Analysis of Mobile Broadband Service Penetration in Korea

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Abstract

The expansion of mobile broadband services will bring noticeable changes to the market in the present and in the near future and will also have an impact on society. The penetration of mobile broadband services is generally regarded to be a crucial factor for economic growth and global competitiveness of a nation, and South Korea continues to hold the global lead in mobile broadband penetration despite the fact that it is neither a technological leader nor a wealthy and developed nation. In this paper, the factors underlying the explosive growth in the number of subscribers to high-speed mobile broadband services in Korea are examined and analyzed under the theoretical frameworks of the diffusion of innovation and Porter’s diamond model of determinants of national competitive advantage. Korea’s success in mobile broadband deployment is characterized in terms of government support and coordination, supply-side and demand-side conditions, and competition in the market. Several implications for policymakers are provided from the analysis of this study.

1. Introduction

The expansion of mobile services will bring noticeable changes to the market in the present and in the near future and will also have an impact on society. The issue of how we might use these services in the future has received much attention as a result of the success of mobile services and due to the different possibilities for future development.

As telecommunications and computing technologies continue to evolve and shape the global business environment, mobile broadband services available within a given country become an increasingly significant factor that affect that country’s global competitiveness. Mobile services have fundamentally altered the nature of the global market because they allow for a new form of connectivity between networks, people, and businesses, eliminating limitations of time and space.

The penetration of mobile broadband services is generally regarded to be a key factor for individual countries to become information societies. Mobile broadband is rapidly expanding throughout the world, and HSPA and LTE technologies are delivering new services and applications to billions of smartphones, M2M devices, and other types of connected devices. The growing availability of mobile broadband services enhances business growth opportunities and drives the availability of a new range of applications, from movies on demand to remote medical services (Reuters, 2002). Essentially, access to mobile broadband networks and high-speed Internet is considered to be a necessary precondition for economic growth and international competitiveness.

Mobile broadband penetration has, from a global perspective, increased dramatically over the past few years, and the most successful country in this regard appears to be South Korea (hereinafter, Korea). Korea continues to hold a commanding global lead in mobile broadband penetration. According to OECD data from June 2013, Korea, together with Australia, Finland, and Sweden, are leaders in terms of mobile broadband uptake, and all three have passed the 100 per cent penetration rate for active mobile broadband subscriptions (see Table 1).

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Standard mobile broadband subscriptions</th>
<th>Dedicated mobile data subscriptions</th>
<th>Satellite</th>
<th>Terrestrial fixed wireless</th>
<th>Total subscriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Korea</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
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</table>

