

Spatial Analysis of the Internet Industry in Korea*

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인터넷 산업의 공간 분석에 관한 연구*

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Abstract : Internet is the most important element in the emergence of the Internet economy, which derives the creation of new firms and employment, and brings about the new ways of marketing and business. The emergence of the Internet economy and the rapid growth of the Internet industry have a great deal to changes in the spatial economy. Korea has experienced a rapid growth of the Internet industries, but few geographical studies have been done to explain the impact of the development of the Internet industries on the spatial economy. This research explored how Korea has developed as a nation of the strong Internet economy in terms of driving forces by demand and supply side. This research tried to build a data set for the Internet industries with the introduction of a new classification scheme and a measurement. The most important finding from this research was the spatial concentration of the Internet industries toward Seoul at the national level and toward the Gangnam area within Seoul. The rise of Internet industries has added attractiveness to Seoul which enjoys a kind of cumulative and circular advantages.

Key Words : The Internet economy, The Internet industry, classification scheme, Internet infrastructure industries, Internet support industries, Internet application industries, spatial concentration

요약 : 인터넷의 확산에 따라 인터넷 경제가 도래하면서, 인터넷 경제의 핵심적 역할을 하는 인터넷 산업은 상당히 빠른 속도로 성장하고 있다. 우리나라도 이미 인터넷 경제에 들어섰으며, 인터넷 관련 산업들이 새롭게 등장하고 있다. 이러한 인터넷 산업의 성장은 공간경제구조에 상당한 영향을 미치고 있으나, 아직까지 인터넷 산업에 대한 지리학적 연구는 매우 미흡한 실정이다. 본 연구에서는 인터넷 산업의 성장을 가져온 주요 동인을 수요와 공급적인 측면에서 살펴 본 후에, 인터넷 산업의 분류체계를 구축하는 방법을 모색하고, 그 방법에 따라서 인터넷 산업에 대한 데이터베이스를 구축하였다. 이렇게 구축된 데이터베이스를 토대로 하여 인터넷 산업의 공간적 분포 특성을 분석하였다. 급성장하고 있는 인터넷 산업은 서울로 집중하는 추세를 보이고 있으며, 서울내에서는 강남지역으로의 집적 현상이 두드러지게 나타나고 있다. 인터넷 산업의 업종간 상호의존적이며 보완적인 특성으로 인해 서울은 누적적·순환적인 이점을 누리면서 수위성을 높여가고 있는 것으로 나타났다.

주요어 : 인터넷 경제, 인터넷 산업, 인터넷 분류체계, 인터넷 기반산업, 인터넷 지원산업, 인터넷 활용산업, 공간적 집중화

1. Introduction

Revolutions in transportation and communication technologies have long been central issues to economic geography because of their power to alter existing patterns of social and spatial relations by

reducing the friction of distance and providing access to ever more distant places. The Internet, as a revolutionary information and communication technology(ICT), is globally connected computer networks which are hierarchically composed of personal computers, Internet service providers, and nation-

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al backbone providers. Internet technologies and applications have grown more rapidly than anyone could have envisioned. The Internet has been offering the possibility of increased access to information by greatly reducing the time and costs of transferring it over distance and the costs of sending information to many places simultaneously (Leinbach and Brunn, 2001; Warf, 2000).

The Internet is the most important element in the emergence of the Internet economy, which derives the creation of new firms and employment, and brings about the new ways of marketing and business (Zook, 2000). The Internet is the major driving force for the development of the Internet economy. The Internet functions as a value chain with layers of information systems such as hardware (backbone/servers), operating systems, software interface (HTML, Domain, TCP/IP), middleware (browsers, DBMS), applications, business webs, and portals (Greenstein, 2002; Kogut, 2003).

