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## Regulation system study for innovative communication services

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**Regulation System Study for Innovative Communication Services**

**Abstract**

The change in the telecommunication market can be explained with the change within the traditional telecommunication services and the introduction of new innovative services. In accordance with the changing telecommunication environment from Fixed/Circuit/Voice to Wireless/Packet/Data, each country is trying to improve its regulatory system and to build the infrastructure appropriate for the change. This study suggests the principals required for regulatory systems to vitalize innovative telecommunication services. It is 'make a road and let it be used freely.' By comparing the regulatory environment of the U.S., EU and Korea about their policies for Fixed/Wireless networks, *ex post* regulations and net neutrality, the implications necessary to lead the future telecommunication market are suggested.

In conclusion, the U.S. has its strength in Fixed networks, EU has it in Wireless networks and Korea needs to make a blue print of future networks which has not yet been experienced by any country of the world and, at the same time, needs to build a flexible regulatory system.

**Key words:** Regulation, Telecommunication, Innovative Service, Fixed/Wireless Network, *Ex post*, Net Neutrality, U.S., EU, Korea

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## 1. Introduction

Communication refers to the transmission of information over long distance and communication system is a collection of individual facilities and equipment for the purpose of communication. Traditionally, communication system consists of information source, transmitter, channel, receiver, and destination as Shannon(1948) identified. Telecommunication providers offer services based on the communication system concept in that perspective. Communication system characteristics are the followings: 1) the coexistence of public and private goods, 2) the existence of economies of scale in a supply aspect, and 3) having network externality in a demand aspect (Jung, 2005). These features are recognized as raising tipping effects and natural monopoly query (Jung, 2005). In response to this, in telecommunication industry, the industry regulation has aimed at preventing monopoly. Since then, it has been a critical issue to balance the regulation to prohibit monopoly with the deregulation of market entry to provide universal services.

Recently, the services based on the technology detouring around the network of existing telecommunication companies have been introduced. However, not only it is hard to effectively define new services in accordance with current telecommunication regulations, but also there is a possibility that the regulations can harm promoting new services (Jung, 2005). On this issue, Blackman and Srivastava(2011) referred that innovative and destructive technology commercialization, that are transferring traditional voice phone call such as VoIP, can be delayed with current regulation system. While earlier communication services required the immense investment to support circuit based system, implementation of packet based system enables service providers to introduce communication service at relatively cheaper costs by reducing the cost of PSTN equipment investment(IDATE, 2011). Since then new services like email, VoIP, MMS and mobile VoIP have introduced, and they have substituted existing communication services. In these processes, we can see the tug of war between the incumbents and the new entrants of the market. The regulation system is the essential factor which mediates and resolves conflicts among relevant players. Therefore, this study aims to establish regulation system that innovative communication system can be promoted by comparing regulations of each country.

In a technological aspect, the existing telecommunication service has replaced with the packet based communication service, but it is expected that a new type of communication service (providing communication services with Internet network such as Social Network Service, Google Voice, and Facebook Phone(expected), but not traditional telecommunication services) will be introduced in the near future (IDATE, 2011). Therefore, services can be summarized as following: 1) The internal transformation of traditional communication service and 2) The introduction of innovative OTT(Over The Top) service. First, the internal transformation of traditional communication service includes the changes from circuit based service into packet based service and the substitution of wire communication into wireless communication. Second, the innovative OTT service is divided into communication network

detour services that are using ISP(Internet Service Provider)'s Internet networks and it is comprised of Portal leading and device business leading services. Portal leading service provides voice phone call service which mainly provides voice telephone with VoIP technology; Skype, Google voice, Facebook phone and so on. Device business leading service includes mobile SoIP(ex. Facetime) service which provides video telephone with WiFi, mobile VoIP(ex. Viber, Skype) service which provides voice telephone with application type and Social Network based service (ex. Kakao Talk, Twitter, and Facebook) which offers text messages.

In traditional communication industry, licensing, interconnection, price, competition, universal service, etc. were important regulations (Intven, Oliver and Sepúlveda, 2000). But in a new communication industry, regulating security, information security, intellectual property and network neutrality are crucial (Blackman and Srivastava, 2010). There is a possibility that bonding between existing telecommunication companies and authorities can prohibit the development of innovative communication services. It is known that works of Google for constructing high-speed Internet network by themselves in Casas area of the United States were implemented in order to test new innovative communication services than to explore cable business area. However, such a try could be blocked or hindered under traditional regulation system.