Table 1 OECD Terrestrial mobile wireless broadband subscribers per 100 inhabitants by technology
<table>
<thead>
<tr>
<th></th>
<th>Country</th>
<th>Fixed</th>
<th>Mobile</th>
<th>VoIP</th>
<th>IP-VPN</th>
<th>Broadband Capacity</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Australia</td>
<td>86.3</td>
<td>27.0</td>
<td>0.4</td>
<td>0.2</td>
<td>114.0</td>
<td>25,937,000</td>
</tr>
<tr>
<td>2</td>
<td>Finland</td>
<td>10.9</td>
<td>101.8</td>
<td>0.0</td>
<td>0.2</td>
<td>112.9</td>
<td>6,109,200</td>
</tr>
<tr>
<td>3</td>
<td>Sweden</td>
<td>28.6</td>
<td>79.3</td>
<td>0.0</td>
<td>0.0</td>
<td>107.9</td>
<td>10,267,000</td>
</tr>
<tr>
<td>4</td>
<td>Japan</td>
<td>89.9</td>
<td>15.4</td>
<td>0.0</td>
<td>0.0</td>
<td>105.3</td>
<td>134,301,898</td>
</tr>
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<td>5</td>
<td>Korea</td>
<td>77.2</td>
<td>25.7</td>
<td>0.0</td>
<td>0.0</td>
<td>88.9</td>
<td>51,456,440</td>
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<tr>
<td>6</td>
<td>Denmark</td>
<td>62.1</td>
<td>40.4</td>
<td>0.0</td>
<td>0.2</td>
<td>102.7</td>
<td>5,742,285</td>
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<td>United States</td>
<td>95.2</td>
<td>0.0</td>
<td>0.5</td>
<td>0.3</td>
<td>96.0</td>
<td>299,447,000</td>
</tr>
<tr>
<td>8</td>
<td>Estonia</td>
<td>46.6</td>
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<td>0.0</td>
<td>1.5</td>
<td>89.1</td>
<td>1,193,916</td>
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<td>9</td>
<td>Norway</td>
<td>56.7</td>
<td>29.4</td>
<td>0.0</td>
<td>0.8</td>
<td>86.9</td>
<td>4,359,830</td>
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<tr>
<td>10</td>
<td>New Zealand</td>
<td>67.1</td>
<td>14.8</td>
<td>0.3</td>
<td>0.3</td>
<td>82.5</td>
<td>3,688,131</td>
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<td>11</td>
<td>Luxembourg</td>
<td>74.9</td>
<td>7.2</td>
<td>0.0</td>
<td>0.0</td>
<td>82.0</td>
<td>436,000</td>
</tr>
<tr>
<td>12</td>
<td>United Kingdom</td>
<td>72.7</td>
<td>7.7</td>
<td>0.0</td>
<td>0.0</td>
<td>80.4</td>
<td>50,859,562</td>
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<tr>
<td>13</td>
<td>Iceland</td>
<td>47.6</td>
<td>26.6</td>
<td>0.0</td>
<td>0.5</td>
<td>74.7</td>
<td>239,628</td>
</tr>
<tr>
<td>14</td>
<td>Ireland</td>
<td>53.4</td>
<td>11.4</td>
<td>0.2</td>
<td>1.4</td>
<td>66.3</td>
<td>3,044,962</td>
</tr>
<tr>
<td>15</td>
<td>Netherlands</td>
<td>51.3</td>
<td>14.6</td>
<td>0.0</td>
<td>0.0</td>
<td>66.0</td>
<td>11,049,000</td>
</tr>
<tr>
<td></td>
<td>OECD</td>
<td>58.3</td>
<td>9.5</td>
<td>0.2</td>
<td>0.5</td>
<td>68.4</td>
<td>851,192,611</td>
</tr>
</tbody>
</table>

Source: OECD, June 2013

Korea is moving forward while other Asian countries are showing evidence of stagnant growth, yet Korea is neither a technological leader nor a wealthy and developed country. As previously stated in a broadband report published by the International Telecommunications Union (ITU), Korea's achievements in this area can almost be classified as a miracle, since the country is neither demographically nor economically suited to achieve the highest Internet penetration in Asia (ITU, 2003).

Recently, ITU (2013) has announced that Korea and Japan are set to be next-generation broadband leaders, which means they are advanced broadband economies where fixed broadband is predominantly supplied through FTTx. Mobile broadband is also almost ubiquitous in these countries as well.

Korea – as a next-generation broadband leader – has led the way in “ICT master plans,” implementing five year plans that were first adopted in 1995 to facilitate the transition into an advanced information society. Plans have had wide focus, including policies that promote both demand- and supply-side infrastructure development, unlike most other developed countries where demand has been left to develop on its own. In 2011, Korea has the highest household penetration rate in the world with 36.9 fixed broadband subscriptions per 100 population and with 105 active mobile broadband subscriptions per 100 inhabitants. Korea is also the top mobile broadband economy according to ITU figures.

Despite growing interest in this area, only a few studies have thus far evaluated the development of mobile broadband services in Korea, and previous research has emphasized individual factors that are important for the diffusion of these services. This study, on the other hand, evaluates the factors underlying the explosive growth of subscribers to high-speed Internet services from the perspective of the diffusion of innovation. In order to develop an analytical framework through which the sources of competitive advantage in mobile broadband of Korea can be studied, we propose that Porter's diamond model (1990a, b) can be implemented to study competitive advantage at the country level.

