Competitive Advantage of Broadband Internet: A Comparative Study Between South Korea and the United States

Published in *Telecommunications Policy*

By

Choongok Lee
Account Executive
Samsung Corporation
choongok@hotmail.com

And

Sylvia M. Chan-Olmsted
Associate Professor
Department of Telecommunication
College of Journalism and Communications
University of Florida
Gainesville, FL 32611
352-392-0954
chanolmsted@jou.ufl.edu

Competitive Advantage of Broadband Internet: A Comparative Study Between South Korea and the United States

Abstract

As telecommunications and computing technologies continue to evolve and shape the global business environment, the broadband Internet readiness of a country becomes an increasingly significant aspect in affecting a country's global competitiveness. Currently South Korea is ahead of the United States in the deployment of broadband Internet connection. What factors have contributed to South Korea's competitive broadband environment? An analytical framework was proposed to compare the development of broadband Internet in South Korea and the United States. It was found that the two nations' differences in their broadband Internet developments might be explained by a combination of policy, consumer demands, and supporting/related technologies issues.

Introduction

The deployment of the broadband Internet infrastructure is shaping the nature of business for many industries involved in media, communications, entertainment, and many other forms of content and interactive services delivered via conventional channels and/or the Internet (Wolf & Zee, 2000). The growing availability of broadband Internet access is enhancing business growth opportunities and driving a range of new applications from movies on demand to remote medical services (Reuters, 2002). At the same time, the Internet has fundamentally altered the nature of global markets as it enables people to connect to other networks, people, and businesses, free from the limitations of time and space (Sprano & Zakak, 2000). In fact, the diffusion of such an infrastructure is now strategically important for individual countries as it carries the potential to significantly contribute to a country's economic wealth in the emerging age of electronic commerce (e-commerce) (Garfield & Watson, 1998; Oxley & Yeung, 2001). Essentially, the broadband Internet readiness of a country affects its ability to compete globally.

The current development of the broadband Internet access market varies greatly across different countries. Nevertheless, South Korea has consistently been the global leader of broadband Internet deployment since 1999. In 2003, South Korea's broadband penetration was approximately 21%, significantly higher than that of the next country in line, Hong Kong (15%). Though the United States has the most broadband subscribers (20 million plus), its broadband penetration rate is ranked number eleven among all nations, behind countries such as Canada, Taiwan, Denmark, Belgium, Iceland, Sweden, the Netherlands, and Japan. By comparison, while 70% of Korean Internet users connect via broadband access systems, only 39% of U.S. Internet surfers use similar routes.

Globally, about one in every ten Internet subscribers has a broadband connection, with DSL dominating the market (59% DSL vs. 39% cable). Contrary to this trend, cable is the leading access provider in the Americas (ITU, 2003).

How did South Korea become the leader in the world of broadband Internet? As stated in a broadband report from the International Telecommunications Union (ITU), South Korea's achievement in this area can almost be classified as a miracle since the country is not demographically or economically suited to have the highest Internet penetration in Asia (ITU, 2003). There are a few studies in the development of the Internet or broadband Internet at the country level. The factor of "culture" was said to play an important role in the policy decisions and formations of national information infrastructures (Garfield & Watson, 1998). Economic wealth and telecommunication policy were also reported as the most salient predictors of a nation's Internet connectivity (Hargittai, 1999). Entrepreneurship and public policy were shown to have differed systematically in various countries, with distinctive consequences for their Internet developments (Guillén & Suárez, 2001). In addition, it was concluded that the key aspects to understanding the overall broadband development of a country were whether there is infrastructure competition between DSL and cable networks; whether there is competition between operators using the same technologies; and whether unbundling, line sharing, or other open access polices are in effect to speed up the development of broadband services (OECD, 2001, October 29).

All of these studies, however, emphasized the individual factors related to the development of either the Internet or broadband. Furthermore, while there was research which investigated the competitive advantage of countries in various broadband-related industrial sectors, most have focused on comparing the United States with a number of

Asian countries collectively (Yun & Lim, 2002). Because of the comparatively advanced deployment of broadband Internet in South Korea, it would be fruitful to assess the possible environmental factors that have contributed to this country's broadband achievement through a comparison with another leader of the industrialized economies, the United States. This study will, therefore, assess the current status of the Korean and United States broadband Internet, discuss the conceptual issues concerning competitive advantages of the nations, and then apply an analytical framework to compare the broadband-related environmental factors in these two countries.

The Development of Broadband Internet in South Korea and the United States

The United States began providing broadband Internet services one year before South Korea. Nevertheless, South Korea has shown exceptionally fast expansion of such services since the introduction of the cable modem service by Thrunet in July 1998. Three months later, DACOM entered the cable broadband business and another competitor, Hanaro Telecom (Hanaro), launched ADSL services in April 1999. Korea Telecom (KT), the competing telco, responded to Hanaro's ADSL launches with ISDN and ADSL services (Lee *et al.*, 2001). Other telecom firms such as SK Telecom entered this market through the alliance with a cable company in December 1999, and ONSE Telecom started to provide cable modem in August 2000. In summary, three companies– KT, Hanaro, and Thrunet– collectively commanded over 93% of the Korean broadband market, and the next four mid-size companies shared the other 7% of the market in 2001 (see Table 1). The dominant position of the major broadband providers seems to continue to the end of 2002 as KT and Hanaro collectively occupied a 96% share of the DSL market, while Thrunet and Hanaro Telecom enjoyed 76% of the cable modem market (Goldman, 2002).

Comparatively, in the United States, although DSL technology was developed by the early 1990s, the RBOCs did not aggressively market DSL until 1999, mostly because of the concern that it would erode their business line markets (Morris, 2000). In 2001, MSOs led telephone companies in the residential broadband Internet access market with a 68% market share. The market share of the top three MSOs (Time Warner Cable, AT&T Broadband, and Comcast[1]) was over 60% of the total cable modem market, while the RBOCs' served over 93% of the DSL lines in 2001 (See Table 1). Cable also continues to dominate DSL in the race of broadband market shares. In 2003, 67% of broadband users in the U.S. connect using cable modems, up from 63% in the previous year, while DSL had 28% of the broadband market in the same year, down from 34% a year earlier (CyberAtlas, 2003).

As for the pace of broadband Internet development in these two countries, Figure 1 clearly shows that South Korea has rolled out high speed Internet with a much faster averaged annual growth rate of 30% since 1999. There are also considerable differences regarding the Internet usage patterns between the American and Korean Internet users. For example, South Korean Internet users tend to surf the Internet more frequently than their US counterparts. In mid 2001, an average South Korean used the Internet 18.9 days per month, compared with 12.3 days for the Unites States.

Literature Review

To assess the differences in the development of broadband Internet access between South Korea and the United States, this study will first review the factors that might affect the growth of the Internet in a society and the relationship between technology and the global competitiveness of a nation. It will then incorporate Porter's diamond model (1990a, b), a tool proposed to study competitive advantages at the

country level, to develop an analytical framework to examine the sources of competitive advantage of broadband Internet between South Korea and the United States.

Factors Influencing the Development of the Internet

Various studies have investigated the development of the Internet or broadband Internet at the country level. Hargittai (1999) examined the impact of economic indicators, human capital, the institutional legal environment, and existing technological infrastructure to explain the differences in Internet connectivity among OECD countries and found that economic wealth and telecommunication policy are the most significant predictors of a nation's Internet connectivity. Guillén and Suárez (2001) also discovered that Internet development is higher in countries with conditions that favor entrepreneurship and with a democratic political system.

Developing nations, however, may be influenced by governmental policy more so than developed countries. Hon (1992), using Singapore's success in Internet deployment as an example of a proactive government strategy, suggested that public policies that address skills development, state-of-the-art telecommunications, funding for small to medium-sized IT companies, an international approach to standardization, and special demonstration projects are essential in nurturing a nation's Internet development (Hon, 1992). In fact, many newly industrialized and developing nations have instituted policies ranging from public acknowledgement of the importance of the Internet to specific acts that encourage, support, or mandate IT innovations and/or acceleration (King *et al.*, 1994).

Cane (1992) further suggested that firm unreadiness, regulatory barriers, and a lack of standards tend to inhibit diffusion of information technology (IT) in OECD nations in spite of their well-developed infrastructures, computer and telecommunication

industries, and substantial resources. Goodman *et al.* (1994) proposed that the availability of Internet might be hindered by government regulation, lack of technical knowledge, and local or cultural factors in developing countries.

Several studies have constructed analytical frameworks to understand the development of the Internet in a nation. Bazar (1997) suggested that the penetration of the Internet within a country is dependent on a number of factors including infrastructure, government policy and regulations, economic development, culture, language, and information technology (IT) penetration in the country. Wolcott *et al.* (2001) presented a comprehensive framework to access the global diffusion of the Internet in a nation. Their framework consists of six dimensions— pervasiveness, geographic dispersion, sectoral absorption, connectivity infrastructure, organizational infrastructure, sophistication of use—and 12 determinants influencing the dimensions in a country.

Technology and Competitiveness

The Internet is a major technological innovation of the 20th century. It has fundamentally altered the nature of the global market because of the new connectability between networks, people, and businesses without the limitation of time and space (Sprano & Zakak, 2000). It is evident that the Internet will contribute significantly to the economic wealth of a nation as it migrates toward an e-commerce-enhanced economy (Garfield & Watson, 1998; Oxley & Yeung, 2001).

Schumpeter (1950) had argued for the idea that technological competition is especially important in capitalist economies. His idea led to the neo-technological trade theories of the 1960s, which stressed the importance of cross-country differences in technological capability and their impact on trade (Dosi *et al.*, 1990). Fagerberg (1988), based on the data for 15 OECD countries from the early 1960s to the early 1980s,

generally confirmed the importance of growth in technological and productive capacity for a nation's competitiveness.

