model that they proposed for pro-poor ICT projects, it becomes important to include value chain among the analytical stages that precede an effective strategic planning process. As part of value chain analysis carried out to prepare for strategic planning, it is useful to identify mechanisms that are able to enhance or transform an organisation's competitiveness.

3.4.3 Lessons from Value chain analysis

a) Even NRENs need to work on competitiveness, relevance and service/product differentiation.
b) Since one of the identified strategic changes is the high cost of access to fibre it is imperative to minimise cost and maximise quality.
c) To improve performance and sustainability for pro-poor ICT projects, the combination of appropriate situation analysis and value chain analysis yielded an approximate action framework comprising five steps as follows[4]:
   - To estimate the value chain of the intended ICT services.
   - To carefully check for all feasible sharing opportunities.
   - To identify possible sharing partners (also see section on best practice).
   - Build Alliance and develop projects.
   - Carry out implementation with integrated assessment.

4. Conclusion and Recommendations

4.1 Conclusion

The study identified the parallel principles and concepts that exist between pro-poor ICT initiatives and NRENs and also noted their contrasts in a resource-constrained environment, especially since both try to address a type of ICT *access-gap*. It also showed how NREN development in Uganda can use lessons and experiences of past pro-poor ICT studies to guide the process of addressing the challenges that need to be overcome for RENU to succeed. Of the many lessons, four stand out:

a) The importance of nurturing a cooperative mind-set.
b) Overcoming the high infrastructure-cost obstacle by "deepening" sharing.

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c) The importance of meeting the R&E community's unique needs adequately and in an affordable manner through innovative use of technology, in order to remain competitive and relevant.
d) The need to include clear performance indicators into the operating plan from outset.

The study also reviewed analytical techniques and procedures that can support the strategic planning process for the second phase of RENU operations. It has highlighted issues that must be addressed to overcome the strategic challenges currently facing RENU to yield an effective strategic plan and action framework.

4.2 Recommendations

To come up with an effective strategic plan that will enable RENU to operate optimally and effectively serve the Uganda research and education community, it is essential to implement a 3-stage planning process to cover short term, medium term and long-term (strategic) operational requirements and this should be preceded by an effective analysis process covering:

a) Adequate and holistic assessment of the operating environment.
b) A review of and update of needs assessment previously done.
c) Determining an appropriate operating model that specifies a suitable business model, an ownership model and a financing model.
d) An accurate assessment of factors that will ensure competitiveness and sustainability.
e) Taking into account the observed key success factors or best-practice.

Table-1 below is recommended for basic value chain assessment that incorporates 3 factors for enhancing competitiveness while Table-2 below is recommended to guide the process of addressing the three identified strategic challenges.

PROPOSED ENHANCED-VALUE CHAIN TABLE FOR RENU

VCA Name: >	Inbound Logistics		Operations	Outbound Logistics	Marketing	Service
VC Elements: >	RREN Services	National Fibre Backbone	Equipment, Opex. [VA: < $20/Mbps]	RENUNet Backbone	Awareness: Communication & Information (ACI).	Members Support.
Key Actors: >	UbuntuNet Alliance	NITA-U Other PIP	UCC, BoD, RENU Staff	RENU-Tech Staff	Internal or External HR	NMC Team
Competitiveness Drivers: 1. Users buy-in & cooperative spirit 2. Extended Sharing 3.Technology & Innovation	UA PoPs + Intl Links + E-Infra.	Local fibre + Colocation	RENU NOC, Content-Caches Capacity building	RENU PoPs	Web + Social media + Email	NM Tools
	UA NRENs, Afr. RRENs Global KS	RENU members, Gov. MDAs	UG R&E Inst. TD Access BW Exchange	R&E Inst. UA traffic.	Work with some partners to extend info dissemination.	Outsource some to able members.

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Table-1: Proposed Value chain table for RENU

Count	Strategic Challenge	Intervention(s)	Specific Actions	How?	Time frame	Performance Indicators.
1	Absence of an optimum Operating Model	Adopt the Community-Based Cooperative Enterprise (CBCE) model.	Adopt a community-driven approach to providing NREN services.	1. Assess needs & readiness level. 2. Involve members in deciding services.	Over 2 Years	1. Number of new institutions covered 2. New services proposed.
			Establish a community owned network, belonging to R&E institutions	1. Representative BoD 2. Establish 4 fora for communities of practice: *ICT DIRs, Librarians, Researchers & Executives*	On going	1 .No of institutions represented on BoD. 2. No of community of practice meetings per year.
			Balance between meeting unique community needs, sustainability, enterprise & innovation	1. Representation of all stakeholders in strategic planning. 2.Appropriately recognize performance & innovation	Every 4 years	1. No of people attending. SPM 2.Outcome of staff performance evaluation.
2	Lack cooperative culture	Trigger paradigm shift on value of collaboration & Nurture ownership & members' buy-in.	Help top leaders of member institutions to appreciate the rationale for NRENs	Sponsor VCs/DVCs, US & CEOs of RIs to UA & AC annual events.	2 institutions per year for next 5 years	1. No of VCs/DVCs/CEOs/ CFOs 2. No of institutions covered. 3. Level of NREN appreciation among R&E Executives.
			Nurture trust	1. Among BoD. 2. Concise periodic reports to partners, members & on website	On going	1. BoD involvement (support &participation). 2. No of reports & No. of recipients.
			Understand community's unique needs.	Involve/engage ICT DIRs, Researchers, Librarians, Lecturers & CFOs	Review every 2 years.	1. No. of communities of practice. 2. Total annual attendance in fora. 3. No. of emerging needs identified
			Nurture human networking & collaboration	Local research collaboration, joint conferences, partnering with industry to address local challenges.	Annual or biannual.	1. No. of q. publications. 2. No of R&E institutions involved. 3. No. of industry participants.
3	V. high cost of access to infrastructure	Deepen Sharing	1.More members sharing, 2.Increase services delivered, 3.Consider TDMA (e.g. e-books & content cache @ off-peak times)	1. Engage HEIs & RIs to connect to RENUNet & nurture new institutions. 2. Grow RENUNet coverage. 3. Forge new ground-breaking infrastructure & content partnerships including private sector.	Over 2 years.	1. RENU membership growth (No. of new members). 2. Aggregate national, regional & international bandwidth. 3. Volume of off-peak content cached per month.
			Add new services	Say VoIP, live streaming between campuses, local-content repository	Over 2 years.	1. No. of new services 2. No. of local content services hosted by RENU & all members.
			Maximize usage efficiency	Precision planning & coordination of spike demand.	Over 2 years.	1. No of spike events VS RENU Avg. monthly traffic. 2. No of services VS members' BW usage