In this article, we provide a brief discussion of mobile broadband Internet deployment in Korea. Then, we provide a conceptual framework where the global diffusion of innovation model and Porter's diamond model are reviewed from a theoretical viewpoint. The major research question of this study is as follows: what factors have predominantly influenced a Korea’s success of mobile broadband penetration?

### 2. Mobile Broadband Service Deployment in Korea

The history of mobile Internet in Korea began with the launch a car phone service by Korea Mobile Telecommunications Service in 1984, Korea Telecom's subsidiary which later became SK Telecom (Choi et al., 2001). Then, Korea Mobile Telecommunications Service started to offer Korea's first mobile data service in 1998. The move to provision mobile broadband services took off after late 2000, following the granting of 3G CDMA2000 licenses. In 2002, Evolution Data Optimized (EV-DO, a standard of the CDMA family developed for mobile broadband) services were launched, primarily offering mobile broadband services to enterprise customers and “early adopters.”

Initially, these services were not marketed aggressively, in part due to concerns of possible network congestion and in part due to worries about low demand. However more aggressive marketing strategies were subsequently implemented, and EV-DO currently holds a 29.9% share of the mobile market.

In the early 2000s, following the government’s drive to increase internet access and use, WLAN services were introduced. This was followed in December 2003 by the launch of W-CDMA services by SKT and KTF and by the launch of WiBro (the Korean equivalent of WiMAX) by KT and SKT in June 2006. However, contrary to government predictions of 5 million subscribers three years from launch, the number of WiBro subscribers in Korea had reached only 0.2 million as of February 2009, with
service coverage limited to the metropolitan area of Seoul.

In September 2006, High Speed Downlink Packet Access (HSDPA) technologies were launched for the first time in the world in Korea. HSDPA is an enhanced 3G (third-generation) mobile-telephony communications protocol. Unlike for Wibro, the uptake of W-CDMA and HSDPA has been far more extensive with a combined subscriber base of almost 25 million in 2013.

In Korea, LG UPlus was the first player in the mobile market to introduce LTE. LG’s LTE service launched in July 2011, and the first national LTE network was completed in March 2012. These efforts by Korea’s smallest operator (by number of subscriptions) saw the company gain around 5 million LTE subscriptions by December 2011. SK Telecom, the largest mobile operator in Korea, launched LTE at the same time and has acquired 6 million LTE customers over the same period, while KT had 2 million LTE customers as of August 2012.

In Korea, SKT dominates the mobile market with 27.43 million subscribers as of January 2014 compared to 16.48 million for KT and 10.90 million for LG UPlus. These three large companies are leading the rapid growth in availability of mobile broadband services in Korea.

As a result of these efforts, Korea currently has one of the world's markets with the most accessibility for mobile broadband service. The OECD has pointed out that competition between mobile broadband service providers with different access technologies is a primary factor for rapid supply and adoption of broadband Internet services.

3. Conceptual Background

This section establishes the conceptual background of this study. First, the diffusion of innovation and the key factors of such are briefly defined in order to delimit the scope of this study. Afterward, Porter’s diamond model is introduced.

3.1. Diffusion of Innovation

Researchers have viewed innovation both as a discrete product or outcome, i.e., "a new idea, method, or device" (Damanpour and Evan, 1984; Kimberly and Evanisko, 1981), and as a process, i.e., "the process of introducing something new" (Rogers, 1983). Innovation is also defined as the adoption of an internally generated or purchased device, system, policy, program, process, product, or service that is new to the adopting organization (Damanpour and Evan, 1984; Zaltman et al., 1973). Rogers (1995) viewed innovation as "an idea, practice, or product that is perceived to be new by an individual or other unit of adoption."

