Mobile Broadband Technology & Services: Sustainability Factors

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Abstract:

The explosive growth in mobile subscriptions and improved mobile device capabilities should prompt stakeholders of the mobile value chain to consider the deployment of low cost mobile broadband infrastructure and socially relevant services. The preference of mobile phones as the only medium to information access in developing and emerging markets is evident from the recent statistics released by GSMA, ITU and the mobile industry. In this paper the choice of low cost mobile broadband technology, affordability and sustainability in the provision of innovative mobile broadband services, in an environment where the customer base is sparsely populated, composed of greater than 95 % prepaid and with low income is discussed. To meet this demand, the paper argues for a new and sustainable socio-economic competitive model that should be adapted by mobile network and service providers. Furthermore, support and incentives for the emergence of local mobile content and services provider sector through incubation centres such as the Makerere University Software Incubation centre is crucial for the sustainable development and capacity building of local technology parks. Enabling policy and a new techno-economic model by telecom regulatory authorities and mobile network service providers is also required to make a sustainable and low cost mobile broadband infrastructure deployment. The paper finally argues that unless we solve the sustainability and affordability issues for mobile broadband technology and service provision, the goal of the UN millennium development goals cannot be achieved, instead of digital inclusion a new digital divide between urban and rural communities in developing countries will be created.

Low Cost Mobile Broadband Infrastructure

The choice of low-cost technology for mobile broadband service provision in general is multifaceted and new emerging technologies are being promoted constantly to fill the different gaps. However, in this paper the discussion is restricted to the following wireless technologies for providing mobile broadband services: 1) 3-generation UMTS technology with high speed access (3G-HSPA promoted by 3rd generation partnership project 3GPP),[3,4,14]. 2) Multi-hop wireless technologies using a combination of WIFI (IEEE 802.11x) standards and Worldwide Interoperability for Microwave Access: WiMAX, promoted by the IEEE 802.16x standards, [8,13]. 3) Digital

multimedia multicast/broadcasting technology (MBMS) [14,16], exemplified by the Mobile-TV technology standards [16]. All three technologies are discussed in terms of the following factors are used to assess the long term sustainability and low cost mobile broadband infrastructure deployment in developing countries[1,7].

- Which technology is suitable for designing, activating and affordable delivery of relevant mobile broadband services such as mobile health, mobile learning and mobile payment in a developing country context?
- Which technology provides easy to tools and protocols to create local mobile content and integrate it to the global web knowledge through mobile IP technologies.
- Which technology has support to alternative energy usage and provides low power network topologies relevant for developing countries? Is the technology suitable to provide access to sparsely populated rural communities?
- What is the contribution of such a technology deployment for the long term mobile-ICT development initiative and digital inclusion?
- Which technology can give the needed spinoff and employment creation through mobile local content and service provision for social and economic development.
- Which technology and/or combination of technologies, has the inherent capacity for long term industry support and sustainable service provision.
- Which technology can provide the maximum spectral efficiency for a given licensed frequency area, by a network operator.

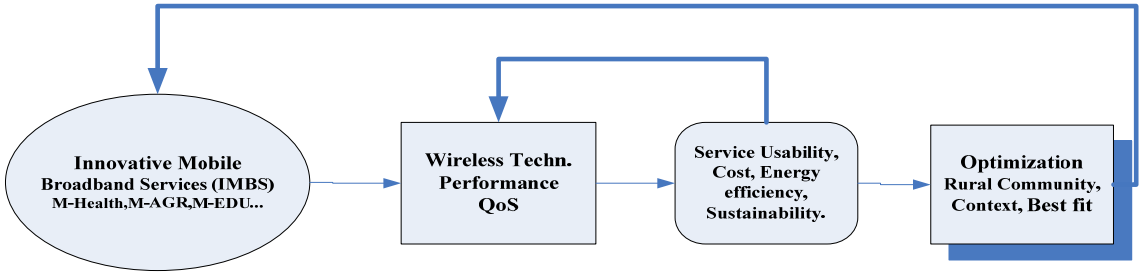

Figure 1, describes a conceptual diagram designed to support the choice and optimization of mobile broadband technologies and services based on the parameters listed above.