Porter's Competitive Advantage of Nations

Competitiveness in the world market has been one of the central concerns of many industries as well as governments. Porter (1990a) developed a framework to analyze the competitive performance among ten countries.[2] He suggested that the influence of a nation on the performance of its firms occurs through the ways in which "a firm's proximate environment shapes its competitive success over time" (p.29). The primary role of the nation is the 'home base' for the firm, a place that supplies the firm's core technologies and advanced skills. This view of the nation as a set of contextual variables has several advantages from an analytic perspective. Porter's analysis of industrial performance at the national level contributes to the theory of competitive advantage at the firm level; it makes easy a dynamic approach to the analysis of competitive performance at the national level (Grant, 1991; Kaufman & Gittell, 1994).

The Diamond Model

Porter's theory of national competitive advantage is based on an analysis of the characteristics of the national environment in which firms operate. He proposed that four country-based analytic dimensions ("the diamond") are the key to understanding the dynamics of an industry.

The first dimension is "industry factors," which he divides into basic considerations such as natural resources, climate, location, and demographics and advanced considerations such as research facilities, communication networks, and labor force training and educational levels. He emphasizes the importance of the advanced factors because they are subject to enhancement through capital investments and less

imitable by competitors. The second dimension is "demand conditions," which emphasizes the nature of consumer demand in a home country in motivating a firm to improve its competitive position. Again, sophisticated, advanced consumer tastes tend to inspire and improve an industry by forcing the firms to develop highly differentiated products. The third dimension is "supporting industries," which are the downstream beneficiaries of the internationally competitive home-based suppliers that often provide the supporting or related industries with better information flow, technical interchange speed, and the rate of innovation and upgrading. Finally, Porter suggested that national circumstances and contexts often determine how firms are created, organized, and managed, as well as what the nature of domestic rivalry might be. Porter also proposed that the interaction intensity between the four sets determines the extent of international success. For example, vertical and horizontal linkage between successful industries helps the creation of 'advanced factors' such as technologies, sophisticated employee skills, design capabilities, and infrastructure. Successful downstream industries create the better demand conditions. These demand conditions encourage development and upgrading by supplier industries and entry by successful firms in related industries. Last, an industry's geographic concentration offers the most effective means for intensifying the interactions. In particular, when rival firms operate close to one another, Porter asserted that the firms will be highly motivated to make the strategic investments necessary to continuously improve productivity.

Some have argued that Porter's "diamond model" lacks precision in the definitions of some key concepts and predictive ability due to the ambiguity over the signs of relationships, the complexity of interactions, and dual causation (Grant, 1991). Most importantly, the diamond offers such a complex set of variables and possible

interactions that it is difficult to specify causal relationships (Kaufman & Gittell, 1994). Some scholars have also concluded that the theory does not work very well for small open economies such as Canada, Finland, Austria, New Zealand, and Ireland (Bellak & Weiss, 1993; O'Donnellan, 1994; O'Malley & O'Gorman, 2001; Rugman & D'Cruz, 1993). Specifically, domestic demand conditions often cannot be a major determinant of competitive advantage for industries in small open economies, and rivalry between domestic firms in small countries may not be a significant influence.

The Proposed Modified Diamond Model

Whatever the validity or otherwise of such critiques, Porter's diamond model is useful as an organizing framework for examining the sources of an industry's (or industry segment's) competitive advantage while taking country-level factors into consideration. There are several studies that used Porter's diamond model in various fields. For example, Healey and Dunham (1994) applied Porter's analysis of the competitive advantage of nations to understand why one British local economy (Coventry) changed from a position of relative competitive disadvantage to one of advantage. Curran (2001) used Porter's diamond model of competitive advantage as a framework with which to evaluate the research performance of departments in UK higher education institutions and found the most successful departments in research were those in the innovation-driven stage. O'Malley and O'Gorman (2001) examined the role of Irish factor conditions; domestic demand conditions; related and supporting industries; and firm strategy, structure, and rivalry in accordance with Porter's diamond model in exploring the development of the Irish indigenous software industry's international competitiveness.

Accordingly, it is proposed that Porter's diamond model be modified for the comparative analysis of the Korean and U.S. broadband markets. Though Porter

recognized that a government could play a significant role, affecting the competitive advantage of nations by influencing the four principal determinants, he did not include government as one of the main determinants of the diamond model. Because a government can help stimulate an entrepreneurial climate and direct/support an infrastructure (O'Shaughnessy, 1996), and changes in regulatory regime require changes in strategies related to any or all diamond determinants (Kamann & Strijker, 1995), it is proposed to add "government" as an external determinant in the modified framework. The factor may influence and be influenced by each of the four determinants. In addition, this study proposes to modify the firm strategy, structure, and rivalry determinant to "competition conditions," using industry rather than firm as the unit of analysis. Porter (1990a) has emphasized that firms would innovate to survive under competitive pressure and suggested rivalry has a direct role in stimulating improvement and innovation. Thus, the competition condition at the industry level may be a more proper determinant in this study. In summary, the intensity and potentiality of the competitive advantage of nations are a function of five determinants: government, advanced factors, consumer/demand conditions, related and supporting industries, and competition conditions (see Figure 2). Note that among the determinants in the diamond model, advanced factors (e.g., research facilities, communication networks, and labor force training and educational levels) are most important in determining the dynamics of an industry (Kuijper & Maltha, 1995) and achieving higher-order competitive advantages (Meeus & Oerlemans, 1995).

Adopting this framework of analysis, the following research questions were raised: what are the differences and similarities between the broadband Internet development of South Korea and the United States? Subsequently, which factors

contribute to the differential development of the broadband Internet in South Korea and the United States?

Developing viable measures of the proposed determinants is a significant challenge because there are limited studies that focus on the development of the Internet or e-commerce at the international level (Bazar, 1997; Guillén & Suárez, 2001; Hargittai, 1999; OECD, 2001c; Oxley & Yeung, 2001; Sparno & Zakak, 2000; Wolcott *et al.*. 2001).

In the context of this study, specific policies that are relevant to broadband Internet and the regulatory systems of telecommunications operators will be examined to assess the differences in governmental influence. Measures such as the national digital communication infrastructure, the educated/skilled labor force, and university research institutes in certain advanced fields will be reviewed to depict the advanced factors (Porter, 1990a). Specifically, the Internet infrastructure by the percent of households with a computer, as a computer is the required hardware to connect to the Internet; the proportion of broadband connection among Internet users; and the relative numbers of Internet hosts and Web sites will be assessed. Note that the number of people online through broadband Internet access is both an indicator of the potential of e-commerce and access to a range of online services (Atkinson & Court, 1998, November). The number of hosts is a gauge of the development of Internet infrastructures (Atkinson & Court, 1998, November). The number of Web sites is a good proxy for the level of national development of Internet content (OECD, 2001a). The level of education completed by adults is also a commonly used indicator for human resource; the highest level of education attainment reflects his/her skill level (OECD, 2001b).

The next factor, consumer/demand conditions, refers to the quality and quantity of customers' demands (Porter, 1990a). In this study, Internet users' characteristics and behavior will be used as the proxy to understand their demand for broadband Internet. Demographic factors such as income, education, age, and geographic location will be reviewed to study the profile of Internet users at home. To understand potential consumers, the reasons for those who do not use the Internet at home are also assessed. To examine the industries related to and supporting broadband Internet, this study will focus on an essential component of Internet-propelled industries, the e-commerce market. E-commerce capabilities can help boost a nation's competitiveness and shift the competitiveness because of the efficiencies gained through Internet technology (Sprano & Zakak, 2000). It is difficult to measure how widespread e-commerce is, but a count of secure servers is a reasonable measure of the distribution of e-commerce activities in a country (OECD, 2000a). E-commerce transactions are used to understand the volume of electronic business (KNSO, 2002, March 10; U.S. Census Bureau, 2002, March 18). The amount of e-commerce is measured by industrial classification to understand e-commerce transactions. Finally, competition among different networks with different technologies and companies is one of the key elements impacting the rate of Internet development in certain countries (OECD, 2001b). To address this issue, this study will review the competition between DSL and cable modem and the competition among companies providing broadband Internet access. Rivalry is examined through the pattern of market share of DSL and cable modem and the top-four firms ratios (CR4).[3] The price of broadband access is also reviewed in order to assess the result of competition.

Research Method

A case study research approach is employed to investigate the research questions. Critics of the case study method believe that the findings of case studies can offer no theoretical implications that go beyond the cases, but this problem can be reduced by using theoretical ideal types and predictions to select and frame a problem for explanation (Aemnta, 1991). The case method is also useful when a topic involves a special or unique set of circumstances or phenomena that warrants intensive, in-depth, and holistic study (Bradshaw & Wallace, 1991; Tellis, 1997; Hammersley & Gomm, 2000), as in this study of the U.S. and Korean broadband development. The cases selected, naturally, are the South Korean and U.S. broadband Internet markets.

For the purpose of this study, materials from governmental publications, press reports, and online documents were examined. Specific statistical data sources include books and reports such as OECD's *Economic outlook* (2000a); OECD's C*ommunications outlook* (2001a); OECD's S*cience, technology and industry scoreboard: Toward a knowledge-based economy* (OECD, 2001b); *The development of broadband access in OECD countries* (2001, October 29); the survey report of U.S. Department of Commerce (DOJ) (2002); and reports from the Korea Network Information Center (KRNIC) (2002).

Results

Comparing the Role of the Government

South Korea has established a set of national policies such as the Korean Information Infrastructure Plan (KII) and the cyber building certification system to encourage the development of broadband Internet.