The diffusion of technological innovation generally refers to the spread in the use of new methods, processes, or production systems (Rogers, 1995; Lin and Lin, 2008). While literature regarding organizational innovation is quite extensive (Rogers, 1983; Tornatzky and Fleischer, 1990), organizational innovation is generally described as "the adoption of an idea or behavior that is new to the organization adopting it" (Daft, 1978). More narrowly, innovation is defined as "the first or early use of an idea by one of a set of organizations with similar goals" (Becker and Whisler, 1967). Innovation activities include all scientific, technological, organizational, financial, and commercial steps that actually lead to, or are intended to lead to, the implementation of innovation.

Innovation does not generally occur in a static environment. Instead, it is the result of a dynamic process that involves the interplay of several factors that are internal and external to a firm. The innovation process encompasses several systematic steps, including requirement analysis, idea generation, project planning, product development, and marketing (Verworn and Herstatt, 2000). These individual steps may overlap with one another and may be simplistically categorized into three broad phases: conception, implementation, and marketing (Tiwari et al., 2000).

A number of analytical and empirical studies have been conducted regarding the diffusion process and the key determinants that influence the diffusion of new services (e.g., Yoo et al., 2005; Lee et al., 2013). The diffusion of new services depends not only on the communication channels over which extensive marketing research has focused, but also on numerous factors associated with the market environment. These additional factors include the intensity of competition, a company's strategic behavior, the characteristics of the new product, standards, regulatory regime, cultural issues, and the organizational capabilities of the company itself (Robertson and Gatignon, 1986; Gatignon and Robertson, 1989; Yoo et al., 2005; Lee et al., 2013).

The price of new services and the number of competing firms in the new markets are generally regarded to be the most important determinants that impact the diffusion of innovation. The price of innovative services has a tendency to be too expensive for customers, and therefore the market size for new services can be quite small. Under conditions of technological and market-based uncertainty, it is difficult for customers to make decisions as to whether
to adopt these innovative services. Since price contributes to the diffusion of new services, the entry of firms into new markets increases the supply of products, lowering prices, and results in an increase in the sales of new products and services.

3.2. Porter’s Diamond Model

In order to develop an analytical framework to investigate the sources of competitive advantage of mobile broadband services in Korea, we employed Porter’s diamond model (1990a, b), a tool developed for the study of competitive advantage at the country level. Porter suggested that a nation’s competitiveness is dependent on the capacity of its industry to innovate and upgrade. Differences in national values, culture, economic structures, institutions, and histories all contribute to competitive success. Porter developed a framework through which the competitive performance of 10 countries could be analyzed. The theory of national competitive advantage proposed by Porter is predicated on an analysis of the characteristics of the national environment within which firms operate (Lee and Chan-Olmsted, 2005). Porter proposed that four broad attributes individually and systemically constitute the diamond of national advantage, which is the playing field that each nation establishes and operates for its industries. These four attributes are factor conditions; demand conditions; related and supporting industries; and firm strategy, structure and rivalry of nations. Figure 1 shows Porter’s diamond model.

![Figure 1 Determinants of national competitive advantage](image)

The first dimension of the model is composed of factor conditions, which determine the flow of trade. The factor conditions include basic factors such as land, natural resources, and demographics, as well as advanced factors such as research facilities, communication networks, and training and educational levels. Porter emphasizes the importance of advanced factors, which include skilled human resources and infrastructure. The second dimension is composed of demand conditions, which stress the nature of how consumer demand within a given country can cause a firm to improve its competitive position. The related and supporting industries are the third broad determinant of national advantage. Internationally competitive home-based suppliers create advantages in downstream industries by contributing to a superior information flow, technical interchange speed, and rate of innovation and upgrading. Finally, Porter defines the fourth dimension of firm strategy, structure, and rivalry, suggesting that national circumstances and context shape the nature of domestic rivalry which can be described by the manner in which companies are created, organized, and managed. Additionally, he proposed that the intensity of the interaction between these four dimensions determines the extent of international success.