The Internet economy is based on the use and application of ICT and the Internet for economic activities. The Internet economy is not about total digitalization of the business environment; it is more about utilizing information products and services to improve wealth creation through enhancing enterprise competitiveness, highlighting the pragmatic attitude that many businesses take towards its development (Turner, 2000). The Internet economy is a pragmatic response to the needs of business and economies in an era when knowledge and information are key determinants of economic success. The Internet economy comprises a large set of IP networks spanning the globe, software applications and the human capital that makes the networks and applications work together for online businesses and agents (corporations and individuals) who are involved in buying and selling products and services in direct and indirect ways (Barua, et al., 1999).

The rapid growth of the Internet economy has brought to not only new business opportunities but also structural changes of the industry. The evolu-

tion of the internet economy has created a demand for new products and services to improve and increase the efficiency and effectiveness of commercial processes. The development of the Internet economy have acted as a positive role in an increase of incomes, growth, interest rates, employment, and productivity at least in the OECD economy (OECD, 2000; USDC, 2000). Employment and firms of ICT industries and Internet users have increased rapidly during the late 1990s. In 2000, ICT industries have been a major source of new R&D investment and contributed to an increase of 25% in real economic growth in the U.S. (USDC, 2000). The renewal of global U.S. economy leadership is strongly linked to the economic boom of the 1990s to which ICT dynamics have contributed considerably.

The emergence of the Internet economy and the development of the Internet industry have influenced dramatically in the changes of the spatial economy. A body of literature in the last half of the 1990s shows that the Internet related activities have concentrated in a few large urban centers in developed countries (Brunn and Dodge, 2001; Dodge and Shiode, 2000; Kolko, 1999, 2002; Malecki, 2002; Malecki and Gorman, 2001; Townsend, 2001a, 2001b; Zook, 2000, 2001). Building upon the results of those research, geographers emphasize the complex geographies that result from the interaction between communications and Internet technologies and existing organizational, economic, political, cultural, physical structures (Graham and Marvin, 2001; Wheeler et al., 2000).

Korea showed signs of a strong Internet economy by the end of 2001, and Korea has been a leader in embracing the Internet-related economy. According to the Ministry of Information and Communication, the sale amount of the Internet industry was 56 trillion won in 2001. The average rate of increase in sales from 1999 to 2001 was very high at 51%, and the average rate of increase in its employment was approximately 26%. Several researches have been conducted, which were focused on the emergence of

the digital economy and an impact of the Internet on the structure of the industry and employment in Korea (Korea Information Strategy Development Institute, 1999, 2000, 2001; Korea Institute for Industrial Economics and Trade, 2000; Samsung Economic Research Institute, 1999). According to the results of above researches, more industries and workplaces have been heavily used and accepted the information and communication technologies and new type of occupations requiring relevant skills have been generated in Korea.

While there is ample evidence that the emergence of the Internet economy and the rapid growth of the Internet industry have contributed a great deal to spatial variation of the Korean economy, the impact of the rise of the Internet industry on spatial pattern remains one of the least explored aspects. Geographical works on the Internet industry are lacking and few research have been analyzed the impact of the development of the Internet industry on spatial structure of Korea. The main reason for having not been carried out those research is due to the problem for collecting adequate data sets. Until now, the definition and the classification scheme of the Internet industry are not firmly established. The problem arising from the acquisition of available data for the Internet industry may induce the difficulty in the explanation of spatial patterns of the Internet industry.

The purpose of this study are to build a database for the Internet industry introducing a new classification scheme which is modified from existing several classification schemes and to analyse the spatial patterns of the Internet industry in Korea at different spatial and sectoral level.

2. Drivers of the Internet Economy and the Rise of the Internet Industry in Korea

Before analyzing the spatial pattern of the Internet

industry, this paper tries to explore how Korea has developed as a nation of the strong Internet economy. Development of the Internet economy in Korea has been mainly driven by the expanding usage of an increasing array of information products and services by users, as well as by the ability of information industries to deliver such products. Also, the Korean government has a key complementary role in the development of the Internet economy. Its role as both user of information and promoter of the Internet economy has been a key stimulator. The driving forces of the Internet economy in Korea may be explained by both demand and supply sides.