Therefore, the study tries to 1) suggest the principals that regulatory systems need to vitalize innovative services, and 2) answer the following question by comparing U.S., EU, and Korea: 'Which country has more probable to lead innovative communication services?' The results of this study will produce a future direction of regulatory framework to promote innovative communication services. Furthermore, this study will provide regularly well-prepared countries in boosting innovative communication services to react to the new trend of communication industry.

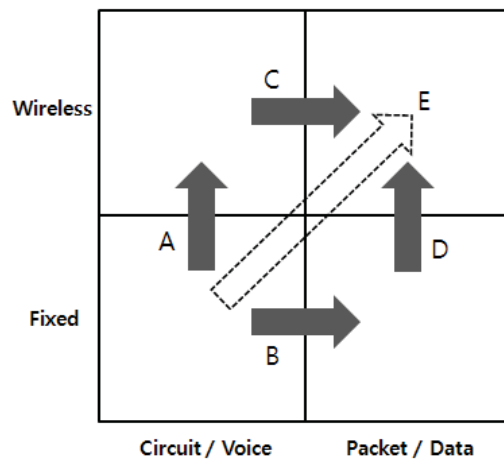
## **2. Theoretical Background**

### **2.1 Overview of research framework**

Previously, the change in telecommunication market was summarized as 1) the internal transformation of traditional communication services and 2) the introduction of innovative OTT services. This can be displayed in a diagram [Figure 1]. From [Figure 1], A refers to Fixed/Wireless substitution and B refers to Circuit/Packet substitution which shows the change within the traditional telecommunication services. There is no specific name for C and D, however, C refers to the appearance of mobile data service and D refers to the change represented by the phenomenon of mobile internet proliferation. The services deriving from C and D can be regarded as a part of introduction of innovative OTT services. B's typical service is VoIP and C's typical service is mobile VoIP whose important feature is destroying the BM of existing telecommunication companies. Compared to A which has progressed for

long time, D is the new domain and has not been a regulatory issue so far.

E which means the change from services based on Fixed/Circuit /Voice to services based on Wireless/Packet/Data is the direction of changes in telecommunication services for the past 20 years and more innovative services are expected to appear on E quadrant in the future.



[Figure 1] Changes in communications

AT&T submitted a comment about the ending of PSTN(Public Switched Telecommunication Networks) in 2009. Such decision of AT&T which was established by Alexander Graham Bell and constituted PSTN for the first time in the world shows the result of changes within the traditional telecommunication services. Users' pattern has changed as Wireless networks replaced Fixed networks and telecommunication companies could reduce huge amount of costs previously required to provide fixed network telecommunication services by replacing Packet Based Network into IP Based Network, which made PSTN's long history fade away.

Around year 2000, Fixed/Wireless substitution came to the fore and IP network based telecommunication service is started to appear. In other words, a sudden change in telecommunication services has achieved in a short time period of less than 20 years and the regulatory system doesn't look like ready for such changes(Baake et al., 2005). In addition, there are not many studies regarding which regulatory system can help the vitalization of innovative services due to the rapid speed of changes.

This study suggests two principals which are required for a regulatory system to encourage the innovative telecommunication services. The first one is making a road and the second one is letting it be used freely. This study aims at drawing a broad picture about the regulatory environment or mood but does not mention specific regulatory methods. In addition, it does not measure which regulatory element is the most effective and also does not have confidence if the things to be mentioned later on are orthogonal. This study analyzes the principals required for regulatory institutions in a neutral stance, based on the insight which

the writer of this study has acquired while on working in a telecommunication company and I believe that this study can provide a rough sketch to make a study in the perspective of Business continued in the future.

## **2.2 Make a road**

First of all, it is important to secure infrastructures which technically enable innovative telecommunication services. It is the same logic as the large amount of water cannot flow into and cruise ships cannot float on a small river. When to secure infrastructure, both Wireless and Fixed network should be considered as the change in telecommunication services is happening both in Fixed and Wireless networks and also progressing in a Fixed/Wireless converged form. Strictly speaking, forthcoming contents of this study are not regulations. If governmental policies can be divided into regulatory and promotional areas, this part of the study belongs to the area of promotion policies. Promotion policies are included in this part of the study because regulatory authorities are mostly the main agents of such promotion policies and most of governmental policies are in a form of regulatory policies even if they are promotion policies.

