

Service Strategies for Eliminating Digital Divide in Korea

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Abstract—Republic of Korea is one of the countries which possess the top-class network infrastructure in the world. However, the network facilities are concentrated in densely populated areas, and this causes the data access speed of less populated areas, such as rural areas, to become relatively slow. The low speed of network makes broadcast-communication convergence services in rural areas difficult, and it leads to the digital divide between cities and rural areas which will emerge as a social issue. In the paper, we analyze the rural BcN project of the Korea government, which aims at accelerating the network infrastructure of rural areas. We also propose the service strategies for boosting the usage of the network infrastructure in rural areas.

Keywords-digital divide; BcN; convergence services; policies.

I. INTRODUCTION

For the last few decades, the Korea government (i.e., the government of Republic of Korea) has executed a series of projects to build the network infrastructure of high speed. As the result of successful projects, Republic of Korea (in short, Korea in this paper) has become one of the top Information Technology (IT) countries in the world [1]. The Korea government executed the high-speed information and communication network project in the 1990's, and has constructed the broadcast-communication convergence network (BcN) infrastructure since the mid 2000s [2], [3], [4].

The development of the network infrastructure of high speed was government driven, so it made it possible to build a network infrastructure timely and effectively. Fast network infrastructure built by the government has been provided to IT industries in Korea with low costs or almost for free, and it enables IT companies to concentrate on developing new IT services and technologies without worrying building their privately-owned networks. The networks developed by the government-driven projects have been served as the infrastructure and the testbed for commercial services and academic researches. It has been pointed out by many professionals that the excellent network infrastructure is one of the main mile stones which lead Korea to the top class of IT technology in the world.

However, the investment of the Korea government and nation-wide network operators is focused on only densely

populated areas. According to the survey of Korea Telecom, the current nation-wide BcN coverage are up to about 80%, and would be increased to 90% by 2010 [5]. But, small farming and fishing villages, which lack profitability from the perspective of service providers, are not included in the operators' BcN expansion plans. Although the residents in small farming and fishing villages can access the Internet, the data rate remains at 1–3Mbps (xDSL type). As a result, various convergence services cannot be used in these areas, unlike in metropolitan-, medium-sized, or small-sized cities.

Voluntary investment to these less populated areas by communication service providers cannot be expected, because communication service providers generally pursue short-term profits. This situation will cause the gap between people with effective access to digital and information technology (those in city areas) and those with very limited or no access at all (those in rural areas), called the *digital divide*. The digital divide could wide the knowledge divide between city areas and rural areas, which is already considered as a serious social problem. The governmental support is inevitably necessary to alleviate the digital divide. The Korea government has set up the BcN establishment project to provide high-speed network convergence services such as IPTV and VoIP in sparsely populated rural areas, and has conducted the project since 2010.

In this paper, we analyze the rural BcN project of the Korea government, and propose the service strategies for boosting the usage of the resulting network infrastructure. In Section II, we outline the motivation of rural BcN and the development plan of it. After the brief introduction of rural BcN, we analyze and discuss the strategies for service applications to stimulate the usage of rural BcN in Section III. We draw a conclusion in Section V.

II. RURAL BCN DEVELOPMENT PLAN

The Korea government has set up the BcN establishment project to provide high-speed network convergence services in sparsely-populated rural areas. The outline of the rural BcN project was made in 2009 [6], and the full version of the rural BcN project has been made and executed since 2010 [7], [8].



Figure 1. Strategy Deployment Circle

A. Motivation

The construction project of high-speed networks in rural areas of over 50 households had been performed from 2002 to 2005. As the result of the success of the project, high-speed Internet service came to be provided to 3.53 million households, that is, 94 percent of all rural households. Through the construction of high-speed networks in rural areas of less than 50 households from 2006 to 2008, 3.76 million households, in other words, 99.7 percent of all rural households came to enjoy high-speed Internet services.

However, the speed of the network in rural areas was not fast enough for emerging broadcast-communication convergence services. The early version of the rural BcN project was made in 2009, and a feasibility study on the project was conducted. The result of the feasibility study was reflected in the plan called “Mid- and Long-term Development Plan for Broadcast-Communication Networks” in 2009 [6]. In 2010, the panel on the construction of smart infrastructure in rural areas has been formed, and the project has begun.