1) Drivers of the Internet Economy by Supply Side

The first driver for the development of the Internet economy by supply side is a strong infrastructure base in Korea. The emergence of a strong Internet economy would not have been possible without sound telecommunication infrastructure. The Korean government provided a solid physical infrastructure for this economy. Also, the deregulation of telecommunication during the 1990s has immensely affected the development of ICT industries, particularly in the areas of mobile phone services and of broadband Internet services. Having strong telecommunications, IT and content industries have provided opportunities for the moving toward the Internet economy.

Given the huge installation costs and scale economies, five mobile phone operators competed fiercely with each other to attract customers with generous subsidies for phone equipments. As a result, companies actively provided broadband services to consumers in a fair competitive environment. Such intense competition has been the main reason that more people have subscribed to broadband services. In addition, the installation of broadband services was relatively chief compared with other countries such as U.S. and U.K. because two thirds of the Korean population lives in large apart-

ment complexes. In short, high-speed Internet connections have played a critical role for building a nation's information infrastructure.

The second driver by supply side is an easy access to venture capital which is essential for the Internet venture enterprises. In Korea, the venture capital has led to the rapid growth of start-ups in the Internet related firms which are low in barriers to entry and exit costs. The emergence of the Internet economy also has been influenced by the Asian Crisis. As the Korean economy recovered from the crisis, there were sudden changes in business environments. From the perspective of employees, capital markets, and even the government, the center of gravity shifted from the old economy, dominated by chaebols, to the new economy, led by Internet start-ups(Chang, 2003). This shift was most evident in the capital market, where the fortunes of firms listed on the KOSDAQ. The capital flow into Internet venture companies was through investment attraction from angel investors/venture capitalist or capital raised as an Initial Public Offering(IPO) on the KOSDAQ. Successful IPOs, which numbered 160 firms on the KOSDAQ in 1999, attracted a large sum of money for venture capital funds. At the end of 2001, among 10,993 start-up firms that were officially recognized by the government, 3,705 firms(33%) were in the computer and information processing industry. The government is actively supporting matching Internet venture companies and angel investors/ venture capitalist, and assisting corporate management for CEOs by implementing finance training for operation process from inauguration to listing on KOSDAQ(Korea Network Information Center, 2002).

The third driver by supply side is the availability of skilled IT professionals which is pivotal in the emergence of the Internet economy. The existence of professional and specialized workers has stimulated the rapid growth of the Internet industries. In Korea, the economic crisis and subsequent restructuring on the chaebols made skilled workers more willing to work at new venture firms in order to reap better pay and

quicker promotions. This opening up of the labor market was an important facilitator for the Internet economy in Korea. The prospect of getting rich quickly induced the skill workers to set up their own ventures. In 2001, 31% of the employers from start-ups was from large corporations, 38% from other small and medium sized firms, 10% from researchers at the research institutes, 6% from former professors, and 15% from others(Korea Small & Medium Business Administration, 2002). It is worth noting that not only employees of large corporations and research institutes quitted their jobs to start their own ventures but university professors did as well. Since the core source of competitive advantage of the Internet industry was human resources, the enterprise having access to the necessary skills could enhance competitive advantage in the Internet economy.

The fourth driver by supply side is the government policies. The government shifted its attention from the old economy to the new economy. After the crisis, faced with the daunting task of easing unemployment, the government sought relief by supporting the start-ups with various modes of funding and subsidies. Due to the very favorable government policies for start-ups the number of start-ups were 10,993 in the end of 2001. The government played an important role in the growth of the Internet economy in Korea by providing direct funding and by helping start-ups secure loans from banks, just as it did to chaebols in the 1960s and 1970s(Chang, 2003).