### **Fixed network**

As each country has different developmental quality in Fixed network, their target level of development is different but their target direction of development is the same. Countries using ADSL based services aim at FTTH, countries equipped with 10Mbps aim at establishing 100Mbps network, and countries equipped with FTTH and 100Mbps network aim at establishing a network of 1Gbps speed or more strengthened functionality. The governmental policies are not needed if Business can voluntarily establish advanced network but many countries are used to establish Fixed networks through promotion policies. Korea, the representative country with powerful Internet network, has established the infrastructure through government's strong promotion policies in 1990's (Picot and Wernick, 2007). In case of the U.S., according to the result of a research analyzing the causal relationship between the degree of activation in broadband market and the success factors, about 1/3 of the reason why U.S. broadband market failed was explained by the absence of promotion policies (Atkinson et al., 2008). Finally, the U.S., whose regulatory direction was used focused on activation of competition, has announced a government driven National Broadband Plan to establish broadband.

### **Wireless network**

Considering current telecommunication services, Wireless network is more important than Fixed network. The use of Wireless data rapidly increases as Fixed/Wireless substitution has globally intensified and the use of smartphones has proliferated. Especially, recent innovative telecommunication services are mostly Wireless based services in a form of

Application. The problem is that there is a technical limitation in improving the quality of Wireless network within the limited spectrum. Thus, it is necessary to secure additional spectrums to encourage innovative telecommunication services based on Wireless network(Rysvy Research, 2011). As spectrum resources are owned by government, the role of government is the most important to secure additional spectrums required for telecommunication. There are two methods to secure additional spectrums, one is utilizing spare spectrums and the other is reallocating the spectrums after organizing existing spectrums. However it is not easy to implement both methods because there are not enough spare spectrums and reallocating previously allocated spectrums affects the interests of many. Nevertheless, some countries including the U.S., the UK and Japan have been preparing for advanced Wireless network by announcing plans to secure additional spectrums.

### **2.3 Let the road be used freely**

Once the road is broadened, it should be let used freely. If excessive regulations are imposed on the market, it is likely that the market cannot properly handle the change due to the resistance of keeping the existing system. Of course, it is important to set up principals for responsible behaviors and also there should be rules to control the case that the principals are not complied and to prevent such cases. However, the principals which allow the existing system just being followed and abused should be disappeared.

#### ***Ex ante vs. ex post***

There are many studies regarding the impact of regulations on the market. We need to discuss which regulation is more efficient rather than discussing if the regulation is needed or not. Ehrlich et al.(2010) have explained the negative effects of *ex ante* regulations in their study regarding the impact of regulations for Wireless telecommunication industries on innovations and consumers' right of choice. For the vitalization of innovative services, it is neither necessary to set up regulations for the whole market, which could inhibit various Business attempts, nor to make related regulations only based on assumptions while the market failure has not yet happened. Especially, the study says that the acts being prohibited by regulations are rather likely to positively contribute to innovations and consumers' choice. We can infer that *ex post* regulations are more efficient methods for the vitalization of innovative telecommunication services from the phrase "*ex ante*, one-size-fits-all rules would be an inefficient and potentially very means of exercising such oversight with respect to the wireless communications industry ... Rather, policymakers should adopt a case-by-case approach based on fact-specific inquiry."

While above discussion is about the necessity of *ex post* regulations in Wireless telecommunication industries, Baake et al.(2005) have explained about Fixed network telecommunication industries. According to Baake et al.(2005), Fixed networks' importance has been increasing through convergence with Wireless networks rather than through the

services of the Fixed network itself, therefore the traditional boundary between existing Fixed network based services and Internet services is collapsing. However, the telecommunication market has not yet adapted itself to such changes and still tries to keep the existing regulatory system which is only proper for existing telecommunication services. For example, the questions such as ‘whether to allow or not the interconnection among different networks?’ or ‘how to induce efficient competition among the same services using different technologies?’ are difficult to solve within the existing regulatory system. Baake et al.(2005) emphasized the importance of those innovative services should not be ruled via *ex ante* regulations but should be encouraged to compete efficiently with existing services via *ex post* regulations to make the innovative services establish new markets in a changing telecommunication market. Therefore, it is necessary to apply *ex post* regulations to the innovative telecommunication services because the existing regulatory system can act as an *ex ante* regulation for the innovative services and also the incumbents who already have competitiveness in the existing telecommunication market can abuse the system to keep their interests.

### **Net neutrality**

Net neutrality means that all traffics transmitted via Internet network should be treated as equal regardless of contents, application, service, device, service provider, and end-user(Kim, 2010). Basically, net neutral principal is originated to prevent the case that network providers discriminate users or other network providers in Fixed network services. There are such cases that U.S. network provider Medison River has cut off the VoIP of contents provider Vonage and Comcast has interrupted or delayed data uploading via a P2P file sharing program BitTorrent(Kim, 2010). Even though the discussion about net neutrality has started from Fixed network, it has not been a big issue in Fixed internet services. As Internet has made its nondiscriminatory access clear from its origin, any severe problem such as continuously controlling traffics or blocking the access has not happened. It is the result of combination between external pressure and the efforts of service providers to improve by themselves.