The Korean Information Infrastructure (KII) Plan

South Korea has promoted the construction of the KII project since 1993. The Framework Act on Informatization Promotion was enacted to drive the KII project in

1995. The goal of KII was to construct an advanced national information infrastructure that consists of communication networks, computers, databases, and multimedia terminals (Cha, n.d.). This project was revised various times during the construction due to the rapid changes in technological innovations and market demands.[4]

Specifically, the KII plan involves three parts—government, public, and test bed—and is constructed in three phases (see Table 2). For example, the main objective of the Korean Information Infrastructure-Government (KII-G) is to construct a backbone network. From 1995 to 2000, a nationwide backbone and ATM switch networks were constructed. An optical transmission network of a 155 Mbps-40 Gbps backbone network was established in 144 cities. The third phase objective is to upgrade to Tera bps. The Korea Information Infrastructure-Public (KII-P), on the other hand, is developed for home and business and invested in by private carriers and building owners. The KII-P aims to offer users interactive broadband multimedia information services. The access network has been established by using various technologies such as the optical backbone network, fiber to the office (FTTO), fiber to the curb (FTTC), DSL, and CATV. KII-P's first phase was completed to connect fiber to the big buildings; KII-P's second phase was also completed to connect 30% of total households with ADSL and CATV. The third phase objective is to provide 80% of the Korean households with 20 Mbps access. Finally, the Korea Information Infrastructure-Testbed (KII-T) is utilized by research institutes and universities and jointly invested in by the government and private carriers. The main goal of KII-T is to test the validity of technologies and to confirm and evaluate their application potential. From 1995 to 2000, major cities were constructed as 5 GigaPoPs. The final phase objective is to construct all optical networks.

As a result of the KII plan, an optical transmission network (the 155 Mbps-40 Gbps backbone network) linking 144 cities and an ATM network was established. Accordingly, South Korea has built a high-speed network infrastructure that offers high-speed services to its households nationwide.

The Korean Cyber Building Certificate System

To promote the broadband access platform in apartments and other buildings, the South Korean government introduced the Cyber Building Certificate system in May 1997. The government issued certificates to buildings with high-speed telecommunications capacity, ranking buildings according to their capacity to handle high-speed Internet (Kim, 1999, December 15; Lee 2001, August).[5] The Ministry of Construction and Transportation also began to require that builders of large apartment complexes install information and communication networks for residents (High speed, 2001, April 25). This system may be especially effective in promoting the deployment of broadband Internet connections in South Korea because apartments account for 47.8% of the housing structures in this country (KNSO, 2001).

Broadband Telecommunications Regulation in South Korea

In addition to the specific policies that encourage the deployment of broadband systems, South Korea has also established a different regulatory mechanism from that of the United States regarding the broadband Internet access market.

Telecommunications operators in South Korea are classified into three groups, facilities-based service providers such as wire telephony, specialized service providers such as Internet telephony, and value-added service providers such as broadband Internet connection. Based on the classifications, the telecom firms are governed by different regulatory systems with various entry conditions and limitations (Article 7 of the

Framework Act on Telecommunications and Articles 4, 5, and 6 of the Telecommunications Business Act) (see Table 3).[6] For example, facilities-based telecommunications service providers are required to provide interconnection from the local exchange and long distance exchange. Specifically, only Korea Telecom (KT)[7] is subject to mandatory interconnection from the local exchange and long distance exchange, but all other facilities-based service providers should, when requested, provide an interconnection agreement. In contrast, value-added service providers, including broadband Internet access providers, have no entry regulation or unbundling requirement. Now that South Korea has opened the broadband Internet access market fully to competition, it also means minimal regulations for broadband Internet connection providers.

Regulation of the Korean Cable Industry

As for the regulation of the Korean cable industry, Korean Broadcasting Commission (KBC) is the current regulatory agency. In 2000, "to meet the demands of a digital and converging world," the Korean government combined its broadcast and cable regulatory bodies to form the independent government agency, KBC. There are over 206 cable networks in South Korea, which are subject to a 33% market share limit in cases of multiple program providers. On the other hand, the regulation of the country's 77 regional cable system operators falls under the umbrella of both KBC and Ministry of Information and Communications (MIC). While KBC is in charge of the recommendations for cable system license permission, MIC issues the license and sets the technological standards. Another important group of players in the Korean cable industry is the communication infrastructure/network providers. Under the current regulatory system, cable system operators, lease, rather than own, the backbone fiber

distribution network. The two major cable network operators are KT and PowerCom network, a recently privatized subsidiary of the Korean Electric Power Corporation (KEPCO). It is also important to note that most Korean cable ISPs are not cable system operators but lease space from the operators.

Broadband Telecommunications Regulation in the United States

Comparatively, the U.S. has not initiated any specific broadband certification procedures or government-led infrastructure building projects beyond the usual cheerleading role in encouraging the building of an information superhighway through the private sector. The key policy issues related to broadband Internet service providers, therefore, rest in the regulatory mechanism under which the U.S. broadband Internet access services are governed. There are three main regulatory systems—cable services, telecommunication services, and information services—under the Telecommunications Act of 1996 (see Table 3). Cable services are defined as "the one-way transmission to subscribers or use of such video programming or other programming service, and subscriber interaction, if any, which is required for the selection of such programming (47 U.S.C. § 251 (a))." Telecommunication services are defined as the "offering of telecommunications[8] directly to the public, or to such classes of users as to be effectively available directly to the public, regardless of the facilities used (47 U.S.C. § 153 (46))." Finally, information services are defined as "the offering of a capability for generating, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications (47 U.S.C. §153 (20))." These different categories are subject to different mandates of the 1996 Act. For example, cable services are regulated under Title VI, which does not include common carrier rules.[9] Telecommunication services are regulated under Title II, which incorporates common carrier rules.[10] On the other hand,

information services providers are treated as unregulated access service end users (Oxman, 1999).

This asymmetric regulation among cable, telecommunication, and information services reveals the problem of a historically pipeline-based regulatory framework in a world of convergence and has led to the heated "open access" debate. The open access issue has become subject to regulatory decisions that approved the merger between America Online and Time Warner. The Federal Trade Commission (FTC) and the FCC imposed open access requirements as a condition of approval of the merge (Rosenthal, 2000/2001). In this context, the main policy issues have been whether Internet-over-cable is a cable service or a telecommunications or information service. Recently, the FCC adopted two major rulings related to the broadband Internet access services through different platforms. The FCC tentatively classified the wireline broadband Internet access services (telephone-based broadband Internet access services) as information services with a telecommunications component, rather than telecommunication services (FCC, 2002, February 15). The FCC also classified cable modem as interstate information services one month later (FCC, 2002, March 15). Thus, the phone companies' and cable companies' broadband services seem to be freed from many of the regulations in the United States. The FCC seems to make such decisions to promote the development of broadband Internet by encouraging private investment and innovation (FCC, 2002, March 15).

The comparison of the governmental role between South Korea and the U.S. regarding broadband Internet seems to indicate a major departure between the two governments in terms of the establishment of specific national policy in assisting and motivating the construction of a national broadband infrastructure. In addition, while the

Korean government has established a regulatory system that reflects the reality of a converging broadband environment and places minimal regulation on the broadband Internet market, its U.S. counterpart seems to be struggling to integrate two historically separated regulatory systems and ensure that broadband Internet service providers are within a market environment that induces investment and innovation. Finally, KBC's and MIC's differential treatment of cable programmers, system operators, and communication network/infrastructure providers in the Korean cable industry might have aided the deployment of broadband by providing the leading infrastructure/network with an incentive to branch out and invest in the broadband industry.

Comparing the Advanced Factors

The comparative advanced factors are assessed in terms of broadband Internet infrastructure and the educated/skilled labor force between South Korea and the United States (see Table 4).

Broadband Internet Infrastructure

South Korea is relatively ahead of the United States in terms of the percent of households with computer and broadband connection.[11] About 77% of the Korean households had a PC in December 2001, but only 56.5% of those in the United States had a PC in July 2001. Over 30% of the Koreans connect to the Internet via a digital subscriber line (DSL) or cable modem at home, comparing to 19.5% in the United States. In the relative number of host and Web sites, the United States is a long way ahead of South Korea. The United States has the highest density of Internet hosts in the world with 234 hosts per 1,000 inhabitants, while South Korea had only about 11 hosts per 1,000 inhabitants in October 2000 (see Table 4). The United States also had a higher penetration of Web sites with about 46 sites per 1,000 inhabitants, while South Korea had

seven sites per 1,000 inhabitants in July 2000. The numbers point to the fact that the U.S. has produced more Internet content than South Korea (OECD, 2001a).

In summary, South Korea is ahead of the United States in terms of the percent of households with computer and broadband access at home. Thus, South Korea seems to have a potential advantage due to network externalities. The United States, on the other hand, has a higher density of Internet hosts and Web sites, a big plus to the production of online contents. In other words, South Korea's advanced factors have focused on the "consumption" of online information or content, while the United States' have emphasized the "production" of such information or content.

Educated/Skilled Labor Force

The United States leads South Korea in terms of the educated labor force. About 27% of the U.S. population aged 25-64 attained university level education, compared to 17% for South Korea. There were about 70 researchers or university graduates per 10,000-labor force in the American business enterprises, contrasting with South Korea's 30 researchers or university graduates per 10,000-labor force (see Table 4).

The United States appears to have a more educated labor force than South Korea. As an educated/skilled labor force often accounts for the degree of investment in knowledge by a country (OECD, 2001b), it is safe to conclude that the United States as a nation has invested in "knowledge/research and development (R&D)" more than South Korea. Comparatively, the U.S. seems to be better positioned in the transition to a knowledge-based economy.

Comparing the Nature of Internet Consumers

The key demographic profile (i.e., education, age, family income, and housing pattern) and the main activities of Internet users in each country will be reviewed next.

The reasons people remain unconnected are also explored to understand potential Internet users.

Education

South Korea and the United States seem to have a similar Internet user characteristic based on educational level. Both the Americans and South Koreans with higher levels of education are more likely to be Internet users. Approximately 81-82% of the Internet populations have a bachelor's degree in both countries (see Table 5). On the other hand, the Internet use of persons with less than a high school education was 4.3% in South Korea as of December 2001 and was 12.8% in the United States as of September 2001. South Korea seems to have a greater disparity of Internet use between individuals with high-level education and those with low-level education than the United States.[12]

Age

South Korea and the United States have a similar Internet user profile based on age. Children and teenagers are more likely to be Internet users than people over 50 years of age in both countries. Over 90% of children and teenagers used the Internet in South Korea in 2001, compared to 68.6% of those who used the Internet in the United States. About 8.7% of people over 50 used the Internet in South Korea in 2001, contrasting with a whopping 37.1% 50 plus users in the United States. There seems to be a relatively larger group of young users in South Korea than in the United States and older users in the United States than in South Korea. In essence, South Korea had a greater discrepancy of Internet use between the younger and older generations than the United States. This gap of Internet use between generations was 84.6% in South Korea in 2001 and only 31.5% in the United States.