The broadcast-communication convergence network in rural areas is needed to lay a foundation for universal broadcast-communication convergence services by expanding broadband broadcast-communication networks, which are concentrated in cities, into rural areas. Constructing BcN in rural areas will help solve rural areas’ economic, social and cultural issues and will vitalize the economy and industry through the diffusion and spread of specialized services based on broadband broadcast-communication net-

works. It is also required to establish a national cooperation system integrating ministries, local governments and carriers in order to construct broadband broadcast-communication networks and expand broadcast-communication convergence services.

B. Phases of the development plan

In order to construct broadband networks and create an environment for increasing the use of broadcast-communication convergence services, executive plans for rural BcN have four sub-goals: network infrastructure, service accessibility, customized services, and political and economical support. The plans for network infrastructure and political support are presented briefly in this section, and we will make a close analysis and discussion of service plans in Section III.

To construct broadband networks in rural areas, broadband networks in small rural villages (with less than 50 households) will be built by 2016. The expenses are partially covered by the central government. The central government, local governments, and carriers share the costs in the ratio of 1:1:2. For the broadband network construction in medium-sized rural villages (with more than 50 households), the efficiency of the broadband network will be increased. The construction of broadband networks in medium-sized areas will be completed by 2012. This construction will be supported through efficient policies, such as inducing to carriers to divide construction projects among themselves

or to construct networks jointly. Broadband networks will be built in remote islands and isolated areas, too. Remote islands and isolated areas are considered as places where new wired networks cannot be constructed. For these areas, a foundation to provide broadcast-communication convergence services will be made by considering and applying various alternatives.

The use of wireless networks such as 4G will be tested for rural areas. Test beds for wireless ultra wide-band networks will be built in small rural areas that have no broadband networks, and the possibility that wireless ultra wide-band network could replace fixed broadband networks will be verified. The government is trying to rent the optic fiber cables from Korea Electric Power Corporation in rural and isolated areas. The rented optic fibers can be considered as another option, but it requires the governmental involvement in the process of mediation and negotiation. Pilot projects will be promoted to verify other wireless technologies such as WiFi Mesh, WiBro. Services through a two-way satellite will be provided for areas where other alternatives cannot be applied.

In order to encourage service carriers to construct broadband networks efficiently, a supportive legislation for carriers will be enacted. Carriers will be encouraged to voluntarily invest in building broadband networks in non-competitive rural areas by reforming laws and regulations that deal with the construction of broadcast-communication infrastructure and developing a support system.

Policy and institutional supports for facilitating the use of services will be provided. The use of services will be facilitated by organizing and operating an effective body that promotes and supports the projects, and by developing a reasonable and affordable tariff plan for specialized services for rural areas. The ecology of broadcast communication industry for boosting the local industry in rural areas will be established. A basis for sustainable development of rural areas will be founded, and the opportunity to grow together will be offered to the related industries by establishing an ecological system that promotes a virtuous cycle.

Figure 1 shows how each direction of deployed strategies is related to other directions and makes influence in a circular way. The first direction of the rural BcN plan begins with building an economical and efficient network. In this part, the voluntary competition of the private sector and the governmental support are combined. In order to avoid duplicate investment, the communication resources will be used as much as possible.

The second direction of the rural BcN plan will be to promote the pilot projects on the basis of users' actual demand. In this part, the actual demand of rural residents will be identified before providing services. Analyzing the actual demand will create a service environment where the services reflect the characteristics of rural communities, and the most frequently used services.

The last direction of the rural BcN plan is to implement a nation-wide cooperation system. There exists a need for a cooperative body which involves all government agencies, local governments and carriers. The cooperative body can effectively foster the ecological environment such as convergence among related industries.

III. STRATEGIES FOR SERVICE APPLICATIONS

To stimulate the usage of BcN in rural areas, the project should be conducted in two directions: making people to access the convergence services more easily and developing killer services to satisfy the needs of rural residents. We suggest service strategies in these two directions in the following subsections.

A. Enhancing user accessibility

To enhance the accessibility of users in rural areas, terminal guidelines for rural residents should be authored and provided. This will facilitate the use of broadcast-communication convergence services in rural areas by eliminating the complexity of using the terminals. The guideline of IT terminals and interfaces will enable the aged rural residents to use the IT terminals and interfaces more easily. As well as authoring the guideline, testing whether or not the IT terminals meet guidelines should be performed through rural BcN pilot projects. Using the terminals with guidelines should be also encouraged through the pilot projects.