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Table-2: Proposed Strategic Challenges Action Framework.

References

Dang, D., Sultana, B., & Umemoto, K. (2008, October 25). An extended sharing model to provide ICT services to the rural poor. *International Journal of Education and Development using ICT* 4(3). http://ijedict.dec.uwi.edu/viewarticle.php?id=487.[accessed 4th November 2013]

Farrell, G. (2007) Survey of ICT and Education in Africa – Uganda's Country Report Washington: World Bank InfoDev http://www.infodev.org/infodev-files/resource/InfodevDocuments_435.pdf [accessed 7th October 2013]

Ferguson, J. and Ballantyne, P. (2002) *Sustaining ICT-enabled development, a research report*. 16 p. www.iicd.org/files/report9.doc [accessed 6th August 2013]

Gerste, R. and Zimermann, S. (2005) Up-scaling Pro-poor ICT Policies and Practices M.S. Swaminathan Research Foundation, pp.6 -10; pp.30 – 33) www.deza.admin.ch/resources/resource_en_24707.pdf [accessed 22nd July 2013]

Gurmmuurthy, A, Singh P.J. and. Gummurthy K. (2005*) Pro-poor Access to ICT – Exploring Appropriate ownership models for ICT Initiatives. 3 case studies from India.* UNDP. http://www.itforchange.net/Pro-poor [accessed 31 October, 2013].

ITU (2011) Measuring WSIS Targets – A Statistical Framework pp.15-29 http://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-MEAS_WSIS-2011-PDF-E.pdf [accessed 15th August 2013].

KENET (2013) www.kenet.or.ke (accessed on 2nd November 2013)

Murray, A. and Duran, X .Factors shaping successful Pro-poor ICT PPP – A report to DFID (pp.18-21; pp. 30-32), http://share4dev.info/telecentreskb/documents/4046.PDF [accessed 6th August 201]

O' Siochru, S and Girard, B. (2005) *Community-based Networks and Innovative Technologies: New models to serve the poor*. UNDP. pp.10 -13; pp.15 -31

Onyango, K.E. (2006) *The promise of Technology and Power of partnerships*. PCF4. http://www.col.org/pcf4/viewpaper651a.html?id=147 [accessed on 27th July, 2013]

SURFNET (2013) www.surftnet.nl/en/ (accessed on 2nd November 2013)

UN-DPI, (2010) Millennium development goals: At a glance. http://www.un-kampagne.de/fileadmin/downloads/presse/MDGs-at-a-Glance-engl-03-2010_02.pdf [accessed 15th July 2013]

Weiner, A. and. Rumiany D (2006.)A new logic of reducing the digital divide in Sub-Saharan Africa: from obstacles to opportunities. *ATDF Journal* 4, (1) pp .14-21 http://www.atdforum.org/IMG/pdf_New_logic_reduce_the_digital_divide_Weiner_Rumiany.pdf

WOUGNET (2007) Uganda Country-based Research, Policy Support and Advocacy Partnerships for pro-Poor ICT UNDP/WOUGNET. 64 p. http://www.share4dev.info/kb/documents/5019.pdf [accessed 27.08.2013]

Biography

Isaac J. M. Kasana is the Chief Executive Officer of Research and Education Network for Uganda (RENU). Before joining RENU, he served for almost 8 years as ICT Director at Uganda Christian University (UCU) and was part of the interim task-team charged with the operationalization of RENU, by vice chancellors in 2006. He graduated from Makerere University just before the oust of Idi Amin in 1979 and spent most of the first 10 years working in electronics involving support and calibration of medical, measuring and scientific instruments, radio communication systems and many generations of computer systems. He has worked in Uganda, Kenya and Tanzania, including about 2 years teaching at (then) Uganda Technical College. Between 1990 and 2004 he founded, co-founded and served as General Manager in four ICT companies including VSAT communications. He has experience in ICT4D and Universal Access Policy formulation. He holds a BSc (Hons) and an M. Eng. in Electrical Engineering, both from Makerere University. He is married and they have 5 adult children.