2) Drivers of the Internet Economy by Demand Side

The most important driver for the development of the Internet economy by demand side in Korea is an easy access to advance infrastructure which is regarded as essential to rapid growth of the Internet industry. The existence of strong telecommunication infrastructure was able to meet greater capacity to deal not only with increased traffic but also with the advent of bandwidth hungry services. As a result,

the number of Internet users was 26.3 million(55.3% of the population) in 2002, which is the 6th rank in the world. More than 60% of the population was equipped with mobile phones, nearly all of which could log on the Internet.

The second driver by demand side is an affordable price of Internet service. Competitive pricing is a key driver, as demand for services and technologies crucially depends upon their affordable price. Korea has the highest rate of broadband subscribers in the world because high-speed Internet services and multimedia services are available at a low price. In 2002, the number of households with high-speed Internet service was increased over 10 million due to the good accessibility to advanced infrastructure at a relatively low price.

The third driver by demand side is the rapidly increased use of the Internet. Korean people, particularly young people, possess the greater propensity to absorb and consume the services and technologies associated with the emerging Internet economy. More than 66% of stock trading was done online, which was the highest ratio in the world. In terms of transaction amount, online trading makes up over 95% of the KOSDAQ market and approximately 75% of the Korea Stock Exchange. Also, over 10 million people have subscribed to Internet banking services because banks are offering incentives such as discounted fees, better deposit rates, and lower loan rates for Internet banking subscribers(KNIC, 2002). In Korea, the mobile internet market is rapidly growing among teenagers and young adults as we call netizen. The mobile Internet has grown into a new trend where many people are downloading ring tones, games, and cute characters to their mobile phones. Netizen, who are willing to absorb Internet technologies and have more positive attitude towards the Internet economy, have influenced the rapid growth of the Internet industry. People are willing to buy various goods online not only digital goods but also tangible goods, which is regarded as a key factor for the driving the Internet economy. In

Korea, the number of people who send instant messages has extremely increased. Instant messaging is now becoming a way of communication with companies and has changed the corporate culture as an important business tool for communication.

The fourth driver for the emergence of the Internet economy by demand side is the development of various Internet application businesses. The Internet application industry is viewed as the heart of the Internet economy, because it is capable of forming a value chain in the Internet economy. The developing pathways to Internet application business in Korea has been client-led development. Korean Internet start-ups tended to heavily populated in application areas such as portals and e-commerce, where were fewer barriers to entry, rather than Internet-related software and technology.

However, demand and supply side drivers cannot be regarded as a separated determinant for the development of the Internet economy in Korea. Because they actually act as complementary by each other. Such a complementary relationship between demand and supply side drivers implies that the value of doing more of one driver increases by doing more of another.

3. The Classification and the Measurement of the Internet Industry

1) Classification of the Internet Industry

The first challenge to analyze the spatial distribution of the Internet industry is to determine how to collect and construct an adequate data set. There is no governmental or other authoritative source of data on the Internet industry. Current SIC codes that were designed at a point in which manufacturing was the dominant activity in the economy is not adequate. There is a need for the adoption of a new classification scheme which will help to better identify

the characteristics of the Internet industry. In this sense an analysis of Internet industries would depend crucially on how these industries are classified and how they are measured.

The classification scheme of the Internet economy has been developed by the Center for Research in Electronic Commerce(CREC) at the University of Texas at Austin and CISCO in 1999. That classification developed by CREC is to break apart the Internet economy into layers based upon the unique elements necessary to facilitate the ultimate revenue producer on the Internet and sales transactions. According to the classification of CREC the Internet economy is broadly classified into infrastructure and economic activity categories. First, the infrastructure category is further divided into two distinct but complementary layers the 'Internet infrastructure layer', which provides the physical infrastructure for electronic commerce, and the Internet applications infrastructure, which includes software applications, consulting, training and integration services that build on top of the network infrastructure, and which makes it feasible for organizations to engage in online commerce. Second, the 'economic activity category' is also subdivided into two layers: electronic intermediaries and online transactions. The intermediary layer involves market maker, provider of expertise or certification that makes it easier for buyers to choose sellers and/or products, search and retrieval services that reduce transaction costs in an electronic market, and other services that facilitate online commerce. The transactions layer involves direct transactions between buyers and sellers like manufacturers and e-tailers.