The user interfaces (UI) should be enhanced for rural residents, and for this purpose, UI design solutions should be developed and provided with the governmental support. The study of UI structures and UI deployment should be conducted first, so that rural residents can easily access programs, contents, and information through BcN. The developed UI will be tested and verified for its usability by applying them to pilot services. For example, a new user interface of IPTV would be implemented and provided to rural residents with guidelines, and the effectiveness will be scored by the real users. Easy and accessible user interfaces will encourage rural residents to use broadcast-communication convergence services.

For customer support, the remote support solutions can be considered for the candidate. Concerning the use of broadcast-communication convergence services, it is important to resolve the inconvenience of rural residents. To support customers in rural areas, various measures should be invented. One of the feasible ways is developing terminals and solutions which can be controlled remotely. When telephone consultation is not sufficiently convenient to customers, a video-based remote support system like IPTV would be an attractive substitute for resolving customers' inconvenience. The terminals and solutions with remote control function will be developed in the pilot projects, and will be distributed to rural residents. Customer satisfaction surveys will be conducted several times during the period

of pilot projects, and the remote customer support will be tested and verified based on user feedback.

There must exist a system which connects and integrates IT services for rural areas. The system aims at enhancing existing services into broadcast-communication network-based services specialized for rural areas, and maximizing synergy. The goals can be achieved by establishing an inter-ministerial cooperation body and by promoting the connection and convergence among different IT services for rural areas. It is important to establish a nationwide cooperation body committed to exploring ways of integrating and connecting IT services for rural communities, although those IT services have been promoted separately by different government agencies. The unified governmental body can integrate the developed public services for rural areas, and make effective support to future development. A centralized service center will be a part of the unified governmental body, and it will operate an open platform, develop and connect specialized services, and offer a test environment.

B. Developing specialized service applications

There have been a few services for rural areas, but those services scatter among several governmental bodies. It is urgent and important to integrate all these scattered services to avoid duplicate investment and to maximize the synergy. The IT services for rural areas have performed one-way communication from service providers to users, and there is no connection among these IT services though their duplicate functionalities. These services have Web-based user interfaces, and are delivering only simple information to users. To supply broadcast-communication convergence services effectively, it is important to integrate similar IT services and upgrade it into a two-way communication service with higher quality.

Integration is not an easy job, so is integrating the existing IT services for rural areas. To support and expedite the integration of IT services, it is necessary to develop a software platform to support the integration. First of all, the open platform must be developed, and be applied for the integration of IT services through a couple of pilot projects. The government should be in charge of the pilot projects since the projects are not beneficiary enough for IT industry to invest their money to.

After integrating the duplicated IT services of various governmental ministries or bodies, it is needed to find good broadcast-communication convergence services, and to provide a test bed for the developed new services. At least one research center should be dedicated for these purposes. The research center will be in charge of operating the integration platform of rural IT services, and be a base station if some rural IT services, e.g., open agricultural market, are expanded nation-wide.

The specialized services for rural areas must be identified, implemented and tested through the pilot projects.

The demand of rural residents can be categorized in five fields: welfare, culture, education, economy and safety. The services should be identified based on these five fields, and the service provision models should be aligned with existing services offered by other ministries and local governments.

For the welfare of the rural residents, a u-health system will be implemented for senior residents and children based on IPTV and video telephone. Local weather, traffic information and local news will be delivered through IPTV. IPTV can be also used for education: home tutoring for students in rural areas, Korean language classes for multicultural families and educational lectures of new agricultural technologies. To stimulate the economy of rural areas, IPTV could offer e-commerce services which connect consumers in cities to the providers in rural areas directly. The history of products can be traced by the consumers in cities through IPTV. This will give more credibility of the agricultural products, and guarantee more profit to the providers in rural areas. For regional safety, guarding services using CCTV will be implemented through IPTV and video telephone. Smart phones as well as IPTV will be used for an emergency alert system.

Executing pilot services should begin with offering the service of the highest demand. The feasibility of each service candidate must be verified and evaluated based on the benefits of the service. The provision of pilot services will be given in steps. At the first step, a framework of service development will be come up with, and only a few services will be implemented. In the following step, these pilot services will be spread around widely in order to stimulate the usage of rural BcN and its related services. At the last step, the services will be provided nation-widely after the usefulness of the services is verified.

To increase the use of services, promotional and educational activities should be organized and executed. For effective educational and promotional activities, existing organizations and facilities owned by other institutions and carriers can be utilized. A regular education system for rural residents should be organized by training at least one educator per community. There must a regular re-education program for the educators at least once in a year, which is run by a dedicated organization.