However, it is a different situation in Wireless networks. Recently, users became to use Internet services in Wireless networks as mobile data services have increased, which causes a lot of conflicts because Wireless networks have different nature from Fixed networks. If traffics suddenly increase in Fixed networks, it can be solved by installing additional fiber-optic cables even if it costs extra expenses. However, in Wireless networks, it is not easy to solve the problem as the spectrum resources are limited. The U.S. and EU have announced their basic stance regarding the net neutral principal but the scope and objects are not clear in the Wireless network. In a case that a Wireless service provider blocks mobile VoIP, it is not clear whether it should be considered as hindering the innovation in the perspective of service vitalization or decreasing investment incentives by destroying existing BM. Net neutral principal should not be used as a tool to discourage network providers’ will to do business.



Therefore, it is important to balance the vitalization of innovative services with the guarantee of existing service providers' investment incentives. Especially, at this point in time, how the net neutral principal is applied is the most important key to enable the innovation to happen after the services have changed into E direction on [Figure 1].

### **3. Case Studies**

This part analyzes the case of Korea, U.S. and Europe based on above principals. Through the comparative analysis of the three systems, each country's situation will be understood and proper implications required for each country to lead in telecommunication market will be suggested.

#### **3.1 U.S.**

Broadband competitiveness of the U.S. has been ranked 15th in the penetration rate, 23rd in speed, 19th in the charge among OECD 30 countries(OECD, 2010). To improve the situation, U.S. has announced National Broadband Plan(NBP) in 2008<sup>1</sup>. NBP aims at establishing 100Mbps Internet network on at least 100million U.S. households to spread broadband. NBP is a part of American Recovery and Reinvestment Act(ARRA) of 2009. The U.S. gives efforts to establish Fixed broadband by allocating \$2.5billion on Broadband Investment Program(BIP) and \$4.7billion on Broadband Telecommunications Opportunity Program(BTOP). NBP includes not just Fixed networks but also Wireless networks. The U.S. plans to establish Wireless broadband by reallocating the spectrum equivalent to 500MHz. It is targeted to increase the penetration rate of 4G up to 98% by 2014. \$27.8billion is allocated to spectrum reallocation, \$5billion is allocated to the establishment of 4G network in suburb areas, \$3billion is allocated to R&D for innovative Wireless technology and \$10.7billion is allocated to establish public safety network, which, in total amount, is a lot more than the budget amount for Fixed networks.

The regulatory policies of the U.S. usually apply *ex post* regulations and regarding net neutrality, FCC has consistently insisted strong regulations. The Net Neutrality Order approved by FCC applies strong regulations such as not allowing any discrimination or blockage of traffic in Fixed networks and also prohibiting any blockage of mobile VoIP or SoIP. As the FCC order was not passed by the House of Representatives, it is still necessary to see further progress but the strong basis doesn't seem to change.

#### **3.2 Europe**

According to 'Digital Agenda for Europe' announced in 2010, there is a plan to achieve

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<sup>1</sup> Refer to National Broadband Plan Homepage

100% of penetration rate of broadband by 2013 and to make more than 50% of European households join Internet network with 100Mbps or higher speed by 2020<sup>2</sup>. For Wireless infrastructures, there is a plan to establish Wireless broadband by securing additional spectrum equivalent to 800MHz by 2013. For this plan, European Investment Bank(EIB) plans to invest €2billion annually and plans to secure funding via EU instruments and EU funds. In addition, it is the strength of EU that its Wireless spectrum policy has global synchronization in mind.

EU has decreased the existing 18 *ex ante* regulations for markets to 7 by innovating regulations(Kim, 2011). Especially, EU is trying to promote the innovations by applying *ex post* regulations on newly formed markets. Regarding net neutrality, EU also made it public that network management of ISP is necessary and it will not make the net neutrality compulsory(Wang, 2011). EU concludes that excessive regulations deter the establishment of healthy competitive environment for markets and the efficient use and investment of networks. EU has a stance that current telecommunication regulations are enough to guarantee the openness of the network.