In Korea, classification schemes for the Internet industry have been proposed by several research institutes such as Electronics and Telecommunication Research Institute(ETRI), Korea Information Strategy Development Institute(KISDI), Samsung Economic Research Institute(SERI). Those are much similar with the scheme developed by CREC. According to those studies, Internet industries are classified into

three groups; the Internet infrastructure, the Internet support, and the Internet application industry. Especially, KISDI has proposed the classification scheme by 3-digit level in detail. However, KISDI's classification scheme does not provide any information about the way how to collect data, so it is hard for this scheme to apply practically.

In order to build a useful data set about Internet industries, this study tries to develop a modified classification scheme of KISDI by the provision of detailed categories of businesses in three-digit level based on the operational aspects. In this study, a classification scheme of the Internet industry is based upon the notion that there is a strong complementary, inter-linked and symbiotic relationship among Internet industries to provide the final services to customers. From this inter-related perspective of Internet industries, this study proposes a hierarchical structure of classification scheme. Internet industries consist of three hierarchical layers, illustrated in Fig. 1. In a hierarchical structure of Internet industries, 'the Internet infrastructure industry' is at the bottom layer of the Internet economy. The second layer above the Internet infrastructure is 'the Internet support industry'. And the top layer above the Internet support industry is 'the Internet application industry'. Those three layers were classified as one-digit level for Internet industries, following two and three digit level's classification according to the criteria of major products and principal business activity in each firm (see Appendix).

The Internet infrastructure industry which is at the bottom layer of the Internet economy does indeed form a base for the Internet economy. The growth of the Internet economy depends on the ubiquitous presence of high speed and intelligent electronic networks and the ability to share any type of contents between all agents in the economy. Accordingly, the Internet infrastructure layer which provides the platform for the growth of the remainders in the Internet economy is the fundamental layer in which other sectors of digital products and

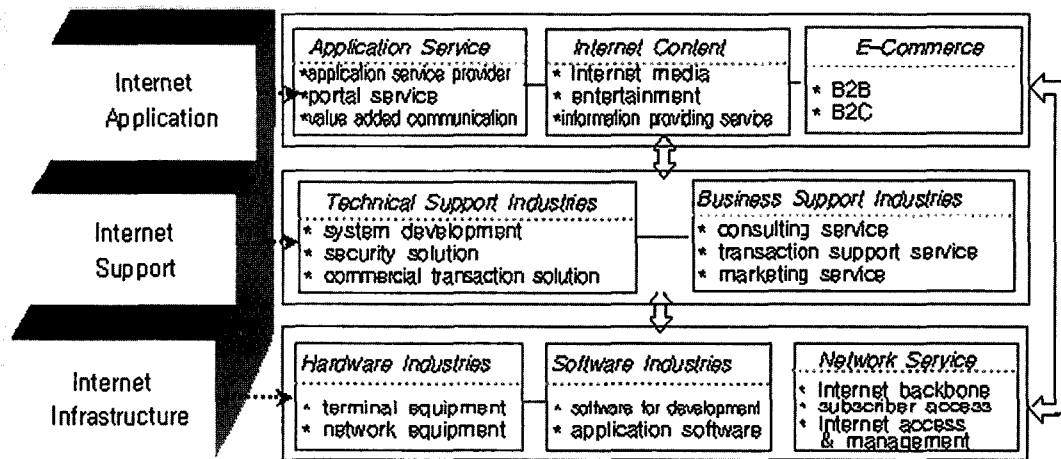


Fig. 1. Classification scheme of the Internet industry by three-digit level

services are developed.