Definition of an Innovative Mobile Broadband Service (IMBS)

A definition of an innovative mobile broadband service (IMBS) with respect to communities of social networks in developing regions is necessary to make a relevant discussion on the choice of low cost technologies which will be used for providing mobile broadband services. The following definition of an IMBS is used in this paper:

Defn.: *An innovative mobile broadband service is a new mobile service which guarantees successful launch, and is motivated by real need of users. The service should be able to use low power and low cost network architecture and devices. With respect to customers, the service must be affordable, fulfill a requirement, provide a benefit, and promotes the creation of an echo system of stakeholders to sustain development of the technology and services.*

From the definition, we can deduct that the promotion of locally relevant IMBS services with the aim of improving the life of low income rural communities, add value to the daily business, and support to farming communities is envisaged. Service innovation and the building of an echo-system around the innovative mobile services for sustainable social and economic development are also targeted. It is assumed in this paper that services such as M-health, M-Banking, M-Education, e.t.c., fall under the category of IMBS.

The role of enabling policy to promote Mobile Broadband Services

The need for enabling policy to promote new and innovative wireless broadband technology and services is apparent in present day governance paradigms in developing regions. Government regulatory authorities could enable or disable the emergence and uptake of new technologies and services by the policies they enact. Innovative mobile broadband services and service providers should be supported by telecom regulatory authorities with policies for quick service activation and reasonable revenue sharing with network providers. Since mobile broadband services will be mainly content based, the promotion of local content development, with industry, academia and local community involvement should be actively sought. As IMBS services will run on next generation wireless networks, regulatory authorities in many developing countries need competence building and resources to address issues such as:

- Regulating multi-frequency access networks.
- Conformance for quality of service and usability for the plethora of mobile value added services expected in developing regions.
- Use the new technology and services for addressing the communications needs of poor and marginalized communities.
- Local Content development, usability, regulation & interoperability.
- Security & reliability of the IP multimedia based system.
- Number portability and ID flexibility to promote increased competition.
- Arbitration and revenue sharing between service providers (MVNOs) & Network providers.

The efficient utilization of wireless broadband technologies, service usability, sustainability and digital inclusion, therefore require capacity building and educational support towards telecom regulatory authorities in developing regions. Local higher educational institutes should be encouraged to collaborate with centres of excellence and industry to design courses for continuous monitoring and assessment of the need for capacity building in next generation network and service regulation.

Low-cost Broadband Infrastructure Deployment Model

Mobile broadband infrastructure through the GSM => UMTS (3GPP) technology path requires a new techno-economic model for application specifically in poor developing countries. Mobile Network and service providers have to go beyond the traditional universal access funds (USF) to address the digital divide between rural and urban areas of developing countries. This is clearly seen by the fact that 3G and high speed access schemes depend on the roll out of nearly twice the number of radio access network nodes, as compared to the 2G GSM networks, for providing acceptable mobile broadband services. This makes the price of broadband services so high and unaffordable for a significant percentage of subscribers, and despite available mobile coverage the number of ***active*** users of both basic and value added services will be limited in developing countries [1,5,12]. This is more profound in

rural and marginalized communities, and a crucial parameter to be addressed to guarantee the success of future content based mobile broadband web services. Furthermore, if this trend continues, the new mobile internet/data services will have limited footprint and at the same time result in significant number of people being left outside of access to public and relevant information. Therefore to reduce the cost of mobile broadband infrastructure and service provision a new techno-economic model with long term planning is necessary.

Radio access network (RAN) sharing by competing operators, is being promoted in Europe as one of the effective models and long term solution to reduce both cost of infrastructure deployment and power consumption of 3G and 3G-HSA broadband mobile networks [3,6]. As shown in figure 2, the main CAPEX load of broadband wireless infrastructure is the cost of the RAN and associated deployment cost [3,12]. The two network operators, NetOp1 & NetOp2 can use the network sharing opportunity to reduce the cost of mobile broadband infrastructure. The savings can be in sharing base station (BS) cell site, BS tower, BS Power, e.t.c.,. A number of European mobile operators are opting to this scheme, to reduce the cost of mobile broadband services, made possible by network sharing agreements [6,3]. This is motivated by the reduction in deployment, operational and power consumption costs, that is achievable with network sharing. It is for example estimated that the deal by network operators T-Mobile and 3, announced recently could achieve a cost savings of 2 Billion UK Pounds, a 30% reduction of base station sites and a 70% reduction of the power consumption by the network nodes [3].