Family Income

Individuals who live in higher income households are more likely to be Internet users in both South Korea and the United States (see Table 5). Internet use of persons living in high-income households was 70.4% in South Korea in 2001, compared to 73.1% in the United States. In contrast, Internet use of people living in low-income households was 36.8% in South Korea and 29.2% in the United States. The disparity of Internet use between different income groups is relatively similar between the two countries with the U.S. slightly leading the way.

Housing Pattern

South Korea and the United States have a similar geographical pattern of Internet use, both having higher Internet penetration rates in urban households. Use of the Internet by people living in urban households was 53.8% in South Korea in 2001 and 53.3% in the United States.[13] However, while the difference in Internet penetration rates between the urban and rural households was 0.4 percent in the United States, the disparity of Internet use between Korean urban and rural households was 11.1% (see Table 5).

The Internet users in South Korea and the United States seem to have a similar demographic profile of higher education, younger ages, higher income, and more urban living. South Korea, however, exhibits more disparities of Internet use across different age, education, geographical groups. In essence, despite the widespread use of the Internet, Internet use in South Korea might be more concentrated in specific groups than for its U.S. counterpart. Furthermore, these user groups might create relatively greater impact on the nature of demand for broadband Internet content and activities in South Korea.

Main Online Activities

Online users in South Korea and the United States show slightly different preferences for Internet activities. Korean Internet users connect to the Internet to search for information, to send or receive e-mail, to play games, to be entertained (to view television/movies or to listen to music), and to purchase products/services in that order. On the other hand, Internet users of the United States go to the Internet for e-mail, information/research, news/weather/sports, games, and product/service purchase in that order (see Table 6). It seems Internet users in both countries have common activities such as information research, e-mail, playing games, and online shopping. Yet, Korean "netizens"[14] seem to favor entertainment activities such as audio/video and games. A more developed broadband Internet environment and the larger percentage of young users may contribute to such preferences in South Korea.

Reasons of the Unconnected

People who do not connect to the Internet in South Korea and the United States cited similar reasons, but with various degrees of importance for each reason. Korean Internet users do not use the Internet at home because of "not wanting to," "lack of knowledge," "no time," "not having computer and facilities," and "high price" in that order. On the other hand, Internet users of the United States do not connect to the Internet at home due to "not wanting to," "high price," "not having computer and other facilities," "possibility to use elsewhere," "lack of knowledge," and "concern with children" in that order (see Table 6). Comparatively, Internet literacy may be more of an issue influencing the rate of Internet penetration in South Korea, while cost is more of a factor for the United States.

Comparing Related/Supported Industries: E-commerce[15]

As discussed earlier, Internet users are likely to engage in certain activities that also facilitate the development of other industries. Thus, electronic commerce, a relatively recent major application of the Internet (OECD, 2000a), is discussed in this section. There is a wide disparity in e-commerce development between South Korea and the United States. The United States had 170 secure servers per 1,000,000 inhabitants, while South Korea had only three secure servers per 1,000,000 in March 2000 (OECD, 2000a). The United States is also far ahead of South Korea in the size and development of e-commerce transactions. The total e-commerce transaction of South Korea was $43.6 billion, and that of the United States was $1,077 billion in 2000. E-commerce accounted for 9.3% of total sales in the United States but only 4.5% for South Korea. Among the Korean Internet users, 78.2% visited e-commerce Web sites, but only 28.3 percent of Korean Internet users made purchases on-line in March 2001 (NetValue, 2001, June 28). It seems that the South Korean Internet users are more inclined to consume online contents than to engage in online transactional activities. On the contrary, the high level of secure servers and e-commerce transactions in the United States indicates a market that is comprised of an abundant "supply" of Internet contents and economic activities.

The two countries, however, show several similarities in the area of business to business (B2B) e-commerce. South Korea's B2B comprised 91% of its e-commerce revenues (KNSO, 2001, March) while the United States' B2B was 94% in 2000 (U.S. Census Bureau, 2002, March 19). By industry classification, manufacturing and wholesale and retail trade occupies over 90% of e-commerce transactions in both South Korea and the United States. The largest classification recorded was in manufacturing with 78.5% in South Korea and 73.6% in the United States. Wholesale and retail trade

follows with 11.9% in South Korea and with 22.9% in the United States. The similarity in B2B e-commerce between the two countries might be due to the fact that the e-commerce system is less dependent on consumer characteristics but more on businesses' desire to take advantage of the operational efficiencies and effectiveness that emerge from utilizing the Internet in transactions (Sharma, 2002).[16]

Comparing the Market Competition Factor

This section focuses on the competition between cable modem and DSL and the competition among companies in South Korea and the United States. Competition is examined through the market share of DSL vs. cable modem, the top-four firms' ratios (CR4) of the broadband Internet access market, and the price of broadband Internet connection services in both countries.

Growth of the Broadband Internet

Households using the broadband Internet have increased from 1997 to 2001 in South Korea and the United States. South Korea shows much higher growth rates compared to the United States beginning in 1999. The growth rate of broadband Internet use at home was 26.7% in South Korea, compared to the 3.3% growth in the United States from 1999 to 2000 (see Figure 3). Competition seems to play a role in the South Korean growth as the number of broadband Internet providers doubled from two to four from 1998 to 1999.

Competition Between Distribution Technologies

South Korea and the United States show a different trend in broadband access market structures based on technologies. In South Korea, although cable modem service was introduced earlier than DSL service, DSL has led cable modem with a 64% market share (see Table 7). In the United States, multiple cable system operators (MSOs) were

the first movers in the broadband Internet market and continue to dominate telephone companies in the market with a 68% share of the broadband access market. DSL, on the other hand, has had only about 32% of the market in the same period.

Housing patterns and regulatory dissimilarity between South Korea and the United States may have contributed to the differences in the development of DSL and cable modem in South Korea and the United States. Over 90% of the Korean households are at a distance of 2.5 miles from a local exchange, while about 35% of RBOCs' customers live outside the technologically feasible area in the Untied States (ITU, 2001). The cost of building the local exchange may be relatively low in South Korea because the total area of South Korea is much smaller than that of the United States. Thus, the distance limitation of DSL (approximately 3 miles) might not have been a serious problem in South Korea compared to the United States.

The dominance of cable modem in the United States might also be explained by the asymmetrical regulation between telephone companies and cable companies. Cable companies have been relatively unregulated, but telephone companies have been strictly regulated as common carriers in the United States.[17] On the other hand, the South Korean government does not regulate the broadband industry by distribution technologies but rather by types of services.

Competition Between Broadband Internet Firms

The broadband Internet markets in South Korea and the United States have been relatively concentrated. In South Korea, the broadband Internet market has become a three-way competition among Korea Telecom (KT), Hanaro Telecom (Hanaro), and Thrunet. KT's share of the broadband Internet connection market averaged 46% from December 2000 to December 2001. Hanaro, the second-largest operator, acquired 27%

of the market in the same period. Thrunet has been just behind Hanaro with about 19% of the high-speed Internet access market (see Table 7). Furthermore, Hanaro took over Dreamline at the end of 2001 (Kim, 2001, November 6). As a result, Hanaro's market share rose to 28%. Accordingly, CR4 of the Korean broadband Internet access market has been very high: 96.3% in December 2000, 83.1% in June 2001, and 87.6% in December 2001.

The cable modem market seems to be concentrated as well in the United States. Time Warner Cable (the cable division of AOL Time Warner) was in first place with over 25% of cable modem subscribers from the second quarter of 2001 to the end of the year. AT&T Broadband followed right behind with over 20% of the cable modem subscribers (except for the first quarter of 2001). Comcast and Cox kept the next place; each had 12%.[18] Accordingly, CR4 for the cable modem market has been very high:75.2% in March 2001. 75.9% in June 2001. 74.2% in September 2001. and 73.9% in December 2001 in the United States.

The DSL market also seems to be concentrated in the United States. RBOCs have occupied the top four places in this broadband Internet market. SBC had nearly 34% of the DSL subscribers in the second and third quarters of 2001, Verizon had about 28%, Bell South owned around 12%, and Qwest had approximately 11% in the same period. CR4 for the DSL market has been slightly higher than the cable modem market with 84.9% in March 2001 and 88.2% in September 2001.[19]

Broadband Internet Pricing

The price of broadband Internet access is influenced by competition, among other factors (OECD, 2001, October 29). South Koreans have enjoyed the broadband Internet access services at a relatively lower price overall than their American counterparts. In

South Korea, the broadband Internet services are available for a charge of approximately $56 per month. In addition, there is an initial setup fee of about $45. Some have suggested that competition has driven the broadband prices lower in South Korea (Lee, 2001, August). In the United States, the broadband Internet services are available for a charge of approximately $56 per month. However, the initial setup cost is around $73 (Baumgarter, 2001).

Discussion and Conclusions

The growth of broadband Internet in South Korea and the United States seems to be influenced by a collection of factors. First, the governments of South Korea and the United States have played different roles in the development of their broadband Internet markets. The Korean government implemented several national policies to encourage the deployment of the broadband Internet. The 1997 economic crisis was one of the main reasons for the government to target broadband Internet as a new opportunity for economic growth (Kim, 2001) as it considers the broadband infrastructure as an axis of development in the new knowledge-based economy (Shin, 2001). Consistent with previous studies (Porter, 1990a), the government of South Korea continues to play an important role in the development of its national economy. South Korea is not unique in this regard as the governments of many developing nations have intervened with the new economy to accelerate IT innovation (King *et al*., 1994). At the same time, the Korean government has worked toward liberalizing the telecommunication industry and privatizing state-run companies. The government of the United States, on the other hand, has pursued active regulatory reform to promote investment and innovations in the private telecommunications sector. While the general approach has encouraged the development of broadband services, delays and uncertainty in deciding on open access

issues seem to cause some confusion and impede investment and innovation in the industry (Rosenthal, 2000/2001).