For this research, the Internet infrastructure layer was further classified into sub-categories, namely hardware, software, and network service categories as a two-digit level. This includes companies that provide telecommunications and fiber backbones, access and end-user networking equipment which are a prerequisite for the Web and the proliferation of Internet-based Electronic Commerce. This layer includes such companies as Internet backbone providers, service providers, network equipment for backbones and service providers (networking hardware and software, server & client hardware) and PC and server manufacturers.

The second layer above the Internet infrastructure industry is the Internet support industry which is the network-enabling applications layer that offers user interfaces as well as manages and distributes the content. The Internet support industry involves software products and services necessary to facilitate Web transactions, as well as transaction intermediaries. The Internet support industry increases the efficiency of electronic markets by facilitating the meeting and interaction of buyers and sellers over the Internet. It acts as catalysts in the process through which investments in the infrastructure and applications layers are transformed into business transactions. The

Internet support industry plays a critical role in filling information and knowledge gaps, which would otherwise impair the functioning of the Internet as a business channel. Products and services in this layer build upon the above IP network infrastructure and make it technologically feasible to perform business activities online. While the output of this layer may not be tangible to the average user of the Internet, it is a fundamental basis for e-commerce and other activities related to Internet application. The Internet support industry thus provides opportunities to develop online business activities.

With consideration of this characteristic on the Internet support industry, this layer was further classified into two sub-groups for this study, namely 'technical support industry' and 'business support industry' at two digit level. Technical support industry was divided into three sub-categories such as 'system development', 'security solution', and 'commercial transaction solution' at three digit level. The category of business support industries was further classified into 'consulting service', 'transaction support service', and 'marketing service' at three digit level.

The top layer above the Internet support industry is the Internet application industry. The Internet application industry was further classified into sub-

categories of 'application services', 'Internet content', and 'e-commerce' at the two digit level. Application services are related to business activities for the utilization of the Internet as new ways of services and value adding procedures, which are further divided into three sub-categories as 'application service providers', 'portal services', and 'value added communication services'. The Internet content industry involves in the creation, organization, and dissemination of information products to a global marketplace where a significant portion of the business is conducted via the Internet. The category of the Internet content is further classified into three sub-categories such as 'Internet media', 'entertainment', and 'information providing services' at three digit level. The category of e-commerce is classified into two sub-groups such as B2B(business to business e-commerce) and B2C(business to consumer e-commerce). B2B is new ways of business among firms through the Internet, including business activities such as the Internet trade and the Internet intermediate services. While, the B2C sector mainly focuses its business on consumers with the utilization of Internet as market places.

Each layer of the Internet industry is critically dependent on every other layer and it has a complementary relationship with every other layer. Improvements in one layer can help the other layers in different ways. As the Internet bandwidth increases with the spread of broadband technology, application vendors are rushing to develop powerful multimedia software that can take advantage of increased bandwidth. These factors are strongly influencing an increase of economic activity through the Internet, contributing to the development of media-rich content. The Internet's open nature stimulates innovation in both the network and applications infrastructure, leading to the vastly accelerated development and development of new technologies in the Internet marketplace. This interdependence also exhibits itself in the form of alliances where conduit and content providers or application vendors and e-tailers join hands to create bundled offerings

that are valuable to consumers. Furthermore, instant communication, coordination, and collaboration across the Internet are helping firms lower their transaction costs through virtual integration with suppliers and customers.

2) Measuring the Internet Industry

Even though the proposed classification scheme may be adopted, it still retains problems arising from the collection of adequate data set. In the absence of adequate data set for the Internet industry, this research attempts to build a data set to reveal the role of this industry on the space economy in Korea. Reliable data on Internet industry firms are extremely difficult to obtain at any scale. Thus, this study uses raw data from several handbooks such as Directory of the Korean Information and Telecommunication Industry(2002), The Korean Software Industries Directory(2002), and Internet Membership Directory(2003) which are contained Internet-related firms' information. Based upon the three digit level of Internet industries, this study tries to sort the raw data into each sub-category of Internet industries.