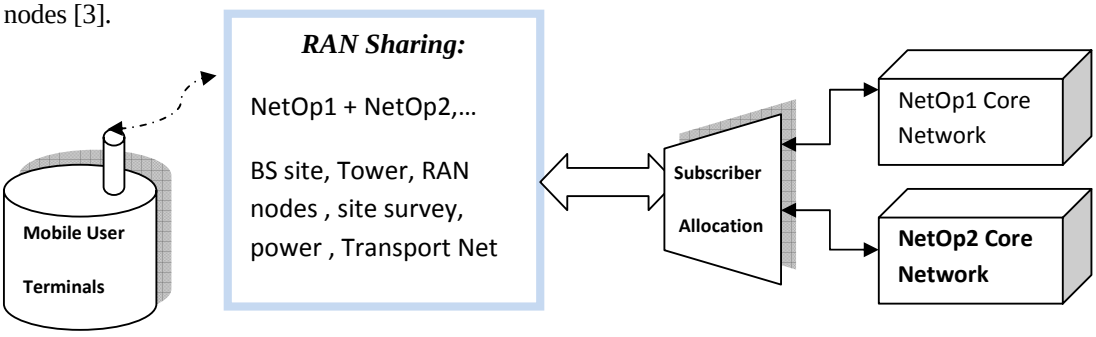

Figure 2. Conceptual RAN Sharing Model.

The issue is whether these savings in CAPEX and OPEX by the network operators is converted into lower mobile broadband service prices promoting the increased utilization of mobile web services ? Resource limited developing countries should support such moves by network operators because, the long term development and provision of mobile broadband web services depends on such schemes. In the author's opinion W3C, ITU and regulatory authorities, should promote a discussion and help enact policies at most to enable such collaborative moves by competing network operators, and stimulate actions towards network sharing by different stakeholders in the mobile value chain. The discussion with RAN sharing is based on the popular mobile technology GSM/UMTS and is crucial to reduce the cost of broadband mobile services to both urban and rural communities [1,3,12]. It is most likely that if RAN sharing is not followed by UMTS operators, new operators with technologies such as WIMAX and DVB-H could be more cost effective and sustainable alternative to provide mobile broadband web services[1,10]. It is apparent that such a move is in the long term beneficial in many respects some of these are:

- For the mobile industry, and the collaborating operators, lower mobile web prices can attract more subscribers and the development of more innovative services, which in turn increases the traffic and revenue generated for the concerned companies.

- Network sharing is also environmentally sound, this is clearly seen in the above mentioned RAN sharing example of T-Mobile & 3UK operators. The duo could reduce 30 % percent of cell sites (~5000 Base stations) and corresponding power requirement. This is a significant reduction of the CO2 footprint, which should be encouraged. In an African rural community perspective, it is a usual scene to find three nearby operator BS towers, powered by three diesel generators. Such wastage of resources, and costly network rollout can be minimized by introducing the concept of radio access network sharing. The reduction in capital, operational and deployment expenditure in turn could solve the affordability issue, by making mobile broadband services cost effective and affordable.

Conclusion

As next generation wireless broadband technologies are being deployed in developing regions, a number of important challenges require research solutions. The provision of innovative mobile broadband services in an environment where the customer base is composed of greater than 95 % prepaid customers and with low income is a challenge. Issues such as affordability and digital inclusion are very well connected. The current state of mobile voice and SMS services is being challenged by the emergence of new mobile broadband technologies which can provide innovative mobile broadband services for low income rural communities. Sustainability and improved digital inclusion due to IMBS services can be promoted by improving affordability through network sharing schemes described above. Furthermore, promotion of a local mobile content and service provider sector can benefit developing countries to create employment opportunities leading towards sustainable social and economic development. Such models also need to integrate end-user focused studies such as service usability studies, local language support and cultural context awareness. The problem is even more daunting when one is trying to deliver innovative data and web services to the poor communities in Africa. Research and studies towards models of addressing these challenges are hence very important and necessary for the continued growth of the Mobile broadband technology and services in developing regions.

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