As for the advanced factors in the two countries, there seems to be very different strengths and weaknesses. In South Korea, the penetration rates of personal computers and broadband Internet access are high, but the numbers of hosts, Websites, and highly educated labor force are low. In the United States, the diffusion of personal computers and broadband Internet access is comparatively low, but the numbers of hosts, Websites, and highly educated labor force are high. The broadband Internet market in South Korea seems to develop with a focus on information or content consumption, while the United States seems to center on information or content production. Accordingly, the United States may be in a better position to transform into a knowledge-based economy than South Korea. Nevertheless, South Korea may still have an advantage in broadband Internet development because of the network externalities (Shapiro & Varian, 1999). In other words, the more people are connected to the Internet, the greater the potential benefits of the network, which may continue to cultivate the development of the network services in South Korea.

As for the consumer and demand conditions, broadband Internet has grown in both countries with South Korea showing a higher growth rate than the United States. Though both countries have a similar demographic profile of residential Internet users, South Korea exhibits a more serious inequality among various demographic groups. Korean Internet users may have more experience with online entertainment activities than American Internet users, most likely due to the advanced broadband Internet environment and a large group of young Internet users.

The United States may have a comparative advantage over the Korean broadband Internet, in part due to the development of broadband Internet related industries. The size of the Korean e-commerce market is much smaller than that of the United States. The development of e-commerce in a country depends on the presence of an institutional environment that facilitates the building of transactional integrity in the online market (Oxley & Yeung, 2001). Kim (2001) pointed out several difficulties that face Korean e-commerce ventures: the size of the domestic market, inefficient distribution mechanisms, and lack of efficient online payment systems.

Competitive conditions seem to be one of the most dynamic and important variables for broadband Internet expansion in South Korea and the United States. Porter (1990a) found a strong empirical association between the vigorousness of domestic rivalry and the creation and persistence of competitive advantage in an industry. South Korea and the United States actually have adopted different broadband technologies. Specifically, DSL has led cable modem in South Korea, while cable modem has dominated DSL in the United States. The housing pattern of South Korea and the regulatory asymmetry of the United States are perhaps the main contributors to the dissimilar growth rates of each of the technologies in the two countries. The broadband Internet connection markets of both countries are highly concentrated. South Korea, however, may have more actual (i.e., local) competition than the United States in the broadband Internet connection market.

The findings of this study seem to indicate that governmental policy related to broadband Internet does impact the development of a nation's broadband Internet market. The Korean government's investment in the deployment of fiber optic networks and mandatory building wiring regulation impacted the supply of broadband services, and its

use of the public sector as the early adopter simulated the demand for broadband services. The early push of Internet broadband by the Korean government was especially effective in nurturing the growth of an infant industry because of the scale economy and resources available to the incumbent large infrastructure providers such as KT and PowerCom. In essence, the competitive advantage of Korean broadband Internet seems to be the active support of the government, high penetration of computers and broadband Internet access at home, high demand, and a relatively low initial price. However, for the next level of broadband Internet development, that is, the harvesting of the economic reward of its broadband advantage, South Korea needs to turn its attention to increasing the capacity for online information/content production, in addition to information/content consumption. Policies that invest in the development of knowledge and a skilled labor force and address the problem of inequality and Internet literacy are necessary to ensure a continuous growth of demand and economic returns for broadband Internet services. In addition, programs that provide IT promotion and training are likely to nurture the supply end of a creative, knowledge-based society, which is again essential in continuing the successful broadband story of South Korea.

The competitive advantage of the United States' broadband Internet seems to be the capability of online contents/information production, an educated labor force, and a strong e-commerce market that provides the currency for further development. While factors such as geographical density that drove the growth of Korean broadband Internet are not replicable in the United States, several drivers of broadband Internet in South Korea might be exportable to countries such as the United States. For example, facility-based competition seems to work better than simple local loop unbundling in inducing competition. Policies that encourage the development of alternative broadband

technologies and introduce a collaborative governmental role in the building of major broadband infrastructure might be effective in speeding up the deployment of broadband Internet.

Limitations for this study include our inability to gather completely comparable data by organizations and time periods. In addition, a more systematic and statistical analysis based on the integrated data would yield more objective results in the interaction among five determinants of the modified diamond model at the nation level. Future research may approach the comparative development longitudinally, take other broadband providers such as satellites and wireless companies into consideration, and incorporate the factor of culture, which might provide a more complete framework to assess a country's broadband Internet development.

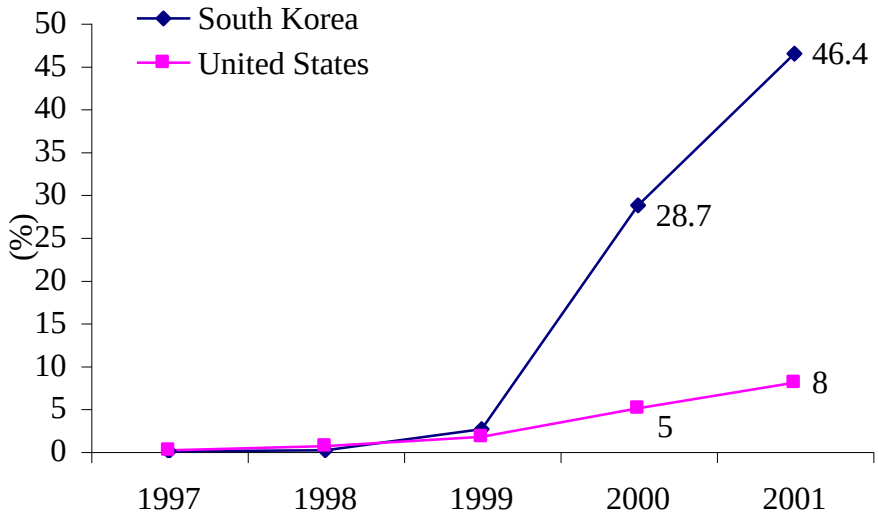
Table 1. The Broadband Internet Market Shares [a] in South Korea and the U.S.

South Korea	November 2000	June 2001	December 2001
Korea Telecom	43.5%	42	42.8
Hanaro Telecom	27.9	21.6	25.8
Thrunet	20.5	16.7	16.7
Dreamline	4.3	2.8	2.3
SK Telecom	0.8	0.9	0.6
DACOM	2.6	0.8	0.6
ONSE Telecom	N/A	2.5	3
Total[b]	99.6	87.3	92

United States (2001)					
Cable operator	**Subscribers**	**Percent (%)**	**Telephone company**	**Lines in Service**	**Percent (%)**
Time Warner	1,917,000	26.7	RBOCs	3,100,684	93.6
AT&T	1,512,000	21.1	CLECs[c]	203,305	6.1
Comcast	948,100	13.2	IXCs[d]	7,767	0.2
Other	2,793,517	39			
Total	7,170,617	100	Total	3,311,757	100
Total share		68	Total share		32

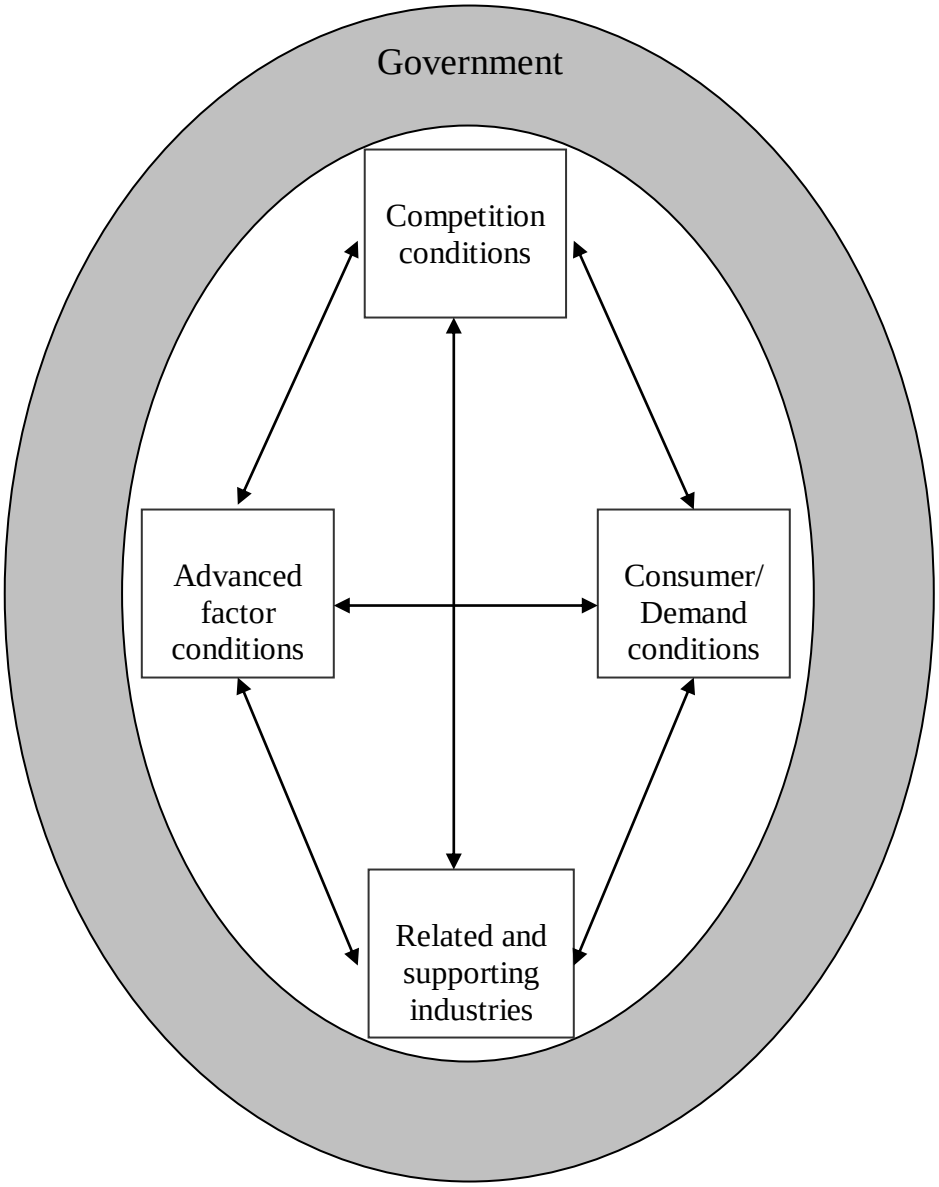
Source: KRNIC, Kinetic Strategies, and TeleChoice, Inc.
[a]Wireline broadband Internet means ADSL and CATV/cable modem in this article.
[b]The total is not 100 because it includes the percentage of satellite, wireless, apartment LAN, and B-WLL.
[c]CLEXs mean competitive local exchange carriers.
[d]IXCs mean interstate exchange carriers.