Firstly, a dataset for Internet industries was collected utilizing raw data set from Directory of the Korean Information and Telecommunication Industry in which firms' information is collected in the base of Korean Information Industries Classification at two digit level. This directory contains information about 18,000 firms including major business activity for each firm. This raw data set was quite valuable to produce a dataset for the Internet industries at three digit level. About 18,000 firms were sorted out according to the classification method devised carefully with the consideration of major business activity. About 4,200 firms which are related to the production of electrical equipments and cable networks and program distribution were removed for this data set, leaving 13,800 firms for the categories of Internet industries.

In addition, this study utilized The Korean Software Industries Directory, which contains infor-

mation on 654 software firms, in order to add any firms which are not included in Directory of the Korean Information and Telecommunication Industry. 80 firms from 654 were added into Internet industries in accordance with the careful double-checking of raw data. As a result, 13,880 firms were pertained into Internet industries from raw data of Directory of the Korean Information and Telecommunication Industry and The Korean Software Industries Directory.

Finally, Internet Membership Directory, which contains 844 Internet related firms joined in the Korean Internet Organization, was utilized in order to find any firms which are not included into the Internet industry categories from the above two handbooks. Except for 36 firms, the other firms were already existed in the other handbooks. As a result, 13,916 firms were finally included into the Korean Internet industries. Based on 13,916 firms, the data set was created by information from locational address, establishment year, and the number of employment of each firm.

4. Spatial Distribution of the Internet Industry

1) The Growth of the Internet Industry

A rapid growth of the Internet industry has been occurred in the Korean economy. Between 1995 and 2001, a growth rate of the number of establishments in the Internet industry marked at 23.7 % in annum. A remarkable rapid growth occurred between 1999 and 2000, right after an Financial Crisis of Korea(see Fig. 2). One of the important points is the fact that the Internet application industry experienced especially rapid growth compared to the other two Internet industries since 1998. Consequently, the share of the Internet infrastructure industry decreased from 43.4% in 1995 to 39.0 % at the end of 2001, while the share of the Internet application industry increased from 31.3% to 35.4% during the

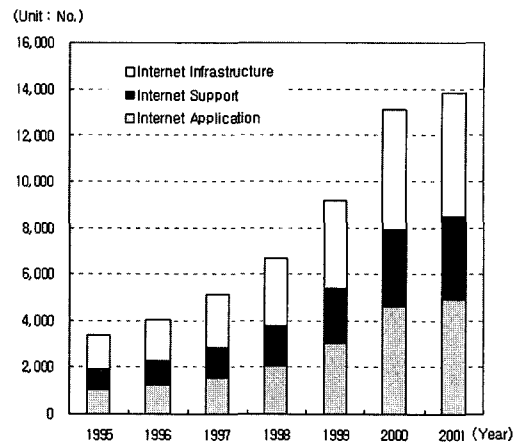


Fig. 2. Trends in the number of establishment of the Internet industry, 1995-2001

Source: Data set for this research was built from 3 handbooks¹⁾

same period.

Such changes in the composition of the Internet industry over this period implies that an initial period of the development of the Internet economy requires the development and support from the Internet infrastructure industry. However, at the expansion period of the Internet economy, the Internet application industry such as Internet content, e-commerce, and application services emerge as a new source of benefit-creating business, because, the application of the Internet depends upon an increase of Internet use from firms, households, government and non-government organizations.

Table 1 shows the composition of the Internet industry by two-digit level in 2001. In the number of establishment in the Internet industry, a high share appears in the technical support industry(21.2%) and the Internet content industry(20.7%), followed by the software industry(19.2%), the hardware industry(16.8%) and the e-commerce industry(11.7%).