4. Factors behind Successful Mobile Broadband Penetration

Porter’s diamond model is useful as an organizing framework that allows us to examine the sources of an industry’s competitive advantage while taking country-level factors into consideration (Lee and Chan-Olmsted, 2005). Recently, a number of studies have focused on taking an innovation system perspective (Edquist, 1997; Freeman, 2002). According to this line of research, an individual actor never innovates in isolation, but rather interacts with other organizational actors to acquire, develop, and exchange knowledge, information, and resources required for innovation. Existing studies concerning innovation systems have focused on analyzing the interrelationships among various actors to assess the dynamics and complexities of the innovation process at different system levels. The successful penetration of mobile broadband services in Korea may be more accurately depicted by analyzing the interactions among diverse players in the industry. Recent studies (Esen and Uyar, 2012; Liu et al., 2009) also showed Porter’s model can be used for analyzing service industries like mobile communication industry and be useful when comparing more than two countries in a specific industry.

This article explores the factors behind the explosive growth in subscribers for high-speed mobile service in Korea using a diffusion of innovation
perspective as well as Porter’s model (Baliamoune-Lutz, 2003; Rogers, 1995; Thirtle and Ruttan, 1987; Porter, 1990a, b). First, for the context of mobile broadband diffusion, government support and coordination such as the national IT program can be derived from Porter’s model, since it is dependent on government policies at the country level, similar to firm strategy/structure at the industry level. The dimension of the demand conditions is related to the demand side in mobile broadband market. It contains the market environment and cultural issues from the innovation diffusion perspective. Furthermore, factor conditions and related/supporting industries are closely associated with supply side and competition dimensions. The supply side includes the price issue which is considered as important in the context of a new service from the diffusion of innovation theory. Figure 2 depicts the factors that led to the success of mobile broadband penetration in Korea with regard to government support and coordination, supply-side conditions, demand-side conditions, and competition.

4.1. Government Support and Coordination

Since broadband Internet services are strictly regulated by the government, government policy impacts the diffusion of broadband Internet service. Porter recognized that a government could play a significant role, by influencing the four principal determinants of the national competitive advantage. The dimension of government support and coordination includes 1) national programs for IT infrastructure, 2) financial and legal support, and 3) regulation. First, the Korean government invested vast resources into upgrading the nation’s telecommunication infrastructure.

National programs for IT infrastructure: The Korean government has invested vast resources to upgrade the nation’s telecommunication infrastructure. IT industry analysts principally attribute the rapid penetration of mobile broadband services to aggressive policy initiatives pursued by the Ministry of Information and Communication (MIC), which merged into the Ministry of Science, ICT and Future Planning (MSIP) in 2013. Since 1996 the Korean government has established a number of master plans to develop an information society, and the Korean Information Infrastructure (KII) project was initially implemented with the objective of establishing high-speed information infrastructure by 2015. This began with accelerated deployment of broadband Internet. In 1999, the Korean government launched the “Cyber Korea 21” project to focus financial and human resources on technological advancement of information and communication networks and to attract investment from the private sector. In order to strengthen network infrastructure, the KII project was designed to connect 144 core areas via fiber optic cable, enhancing subscriber networks such as wireless services and satellite networks.

Financial and legal support: The Korean government has implemented an Information Promotion Fund to finance projects that foster the use of information. Money from the fund is used to support ICT-related R&D, develop and encourage standardization within the ICT industry, train ICT human resources, promote broadband network roll-out, and promote e-Government initiatives.

The Korean government has supported the supply of inexpensive personal computers to allow individuals to connect to the Internet and has sponsored a variety of educational programs for such uses. The government also provided free broadband Internet access to middle/high schools and promoted the development of education-related content even for elementary schools. The availability of broadband Internet both at home and in schools has motivated students, citizens, and customers to subscribe to broadband services and for content providers to develop more competitive content and services (Park and Yoon, 2005). Recognizing that the high costs of deploying new local access networks may also hinder broadband roll-out, the government provided pump-priming funds to facility-based service providers via loans at preferential rates worth US$77 million in 1999 and a further US$77 million in 2000. Until 2005, additional investments amounting to US$926 million.
were spent on building infrastructure in rural areas and in small cities (Choudrie and Lee, 2004). Another provision granted public money in the form of prepayment for public services.