Figure 1. Broadband Internet Household Penetration Rates (in %)



Source: Kirkpatrick (2001); KRNIC; NetValue.
Note: "Broadband" includes digital lines, cable modems, satellite, and T1/leased lines.

Figure 2. A Modified Diamond Model



Source: Adapted from Porter (1990). Figure 3-5, p. 127.

Table 2. An Overview of South Korea's KII Policy

	KII-G	**KII-P**	**KII-T**
Main user	Government	Domestic and business	Research institutes and universities
Investor	Government	Private	Government and private
Main objective	Backbone	Access	Testbed
Phase I (1995-1997)	Connect 80 call zones	Fiber to the big buildings	2.5 Gbps between Seoul and Taejon
Phase 2 (1998-2000)	Connect all 144 call zones with ATM service	30% of the total households with ADSL or CATV	GigaPoPs
Phase 3 (2001-2005)	Upgrade to Tera bps	Over 80% of the households with 20 Mbps access	All optical net

Source: Lee (2001, August); Lee *et al.* (2001).

Table 3. The Regulatory Environment in South Korea

South Korea			
Category	*Facility-based service providers*	*Special service providers*	*Value-added service providers*
Classification criteria	Owning facilities and providing facility-based services	No facilities, but providing facility-based services	No facilities, but providing value added services
Types of services	Wire telephony, leased line services, cellular telephony, PCS, TRS, CT-2, and radio paging	Internet telephony, international call-back, premises communications, and voice resale	PC Online, Internet, e-mail, and voice mail services.
Entry conditions	MIC authorization	MIC registration	MIC notification
Interconnection	Mandatory (KT)/ Agreement	None	None
Unbundling	None	None	None
United States			
Category	*Cable services*	*Telecommunication services*	*Information services*
Definition	One-way transmission subscribers or use of such video programming or other programming service Subscriber interaction which is required for the selection of such programming	Offering of telecommunica-tions for a fee directly to the public, or to such classes of users as to be effectively available directly to the public, regardless of the facilities used	Offering of capability of generating, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunica-tions
Regulation	Title VI of the 1996 Act	Title II of the 1996 Act (Common carrier: interconnection & unbundling)	None
Entry Conditions	Local government authorization	FCC notification	None

Source: Modified from OECD (2000b).

Table 4. Comparison of Advanced Factors

Broadband Internet infrastructure	South Korea (Dec. 2001)	United States (Sep. 2001)
Percent of household with a computer	76.9	56.5
Percent of individuals using the Internet at home via broadband access (DSL & cable modem)	30.7	19.5
Estimated hosts per 1,000 inhabitants[a]	11	234
Estimated Web sites per 1,000 inhabitants[b]	7	46
Educated/Skilled labor force	South Korea (1999)	United States (1999)
Percent of population 25-64 attained university level education	17	27
Researchers or university graduates per 10,000 labor force in business enterprises	30.3	70

Source: KRNIC (2002, January); U.S. Department of Commerce (2002, February 5); OECD (2001a & 2001b).

[a]October 2000.

[b]July 2000.

Table 5. Internet Users by Demographic Profiles in the U.S. and South Korea

Internet Users by Education		South Korea[a]	United States[b]
Less than high school		4.3 %	12.8
High school diploma		41.2	51.1
Bachelor's degree and beyond		81.0	82.3
Internet Users by Age			
South Korea[c]		United States[d]	
Age 7-19	93.3 %	Age 9-17	68.6
Age 20-49	60.6	Age 18-49	64.5
Age 50 +	8.7	Age 50+	37.1
Internet Users by Family Income		South Korea[e]	United States[f]
Low		36.8 %	29.2
Middle		61.0	33.4
High		70.4	73.1
Internet Users by Housing Pattern		South Korea[g]	United States[h]
Rural (% of rural households using the Internet)		42.7 %	52.9
Urban (% of urban households using the Internet)		53.8	53.3

Source: KRNIC (2002, January); U.S. Department of Commerce (2002, February 5).

[a] Population is more than seven years old. The data were as of December 2001.

[b] Population is more than 25 years old. The data were as of September 2001.

[c] Population is more than seven years old. The data were as of December 2001.

[d] Population is more than three years old. The data were as of September 2001.

[e] Population is more than seven years old. The data were as of December 2001. Won (Korean money) was exchanged to U.S. dollars with a rate of 1319 won to $1 as of March 26, 2002. In South Korea, low income refers to less than $14,000; middle income refers to $14,000 to $22,999; high income refers to $23,000 and above.

[f] Population is more than three years old. The data were as of September 2001. In the United States, low income refers to less than $24,000; middle income refers to $24,000 to $49,999; high income refers to $50,000 and above.

[g] Population is more than seven years old. The data were as of December 2001.

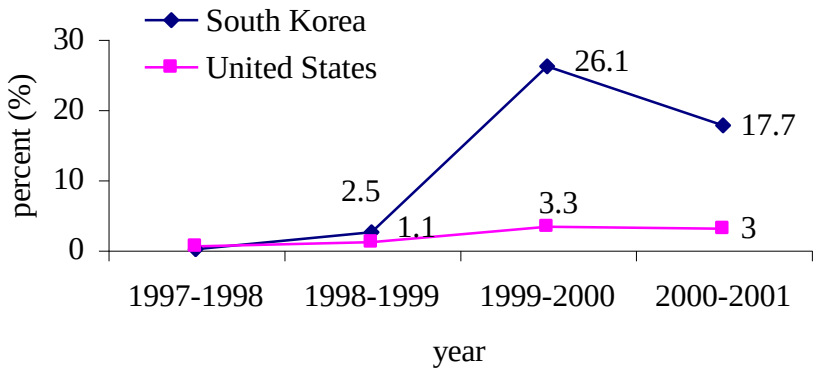
[h] Population is more than three years old. The data were as of September 2001.

Table 6. Main Online Activities and Reasons for Having No Home Connection

Main Online Activities			
Rank	*South Korea (Dec. 2001)*	*United States (Sep. 2001)*	
1	Information search	E-mail	
2	E-mail	Information search	
3	Playing games	News, weather, sports	
4	Entertainments	Playing games	
5	Product/service purchases	Product/service purchases	
Reasons for Having No Home Connection			
South Korea (Dec. 2001)		*United States (mo. 2001)*	
Don't want it	42.9 %	Don't want it	53.05
Lack of knowledge	24.9	Too expensive	25.29
Don't have time	17.8	No computer and other facilities[a]	6.99
No computer and other facilities	11.4	Can use elsewhere	4.09
Too expensive	1.5	Lack of knowledge	2.1
Other	1.4	Concern with children	0.93
		Other	7.56
Total	100		100

Source: KRNIC (2002, January); U.S. Department of Commerce (2002, February 5).
[a]Two segments, "no computer" and "computer capability," are combined to make this segment.

Figure 3. Annual Growth of Broadband Internet Use at Home



Note: "Broadband" includes digital lines, cable modems, satellite, and T1/leased lines.
Source: Kirkpatrick (2001); KRNIC; NetValue.

Table 7. Market Shares for Residential Broadband Internet Markets in the United States and South Korea

	South Korea		***United States***	
	DSL	*Cable modem*	*DSL*	*Cable modem*
Dec. 2000	65%	35	33	67
Jun. 2001	64	36	31	69
Dec. 2001	62	38	32	68

South Korea Top Broadband Internet Firms *(as a % for both ADSL and cable modem)*									
	Dec. 2000			Jun. 2001			Dec. 2001		
	ADSL	Cable modem	Total	ADSL	Cable modem	Total	ADSL	Cable modem	Total
Korea Telecom	43.7 %	None	43.7	48.1	None	48.1	46.6	None	46.6
Hanaro Telecom	17.5	10.6	28.1	14.1	10.6	24.7	14.1	14	28.1
Thrunet	None	20.6	20.6	None	19.1	19.1	0.03	18.1	18.13
Dreamline	2.7	1.7	4.4	1.9	1.3	3.2	1.4	1.1	2.5
CR4	96.3			83.1			87.6		

U.S. Top Cable Broadband Internet Firms *(as a % of cable modem subscribers)*				
Cable Operator	Mar. 2001	Jun. 2001	Sep. 2001	Dec. 2001
Time Warner Cable	24.8%	26.1	26.7	27
AT&T Broadband	26.7	24.9	22.3	21
Comcast	11.4	12.5	12.7	13.4
Cox	12.3	12.4	12.5	12.5
CR4	75.2	75.9	74.2	73.9

U.S. Top Telephone Broadband Internet Firms *(as a % of DSL subscribers)*		
Telephone companies	Mar. 2001	Sep. 2001
SBC	33.6	34.5
Verizon	27.2	28.6
BellSouth	12.3	13.4
Qwest	11.7	11.8
CR4	84.9	88.2

Source: KRNIC; Telechoice; Kinetic Strategies; FCC (2001, August 10).

Note: For the purpose of this study, the market is limited to the ADSL and cable modem.

References

Albarran, A.B., & Dimmick, J. (1996). Concentration and economies of multiformity in the communication industries. *Journal of Media Economics, 9*(4), 41-50.

Amenta, E. (1991). Making the most of a case study: Theories of the welfare state and the American experience. *International Journal of Comparative Sociology, 32*(1-2), 172-195.