As well as educational activities, regular surveys should be conducted on the use of services and customer satisfaction. The feedback from the users will increase the use of services in rural areas through a virtuous cycle of demand analysis, service development and provision, customer satisfaction study, and increase of usage rate. To achieve this goal, it is necessary to develop indicators and indices for evaluating customers' usage statistics and satisfaction level objectively. A survey on the usage status and satisfaction level of broadband networks can be conducted on a yearly basis.

IV. SUGGESTIONS

We have designed and developed the BcN establishment policy in rural areas with assisting the Korea government. We want to make a few suggestions to whom are considering deploying an enhanced IT infrastructure in isolated areas of their countries.

First, the economic efficiency of network facilities should be considered. The feasible options for our BcN establishment in rural areas would be narrowed into two candidates: one is the wired networking using PONs and the other is the wireless networking using wireless LANs or wireless mesh networks (WMNs). Using PONs as the network infrastructure of rural areas costs more than using wireless network techniques. But, using PON has an advantage when upgrading the speed of the network to over 1 Gbps. It is much easier and less costly to accelerate PONs than to upgrade wireless networks. The wireless networking is much cheaper than the wired networking using PONs, while the coverage of wireless networks is smaller. The wireless networking has the strength in the case that subscribers inhabit densely in a relatively small area. The network deployment method should be determined with considering the characteristics of a given area and the budget of the local government.

For the successful deployment of the BcN in rural areas, good services should be also developed and provided. Good services on BcN will stimulate the network usage. At the same time, the provided services should reflect the unique features of rural areas. For example, u-Health service can be one of promising killer services, when considering the fact that the population of rural areas becomes older than the population of urban areas on average. U-Learning would be another killer service for rural areas in order to narrow the academic gap between rural and urban areas. The services can be implemented in cooperation with private service providers and local government, and during the development phase, the opinion of local residents, who are the future beneficiaries, must be feed-backed.

Local governments must have plans for diminishing the burden of communication charge, i.e., the fee of using the BcN network and its related services in rural areas. Service providers should supply cheaper rate plans for rural inhabitants, and local government has to consider to support a part of communication charge as a way of eliminating the digital divide. One of the feasible ways would be to designate the BcN services as universal services like electricity or telephone services. Another feasible way would be lowering the rate by a long-term contract between local government and private service providers.

V. CONCLUSION AND FUTURE WORK

Korea is one of the countries which possess the top-class network infrastructure in the world. However, the network facilities are concentrated in densely populated areas, which

causes the data access speed of less populated areas, such as rural areas, to become relatively slow. The low speed of network makes broadcast-communication convergence services in rural areas difficult, and it leads to the digital divide between cities and rural areas, which will emerge as a social issue. The Korea government has set up the BcN establishment project to provide high-speed network convergence services, such as IPTV and VoIP, to sparsely-populated rural areas, and has conducted the project since 2010.

In the paper, we analyzed the rural BcN project of the Korea government, which aims at accelerating the network infrastructure of rural areas. The service strategies for boosting the usage of the network infrastructure in rural areas were proposed. Boosting network usage is as important as speeding up the network itself. Fast network infrastructure is useless unless it is used actively. The suggested boosting strategies can go to two directions: enhancing user accessibility to the services and developing specialized services.

The rural BcN project of the Korea government is under progress now, and it will become complete by 2016. We believe that we can make another further discussion of the rural BcN project after the project itself is over with some analyzable result.

REFERENCES

- [1] National Information Society Agency of Korea, "Broadband convergence Network annual report 2007," Ministry of Information and Communication of Korea, Tech. Rep., 2007.
- [2] Ministry of Information and Communication of Korea, "Basic blueprint for building the Broadband convergence Network," Ministry of Information and Communication of Korea, Tech. Rep., 2004.
- [3] Ministry of Information and Communication of Korea, "Second phase plan for establishing BcN," Ministry of Information and Communication of Korea, Tech. Rep., 2006.
- [4] Korea Communication Council, "Third phase plan for establishing BcN," Korea Communication Council, Tech. Rep., 2008.
- [5] Korea Communication Council, "UBcN deployment policy," Korea Communication Council, Tech. Rep., January 2009.
- [6] Korea Communication Council, "Directions for BcN infrastructure of rural areas," Korea Communication Council, Tech. Rep., 2009.
- [7] Korea Communication Council, "Project plans for promoting BcN construction in rural areas," Korea Communication Council, Tech. Rep., March 2010.
- [8] Korea Communication Council, "Long-term plan for constructing broadband networks in rural areas," Korea Communication Council, Tech. Rep., June 2010.