**Regulation:** The Korean government has enacted a vast number of industrial support policies to encourage R&D in the ICT sector, including incentives for joint international research, tax and rent reductions for companies operating in emerging Internet sectors, deregulation for high technology start-ups, promotion of overseas IT market penetration, promotion of greater IT use in traditional industries such as agriculture and fisheries, and measures to facilitate standardization.

In addition to providing frameworks and supporting market development, the government has extended its activities to the implementation of policies with regard to competition and regulatory frameworks. Korea has established a regulatory mechanism for broadband services in order to encourage the deployment of broadband systems. In Korea, telecom firms are governed by different regulatory systems with a variety of entry conditions and limitations. The Korean government licensed new firms to enter both wired and wireless telecommunication services that are traditionally monopolized by the local incumbent. This has resulted in a competitive environment where telecommunication service providers provide high-quality services at lower prices. Growing competition then induced telecommunication companies to seek out new business opportunities, such as providing broadband Internet access services.

**4.2. Supply Side**

We also investigated supply-side drivers including 1) price reductions and 2) dense housing patterns.

**Price reduction:** One of the most important factors underlying the market penetration of broadband services in Korea can be credited to low subscription prices resulting from intense domestic competition. The price of mobile broadband services in Korea has been quite inexpensive as compared to that of other countries. In 2008, mobile broadband service subscribers could use connected services all day long for approximately 25.9–46.1 US dollars per month. Facilities-based service providers (FSPs) have freely entered the market without encountering entry and price regulations because broadband services have been classified as value-added services, and therefore these FSPs have competed with each other head-to-head. Most FSPs entered the market concurrently, setting flat-rate retail prices at low levels to entice long-hour dial-up users. The resulting laissez-faire facilities-based competition resulted in a further lowering of prices.

**Dense housing patterns:** Deployment of telecoms networks is more cost-effective in densely populated urban areas. ITU (2001) determined that Korea's crowded housing structure was a key driver of the rapid growth of broadband services. More specifically, the fact that more than 90% of all households are located within a short distance from a local telephone exchange office causes mobile technology to be the most economic method for mobile broadband. Approximately 70% of the country's citizens live in the seven largest cities, and nearly 48% of all families live in apartment complexes, allowing for economies of scale to work efficiently for FSP market operations. Since apartments are the most common type of housing in Korea, altnets can easily acquire broadband subscribers by deploying their own HFC or even by providing fiber access lines.

Distance is not an issue since more than 90% of all households are located within a 1.4 mile radius around a mobile broadband switchboard. This explains why, for broadband subscriptions, residential Internet use exceeds that of business use in Korea. This is a stark contrast to that of many sparsely populated Western countries that suffer from the so-called "last mile" problem that prevents bringing Internet lines to every home.

**4.3. Demand Side**

The rapid growth of mobile broadband services in Korea has also been impacted by demand-side factors. These include 1) attractive applications and 2) an IT-friendly culture.

**Attractive applications:** The majority of customers demand technological superiority and functional performance. Many end-users are interested in practical utility when they adopt new innovations (Shapiro and Varian, 1998; Arthur, 1996), and in the early stages of Korea's broadband market development, cyber trading, Internet-based school services, and online interactive games drove the demand for broadband services.

The marked growth of Internet banking and e-commerce has positively influenced the diffusion of broadband Internet services from the demand side, and the continued boom of Internet businesses in Korea has also given fresh hope to online shopping mall web sites. As broadband penetration increased, there was a move away from purely 'passive' uses of the Internet, such as web browsing, toward more 'interactive' services, such as shopping, emailing, and participation in cyber communities. In particular, mobile TV was authorized for broadcast in 2005, making Korea the first country
in the world to launch mobile broadcast services. Since 2005, mobile TV services have been substantially improved. The T-DMB service is by far the most popular, in part because T-DMB service providers have developed a wide range of interactive services to gain new revenue sources. An increase in the demand for entertainment and mobile games has also stimulated the growth of mobile broadband Internet services.