Atkinson, R.D., & Court, R.H. (1998, November). *The new economy index: Understanding America's economic transition.* Washington, DC: The Progressive Policy Institute. Retrieved March 20, 2002 from http://www.neweconomyindex.org/states/index.html

Bandwidth Report, http://www.websiteoptimization.com/bw/

Baumgartner, J. (2001). Modem fees on rise. *Multimedia News, 22*(9), 1.

Bazar, B. (1997). *A preliminary model of Internet diffusion within developing countries.* Paper presented at the third Austrian World Wide Web conference, Southern Cross University. Retrieved March 22, 2002 from http://ausweb.scu.edu.au/proceedings/boalch/paper/html

Bellak, C.J., & Weiss, A. (1993). A note on the Austrian diamond. *Management International Review, 33*, 109-118.

Bradshaw, Y., & Wallace, M. (1991). Information generality and explaining uniqueness: The place of case studies in comparative research. *International Journal of Comparative Sociology, 32*(1-2), 154-172.

Cane, A. (1992). Information technology and competitiveness advantage: Lessons from the developed countries. *World Development, 20*(12), 1721-1737.

Cha, Y.-S. (n.d.). A comprehensive plan for building the Korea information infrastructure. Unpublished manuscript. Retrieved March 27, 2002 from http://www.apectelwg.org/apecdata/cc/document/forum_ii_6.html

Curran, P.J. (2001). Competition in UK higher education: Applying Porter's diamond model to Geography departments. *Studies in Higher Education, 26*(2), 223-253.

CyberAtlas (2003). World wide cable modem subs expected to double by 2007, Cyberatlas. Retrieved Septemeber 25, 2003 from http://cyberatlas.internet.com/markets/broadband/article/0,1323,10099_2239451,00.html

Dosi, G., Pavitt, K., & Soete, L. (1990). *The economics of technical change and international trade*. New York: Harvester Wheatsheaf.

Fagerberg, J. (1988). International competitiveness. *The Economic Journal*, *98*(2), 355-374.

Federal Communications Commission (2000, January 14). *Annual assessment of the status of competition in markets for the delivery of video programming: Sixth annual report* (FCC 99-418), Washington, DC: FCC.

Federal Communications Commission (2000, June). Fact sheet: Cable television. Retrieved October 20, 2001 from http://www.fcc.gov/csb/facts/csgen.html

Federal Communications Commission (2000, August 21). D*eployment of advanced telecommunications capability: Second report* (FCC 00-290). Washington, DC: FCC.

Federal Communications Commission (2001, August 10). *Third notice: In the matter of inquiry concerning deployment of advanced telecommunications capability to all Americans in a reasonable and timely fashion, and possible steps to accelerate such deployment pursuant to section 706 of the telecommunications Act of 1996* (FCC 01-223). Washington, DC: FCC.

Federal Communications Commission (2002, February 6). D*eployment of advanced telecommunications capability: Third report* (FCC 02-33). Washington, DC: FCC.

Federal Communications Commission (2002, February 15). *Notice of Proposed Rule making: In the matter of appropriate framework for the broadband access to the Internet over wireline facilities; universal service obligation of broadband providers; computer III future remand proceedings: Bell operating company provisions of enhanced services* (FCC 02-42). Washington, DC: FCC.

Federal Communications Commission (2002, March 15). *Declaratory ruling and notice of proposed rule making: In the matter of inquiring concerning High-speed access to the Internet over cable and other facilities; Internet over cable declaratory ruling; appropriate regulatory treatment for the broadband access to the Internet over cable facilities* (FCC 02-77). Washington, DC: FCC.

Frank, R., & Solomon, D. (2002, January 22). Cable industry mergers? Let's count the ways. *Wall Street Journal*, C1.

Fraumeni, B.M., Manser, M.E., & Mesenbourg, T.L., Jr. (2000, June 15). Government statistics: E-commerce and the electronic economy. Retrieved February 25, 2002 from http://www.census.gov/econ/www/ecomm2.htm

Garfield, M.J., & Watson, R.T. (1998). Difference in national information infrastructures: The reflection of national cultures. *Journal of Strategic Information Systems, 6*, 313-337.

Goldman, A. (2002). Top consumer ISPs in South Korea, *CyberAtlas*, Retrieved September 25, 2003 from

http://cyberatlas.internet.com/markets/broadband/article/0,1323,10099_1560161,00.html

Goodman, S.E., Press, L.I., Ruth, S.R., & Rutkowski, A.M. (1994). The global diffusion of the Internet: Patterns and problems. *Communications of the ACM, 37*(8), 27-31.

Grant, R. (1991). Porter's competitive advantage of nations: An assessment. *Strategic Management Journal, 12*, 535-548.

Guillén, M.F., & Suárez, S.L. (2001). Developing the Internet: Entrepreneurship and public policy in Ireland, Singapore, Argentina, and Spain. *Telecommunications Policy, 25*(5), 349-371.

Hammersley, M., & Gomm, R. (2000). *Case study method: Key issues and key texts*. Beverly Hills, California: Sage Publishing.

Hargittai, E. (1999). Weaving the western Web: Explaining differences in Internet connectivity among OECD countries. *Telecommunications Policy, 23*, 701-718.

Healey, M.J., & Dunham, P.J. (1994). Changing competitive advantage in a local economy: The case of Coventry, 1970-90. *Urban Studies, 31*(8), 1279-1302.

High-speed info networks a must for apartment complexes (2001, April 25). *Korea Herald*. Retrieved February 23, 2002 from http://www.koreaherald.co.kr/SITE/data/html_dir/2001/04/25/200104250007.asp

International Telecommunications Union (2001). A broadband future. *ITU news, 6.*

International Telecommunications Union (2003). Broadband Korea: Internet case study, Retrieved September 25, 2003 from http://www.itu.int/ITU-D/ict/cs/korea/material/CS_KOR.pdf

Kamann, D.J.F., & Strijker, D. (1995). The Dutch dairy sector in a European perspective. In Beije, P.R., & Nuys, H.O. (Ed), *The Dutch diamond?: The usefulness of Porter in analyzing small countries* (103-154). Apeldoorn, Nederland: Garant.

Kaufman, A., & Gittell, R. (1994). Porter's model for geographic competitive advantage: The case of New Hampshire. *Economic Development Quarterly, 8*(1), 43-70.

Kedia, B.L., & Bhagat, R.S. (1988). Cultural constraints on transfer of technology across nations: Implications for research in international and comparative management. *Academy of Management Review, 13*(4), 559-572.

Kim, D.-H. (2001, November 6). Broadband consolidation enters final stage. *Korea Times.* Retrieved February 20, 2002 from http://www.hankooki.com/kt_tech/200111/t2001110617044945110.htm

Kim, H. (1999, December 15). Wired apartments bring Information Age home. *Korea Herald*. Retrieved March 10, 2002 from http://www.koreaherald.co.kr/SITE/data/html_dir/1999/12/15/199912150027.asp

Kim, S.-B. (2001). Korea's e-commerce: Present and future. *Asia-Pacific Review, 8*(1), 75-85.

Kinetic Strategies. (n.d.). Retrieved February 2, 2002 from http://www.cabledatacomnews.com/cmic/cmic16.html

King, J.L., Gurbaxani, V., Kraemer, L.K., McFralan, W.F., Raman, K.S., & Yap, S.C. (1994). Institutional factors in information technology innovation. *Information Systems Research, 5*(2), 139-169.

Kirkpatrick, D. (2001). Techies vs. Telcos. *Fortune, 144*(9),175.

Korea National Statistical Office (2001). *2000 Population and Housing Preliminary Report*. Seoul, Korea: Author. Retrieved October 29, 2001 from http://www.nso.go.kr/report/data/spce00-1.htm

Korea Network Information Center (2002). *A survey on the number of Internet Users and Internet behavior*. Seoul, Korea: Author. Retrieved February 10, 2002 from http://stat.nic.or.kr/stat_report.html

Korea Network Information Center (2002). Internet statistics. Retrieved February 14, 2002 from http://stat.nic.or.kr/sdata.html

Kuijper, J., & Maltha, S.R. (1995). Industry competitive analysis in the Netherlands: a practitioner's view. In Beije, P.R., & Nuys, H.O. (Ed.), *The Dutch diamond?: The usefulness of Porter in analyzing small countries* (155-184). Apeldoorn, Nederland: Garant.

Lee, E. (2002, April 5). A happy girl's success story. *Daily Sports*. Retrieved April 7, 2002 from http://kr.dailynews.yahoo.com/headlines/en/20020405/ilgan/is2002040567945.html

Lee, H., O'Keefe, R.M., & Yun, K. (2001). The growth of broadband Internet connections in South Korea. Paper presented at the 14th Bled Electronic Commerce Conference, Bled.

Lee, J. (2001, August). Korea information infrastructure and broadband service. Retrieved March 3, 2002 from http://www.aptelwg.org

Meeus, M.T.H., & Oerlemans, L.AG. (1995). The competitiveness of firms in the region of north Brabant: an exploratory analysis of Porter's theory of competitiveness at the level of firms. In Beije, P.R., & Nuys, H.O. (Ed.), *The Dutch diamond?: The usefulness of Porter in analyzing small countries* (223-256). Apeldoorn, Nederland: Garant.

Morris, J.B. (2000). Broadband backgrounder: Public policy issues raised by broadband technology. Washington, DC: The Center of Democracy and Technology. Retrieved October 1, 2001 from http://www.cdt.org/digi_infra/broadband

NetValue (2000, November 1). Korea is the number one in three activities among five Asian courtiers. Retrieved November 27, 2001 from http://nvasia.netvalue.com/presse_sg/index_frame.htm?fichier=rpasia2.htm

NetValue (2001, June 28). Korea, high rate of visiting e-commerce Web sites, but low rate of purchase. Retrieved November 27, 2001 from http://nvasia.netvalue.com/presse_hk/index_frame.htm?fichier=cp0038.htm

O'Donnellan, N. (1994). The presence of Porter's sectoral clustering in Irish manufacturing. *Economic and Social Review, 25*, 221-231.

Organisation for Economic Co-operation and Development (2000a). *Economic outlook*. Paris: Author.

Organisation for Economic Co-operation and Development (2000b). *Regulatory reform in Korea*. Paris: Author.