### 3.3 Korea<sup>3</sup>

Korea's competitiveness in high speed Internet is regarded as the best of the world. Korea has high speed networks with average speed of 53Mbps now after it started 2nd stage of the infrastructure establishment expanding the bandwidth in 2003, which had been continued from government's promotion policies in 90's. As it has established the infrastructure mainly with FTTH from 2006, now more than 55% of the infrastructure is consisted of fiber-optic networks. However, in result, it is in a stagnant state now. Fixed network infrastructures were well established through the facilities based competition among ISPs after the government deployed strong promotion policies, but now ISPs have lost their direction for further developments as they don't have any distinctive BM or investment incentives. The reason why ISPs don't upgrade the network even if they have enough capacity to establish 1Gbps and the competition among them is still fierce is because there is nothing they can earn through the upgrade.

It is even worse in Wireless networks. As smartphones have been rapidly spread from 2009, 50% of the total users are expected to use smartphones by the end of 2011. The rapid increase of smartphone use has led to the severe explosion of mobile data. However, regulatory authorities have not yet announced any specific guidelines on how it will secure additional spectrums.

Korea closely adheres to *ex ante* policies and has not yet set up the principals about the net neutrality. Currently, only the direction of guideline has decided and it plans to clarify the

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<sup>2</sup> Refer to European Commission - Information Society - Digital agenda for Europe Homepage

<sup>3</sup> Refer to Digieco, Economics & Management Research Lab Homepage

principals by 2011.

[Table 1] The result of case studies

	U.S.	EU	Korea
<b>Fixed</b>	Strong	Weak	None
<b>Wireless</b>	500Mhz	800Mhz	None
<b>Regulation</b>	<i>Ex post</i>	<i>Ex ante</i> → <i>Ex post</i>	<i>Ex ante</i>
<b>Net Neutrality</b>	Strict	Flexible	Scheduled(2011)

### 3.4 Implications

Korea does not have promotion policies for Fixed networks. Korea has already achieved the goals in Fixed networks which the U.S. and Europe want to establish. However, we have to think about if it is the only ultimate objective to establish good network infrastructures. Korea worries that network providers are tired of speed competition and enterprises like Google or Facebook are not generated in Korea even if its network is well established. The reason why the innovations are not active might be resulted from the traditionally continued strong *ex ante* regulatory system, therefore it is worth to refer the cases of the U.S. and Europe. But it is a different problem that network provides are tired of speed competition. As there are limitations in the user based BM itself, network providers should develop a completely new BM and the innovative services that can be provided only by them, which is not easy to do.

Speed competition in Wireless networks is also expected to progress in a similar way of Fixed networks. If 4G technology is applied in Wireless and enables the same speed as in Fixed networks, what could be the next step? It is worth to think about as the U.S. or Europe can also encounter the same question in the future. It is necessary for Korea to set up future oriented policies covering both Fixed/Wireless networks, especially considering the overall value chain.

### 4. Conclusion

The U.S. is likely to establish the most desirable environment if they change their too strong net neutral principals against network providers to be more flexible. Europe's unique flexibility is outstanding and especially it looks like already prepared the base to lead the future market of Wireless networks. Korea is facing the most difficult time to make a blueprint of future networks, which has not yet been experienced by any country of the world, and should build a flexible regulatory system.

The principals suggested in this study 'make a road and let it be used freely' is a simple message that it is necessary to build an environment enabling the innovations to happen. However, the two objectives of the principal can be seen as contradictory each other which

cannot be fulfilled at the same time. Korea who has developed infrastructures but lacks innovations and the U.S. who has active innovations going on but lags behind in the infrastructures, how these two countries' situation can be interpreted? The solution for Korea's problem looks obvious. It is difficult that a strong promotion policy coexists with a flexible regulatory environment. On the contrary, the U.S. has failed to improve the network environment only with the policies encouraging competition but succeeded to achieve the innovation of market basis and to build eco system. However, how the regulatory systems will change under strong promotion policies? Can the network providers have the investment incentives if the current regulatory environment keeps continued? After all, all the countries should take efforts to find the balance between those two principals.

## **5. Further research**

OTT innovative service is not a user based BM and so existing telecommunication companies are experience huge failure in competition with OTT telecommunication service providers. It is an important question how to find a sustainable BM in the perspective of the telecommunication companies or the Network Providers of the value chain. It is because we cannot rule out the network builder themselves from the loop of innovations. Considering that the writer of this study works in the research center of a telecommunication company, it is a very important issue.

If we make a road and let it be used freely, will the innovations happen? It is not just enough and needs the activation of market based innovations and the establishment of eco system. It is worth to do empirical studies which element affects the innovation in the perspective of regulations and to link the result to the concept of business.

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National Broadband Plan, <http://www.broadband.gov/>

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