The high rate of Internet penetration rate coupled with the increasing use of mobile broadband facilities has likely spurred this trend, and the development of related services – such as entertainment, community, and mobile commerce services – around the value chain of broadband services could influence the diffusion of innovation.

**IT-friendly culture**: Another major factor that has affected mobile broadband penetration has been the advent of a Korean culture that is IT-friendly, participates in virtual communities and blogging platforms, and also shows enthusiasm for IT-based educational services. Virtual communities are a new form of communication where community members share information and knowledge for topics of mutual interest or to solve specific problems. When offline activities are unfeasible because the members of a community are geographically dispersed, adoption of multimedia support, including video conferencing, may provide the community with similar benefits to that of offline, face-to-face meetings. High-speed mobile broadband services are necessary to enable effective multimedia usage, and in fact, there are several mobile virtual community service providers in Korea, including KaKaoStory and Band. In these virtual communities in Korea, members frequently interact with others in cyberspace via mobile broadband Internet services, and even occasionally launch task-oriented project teams through ad-hoc organization. One of the distinctive Korean cultures is that it is important for Koreans that they are involved in a group based on region, educational background and hobby. That would be why Koreans eagerly participate in virtual communities. The results of previous studies have shown that cultural characteristics may have an impact on the diffusion of innovations (Lee et al., 2013). In more than 40 countries around the world, Hofstede (1991) has collected cultural data and analyzed his findings. He identified five distinct cultural dimensions and classified national cultures into four types. According to his research, Korea is characterized by relatively low individualism. This is manifest in a close long-term commitment to the member ‘group’—be that a family, an extended family, or extended relationships. The society fosters strong relationships, wherein everyone takes responsibility for the fellow members of their group. Koreans share similar values, norms, and communications, and thus customers tend to exhibit similar behavior patterns and close interpersonal relationships. This homogeneous culture has been shown to be positively related with the speed of diffusion of innovations.

Also, Korean work culture has a tendency to have employees stay longer in the office, rather than having them work in a mobile office environment. Koreans also often seem to prefer indoor leisure environments (such as playing online games in internet cafes) and are less likely to work or surf the internet outdoors.

Furthermore, Korean parents generally tend to be obsessed with their children’s education, and invest large portions of their income in private education. These days, IT-based training has become a matter of primary concern in Korea, and the Ministry of Education and Human Resources Development has thus far spent $1.3 billion on 30-inch televisions, computers, and Internet access for 220,000 classrooms. The Ministry has also developed a computer education program to help teachers learn how to use computers more effectively in their classes. Now, computers and the Internet have become indispensable tools for students to do their homework properly. Thus, most families with students subscribe to mobile broadband services.

### 4.4. Competition

Finally, competition among different firms with different technologies and networks is one of the key elements that influences the rate of Internet service penetration in certain countries (OECD, 2001). The factors related to the competition include 1) intense competition and 2) changes in the business model toward an open system.

**Intense competitions**: Korea’s mobile broadband market evolved via fierce competition between service providers to seize new business opportunities. An increase in the number of competitors indicates that more information is available on new product and services, and a higher number of competitors triggers an increase in alternatives for customers to adopt new products and services and to reduce risk by obtaining more information on these new product and services. Most of all, the aggressive entry of SKT, KT and LG U Plus, which control Korean wireless telecommunication services, has affected the rapid diffusion of mobile broadband services.