Organisation for Economic Co-operation and Development (2001a). *Communications outlook*. Paris: Author.

Organisation for Economic Co-operation and Development (2001b). *Science, technology and industry scoreboard: Toward a knowledge-based economy*. Paris: Author.

Organisation for Economic Co-operation and Development (2001, October 29). *The development of broadband access in OECD countries*. Paris: Author. Retrieved December 5, 2001 from http://www.oecd.org/pdf/M00020000/M00020255.pdf

O'Malley, E., & O'Gorman, C. (2001). Competitive advantage in the Irish indigenous software industry. *European Planning Studies, 9*(3), 303-322.

O'Shaughnessy, N.J. (1996). Michael Porter's competitive Advantage revisited. *Management Decision, 34*(6), 12-20.

Oxley, J., & Yeung, B. (2001). E-commerce readiness: Institutional environment and international competitiveness. *Journal of International Studies, 32*(4), 705-724.

Oxman, J. (1999). *The FCC and the unregulation of the Internet: Office of Plans and Policy working paper series 31*. Washington, DC: Federal Communications Commission. Retrieved October 13, 2001 from http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp31.txt

Porter, M.E. (1990a). *The competitive advantage of nations*. New York: Basic Books.

Porter, M.E. (1990b). The competitive advantage of nations. *Harvard Business Review, 68*(2), 73-93.

Reuters (2002, January 24). CEOs talk broadband with Cheney. Retrieved January 26, 2002 from http://news.com/2100-1033-822691.html

Rosenthal, M. (2000/2001). Open access of Internet service providers to the cable operators' facilities in the United States. *International Journal of Communications Law and Policy, 6,* 1-29.

Rugman, A.M., & D'Cruz, J.R. (1993). The "double diamond" model of international competitiveness: The Canadian experience. *Management International Review, 33,* 17-39.

Schumpeter, J.A. (1950). *Capitalism, socialism, and democracy*. New York: Harper.

Shapiro, C., & Varian, H.R. (1999). *Information rules: A strategic guide to the network economy*. Boston, Massachusetts: Harvard Business School Press.

Sharma, A. (2002, February). Trends in Internet-based business-to-business marketing. *Industrial Marketing Management, 31*(2), 77-84.

Shin, Y.-S. (2001). Broadband, closer to the future. Paper presented at Global Information Summit 2001 in Tokyo, Japan.

Sprano, E., & Zakak, A. (2000). E-commerce capable: Competitive advantage for countries in the new world e-commerce. *Competitive Review, 10*(2), 114-121.

TeleChoice (2001). It ain't over 'til it's over. Retrieved November 10, 2001 from http://www.xdsl.com/content/xdsltoday/tcperspective/CableIsKillingDSL.asp

TeleChoice (n.d.). Retrieved February 3, 2002 from http://www.xdsl.com/content/tcarticles/wp021202.asp

Tellis, W. (1997). Introduction to case study. *The Qualitative Report [e-journal], 3*(2). Retrieved February 25, 2002 from http://www.nova.edu/ssss/QR/QR3-2/tellisl.html

The Cable Communications Act, 47 U.S.C. 151 *et seq.* (1934).

The Cable Communications Act, 47 U.S.C. 521 *et seq.* (1984).

The Cable Television Consumer Protection and Competition Act, 47 U.S.C. 521-59. (1992).

The Framework Act on Telecommunications (Korean law).

The Telecommunications Act, 47 U.S.C. § 153 (20) (1996).

The Telecommunications Act, 47 U.S.C. § 153 (46) (1996).

The Telecommunications Act, 47 U.S.C. § 160 (a) (1996).

The Telecommunications Act, 47 U.S.C. § 251 (a) (1996).

The Telecommunications Act, 47 U.S.C. § 251 (c)(2) (1996).

The Telecommunications Act, 47 U.S.C. § 251 (c)(3) (1996).

The Telecommunications Act, 47 U.S.C. § 252 (1996).

The Telecommunications Act, 47 U.S.C. § 253 (1996).

The Telecommunications Act, 47 U.S.C. § 254 (b)(1) (1996).

The Telecommunications Act, 47 U.S.C. § 302 (1996).

The Telecommunications Act, 47 U.S.C. § 271 (1996).

The Telecommunications Act, 47 U.S.C. § 274 (1996).

The Telecommunications Business Act (Korean law).

United States v. Southwestern Cable Co., 392 U.S. 157 (1986).

U.S. Census Bureau (2002, February 20). United States department of commerce news: Retail e-commerce sales in fourth quarter 2001 were $10.0 billion, up 13.1 percent from fourth quarter 2000. *United States Department of Commerce News.* Retrieved March 23, 2002 from http://www.census.gov/marts/www/current.html

U.S. Census Bureau (2002, March 18). E-commerce 2000. *E-Stats*. Retrieved March 23, 2002 from http://www.census.gov/estats

U.S. Department of Commerce (2002). *A nation online: How Americans are expanding their use of the Internet*. Washington, DC: Author. Available at http://www.ntia.doc.gov/ntiahome/dn/nationonline_020502.htm

Viscusi, W.K., Vernon, J.M., & Harrionton, J.E., Jr. (2000). *Economics of regulation and antitrust*. Cambridge, Massachusetts: The MIT Press.

Wolcott, P., Press, L., McHenry, W., Goodman, S., & Foster, W. (2001, November). A framework for assessing the global diffusion of the Internet. *Journal of the Association for Information Systems, 2*. Retrieved March 20, 2002 from http://www.istis.unomaha.edu/isqa/wolcott/GDI/2001_GDI_Framework.htm

Wolf, M., & Zee, N. (2000). *Last mile: Broadband and the next Internet revolution*. New York: McGraw Hill.

Yun, K., & Lim, S. (2002). Market structure and competition between cable and DSL in Korea. Paper presented at ISOne World, Las Vegas.

Endnotes

[1] Comcast purchased AT&T Broadband from AT&T on December 20, 2001.

[2] They are the United States, West Germany, Italy, the United Kingdom, Sweden, Switzerland, Denmark, Japan, South Korea, and Singapore.

[3] A concentration index makes it possible to understand actual competition in a particular market. See Viscusi *et al*., 2000. CR4, one of the concentration indexes, is one of the prevalent measures for market concentration within a particular industry. See Albarran & Dimmick, 1996. Also, when the top-four firms control more than 50 percent of a market, the market is considered highly concentrated. See Albarran & Dimmick, 1996.

[4] For example, the estimated completion year was moved from 2015 to 2005. Also, proposed technologies were changed from ATM and fiber to Home (FTTH), xDSL, and CATV modem in 1997, and then to Ethernet and IMT2000 in 2000. See Lee, 2001.

[5] First Class buildings require more than 100Mbps capacity, and Second Class buildings need more than 10Mbps.

[6] Facilities-based service providers are the owners of facilities and provide facility-based services, such as wire telephony, cellular telephony, leased line services, and several wireless services. Specialized service providers do not own facilities, but supply facility-based services such as Internet telephony, international callback, premises communications, and voice resale. Value-added service providers do not have facilities, but offer value-added services, such as PC Online, Internet, e-mail, and voice mail service. As for different levels of regulation, the Korean system requires authorization for facilities-based providers, registration for special service providers, and notification for value-added service providers.

[7] SK Telecom is also subject to mandatory interconnection, but it is not taken into account here for the purpose of this paper. It owns only wireless facilities.

[8] Telecommunications is the transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received. See 47 U.S.C. 153 (43).

[9] Thus, cable operators are not required to provide interconnection or unbundling. The FCC sets the terms and conditions of franchise agreements as well as programming and ownership structural regulations. In addition, the local authorities award cable franchises and approve the transfer of franchises in their localities. See Rosenthal, 2000/2001.

[10] Incumbent local exchange carriers (ILEXs) are required to provide interconnection to any requesting carrier and to provide requesting telecommunications carriers with nondiscriminatory access to network elements on an unbundled basis. See 47 U.S.C. § 251 (c)(2); 47 U.S.C. § 251 (c)(3). In addition, a clear system to maintain affordable local rates is mandated. See 47 U.S.C. § 254 (b)(1). The FCC is the only competent agency for federal regulation of telecommunication services but may forbear from applying telecommunications-related provisions. See 47 U.S.C. § 160 (a).

[11] However, there was a three-month gap of the data for the two countries.

[12] The population of the survey, however, was very young. It can influence the disparity of Internet use based on the level of education in South Korea.

[13] The urban and rural penetration rates do not add up to 100 because they are penetration rates for rural or urban households with Internet access based on the rural or urban population, respectively.

[14] "Netizen" combines two words, "net" with "citizen." It is a commonly used name for Internet users in South Korea.

[15] Frauameni *et al*. (2000, June 15) defined e-commerce as "any transaction completed over a computer-mediated network that involves the transfer of ownership or rights to use goods or services." That is, unpriced transactions are excluded. In general, e-commerce covers Business-to-Consumer (B2C) and Business-to-Business (B2B). See OECD, 2000a.

[16] That is, companies can reduce purchasing costs of raw goods by searching for production online, companies can act fast and compare the prices easily among various suppliers by using the Internet, and companies can better utilize their inventory and raw material by using B2B technologies. See Larson & Fischer, 2000, March 16.

[17] The asymmetrical regulation, however, seems to disappear because the FCC tentatively classified the broadband Internet access services as information services in 2002.

[18] The level of concentration is likely to increase as Comcast won a bid for control of AT&T Broadband in late 2001 (AT&T's broadband division), creating the nation's largest cable operator. See Frank & Solomon, 2002, January 22. If approved by regulators, AT&T-Comcast will control nearly 40% of the nation's cable modem market.

[19] Note that the measurements of CR4 are indicators of national concentration levels here. Nevertheless, in the United States there is usually only one cable-based broadband Internet access service provider as a result of local franchise agreements and one or few incumbent local exchange carriers and competitive local exchange carriers at the local level. Such semi-monopoly in a local situation means that the broadband Internet access market of the United States provides even less competition at the local level. In addition, the open access issue in the United States is still unresolved at this point.