**Changes in the business model toward an open system**: The emergence of the Internet has transformed competition in the market from a closed-network business model to an open-network one. The disintegration of access functions from other services
has played a crucial role in changing the competitiveness of the Internet access market. Internet users in Korea are well-educated in terms of personal computer use and internet access, and can easily search for value-added information as well as for a variety of service providers. ISPs provide inexpensive access and customers enjoy a more open Internet with a higher availability of valuable services.

New startups have implemented new business models and have grown into important companies, such as KaKao in mobile community services, SundayToz in mobile games, and Yellow Mobile in mobile shopping. Korean handset manufacturers, such as Samsung and LG, have the largest market share in the world and are constantly receiving awards for their phone designs and innovative features. A vast range of mobile broadband services and applications are also available.

Koreans can use their mobile phones to make payments online for everything from drinks in a coffee shop to large purchases in department stores. Operators have introduced mobile banking services, and video services and games over mobile phones have also been a huge success.

As fixed broadband access technologies continue to evolve, the rapid uptake of mobile broadband may prove to be a challenge. Innovative bundling tariffs, appealing content, and compelling voice offerings will likely be key success factors for the mobile sector in the future.

5. Conclusion

In this paper, we investigated some of the key factors that have influenced the successful penetration of mobile broadband in Korea: (1) government support, (2) demand-side conditions, (3) supply-side conditions, and (4) competition. Korea should now prepare and provide well-organized IT education, including training on cyber-ethics for old as well as for young individuals. Furthermore, technical support for safe mobile transactions as well as relevant policies for internet security will prove to be essential to promote the use of high-speed mobile broadband Internet services. Moreover, a social consensus regarding internet culture should be formed. Such a mature internet culture may, in the future, play a role for self-regulation against the adverse side effects such as hacking, computer viruses and worms, spam mails, privacy invasion, online crime, Internet addiction, and other harmful web sites.

Korea’s rapid mobile broadband deployment has several implications that policymakers from other countries should take into account. First, to accelerate initial investment when rolling out mobile broadband networks, government-led policies for the construction of an IT infrastructure are required. Second, unrestricted competition between service providers, as well as between technologies for mobile service access, is effective in improving quality and lowering prices, thus paving the way for early adoption (Moore, 2002). Finally, a diverse range of attractive services should be developed to generate sufficient traffic for both carriers and content providers. An IT-friendly culture also appears to be beneficial with respect to early adoption and rapid diffusion of new services and technologies.

Korea is indisputably an Internet powerhouse, thanks to the nation’s cutting edge infrastructure and technologically savvy citizens. Indeed, many Koreans spend hours every day on the Web, playing games, surfing, or chatting. Some users even say they feel insecure when they are not connected. They are willing to spend real money in the virtual world and quickly adopt and accept new technologies, making Korea a global "test bed" for new Internet businesses. The success of Korea’s mobile broadband service industry holds great significance in that it has encouraged the traditional voice service industry to take a leap forward, transforming itself into a new and promising Internet and data-based industry.

Of course, this study has several limitations. Since this study does not include any empirical validation with data, it might be just like a preliminary conceptualization of what might explain the sudden increase in mobile broadband adoption. Along with further theoretical development it would have been useful to conduct preliminary interviews with mobile broadband providers to support the proposed model. Also, although IT adoption and IT continuance are different concepts, this study did not make clear distinction of the two concepts since penetration may include both of them. Classifying different factors under IT adoption and retention can further add interesting explanation to the model. Moreover, we did not conduct any comparative analysis of Korea vs. other countries though we used a national competitive advantage model. A comparative study between countries in each dimension of the framework can be considered for future research direction.

There could be other factors behind Korea’s high penetration of high-speed mobile Internet, although these have not been mentioned in this study. For example, individual or user specific traits might be added to the model. However, we have selected and grouped the most significant factors into four categories: government support and coordination, supply-side conditions, demand-side conditions, and competition. This provides us with a coherent and integrated perspective on the characteristics of Korea’s
mobile broadband penetration. This analysis can function as a blueprint for other countries that are making efforts to accelerate the deployment of high-speed mobile Internet networks.

References