However, there exist some differences in the composition of employment in the Internet industry compared with that of establishment. The highest share of employment comes from the hardware industry(31.1%). On the other hand, the shares of

Table 1 . The composition of the Internet industry by size, numbers of establishment, and employment, 2001

(unit: number,%)

1-digit level	2-digit level	Establishment		Employment		size of workers						
		No.	%	No.	%	1-4	5-9	10-19	20-49	50-99	100-299	300 above
Internet	Hardware	2,348	16.8	189,414	31.1	13.7	17.5	24.1	23.5	11.2	6.0	4.0
	Software	2,668	19.2	75,246	12.4	12.3	28.4	30.1	22.2	4.7	2.0	0.4
Infrastructure	Network Service	406	2.9	23,968	3.9	16.3	29.3	24.4	17.3	8.2	2.0	2.7
	Sub total	5,422	39.0	288,628	47.4	13.2	23.8	27.1	22.4	7.7	3.7	2.1
Internet Support	Technical Support	2,960	21.2	105,523	17.3	14.8	23.1	27.4	26.2	7.0	3.3	1.2
	Business Support	609	4.4	23,021	3.8	12.5	25.9	28.2	19.7	7.3	3.0	3.4
	Sub total	3,569	25.6	128,544	21.1	14.4	23.6	27.5	22.6	7.1	3.3	1.6
Internet Application	Application Service	422	3.0	12,862	2.1	6.2	17.1	29.1	32.0	10.9	4.5	0.2
	Internet Content	2,876	20.7	112,477	18.5	14.5	21.5	29.6	24.9	6.8	1.8	0.9
	Electronic Commerce	1,627	11.7	66,739	11.0	38.2	23.4	17.0	13.7	4.2	2.2	1.2
	Sub total	4,925	35.4	192,078	31.6	21.6	21.8	25.4	21.8	6.3	2.2	0.9
Total		13,916	100.0	609,250	100.0	16.5	23.0	26.6	22.2	7.0	3.0	1.6

Source: Data set for this research was built from 3 handbooks¹⁾

employment in software, Internet content, and technical support industries are relatively low compared with their share of establishment. This indicates that the hardware industry utilizes economies of scale to produce equipments related to computer, terminal, and network, while software, technical support, and Internet content industries which are more technically innovated and venture-capitalized firms are relatively small-sized firms. In fact, the percent of firms whose size is less than 10 employees is only 31% in the hardware industry, compared to 41% in the software industry and 61% in the e-commerce industry.

2) Regional Distribution of the Internet Industry

The trend of growth in the Internet industry by regions between 1995 and 2001 is very striking(see Fig. 3). Most of the new establishments in the Internet industry during this period were located in Seoul, increasing the concentration ratio from 60.8% in 1995 to 65.6% in 2001. While, except for Busan, the other regions experienced a decline in their shares at the same period. The shares of the other metropolises in the Internet industry, even in, the Gyeonggi province were quite low compared to their shares of

other industries such as manufacturing and service industries. The concentration trend toward Seoul is more clearly appeared in right after 1998. After economic crisis of Korea, the development of the Internet industry clearly occurred in Seoul, indicating that Seoul has reinforced its dominance of Internet industry by its strong base of the Internet infrastructure (Lee & Lee, 2002).

Regional distribution of Internet industries by

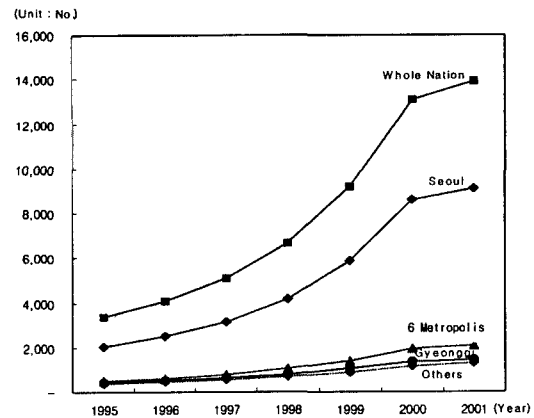


Fig. 3. Growth Trend in the Internet Industry by Regions, 1995-2001

Source: Data set for this research was built from 3 handbooks¹⁾

sub-category shows somewhat different from that of the Internet industry in aggregate. Seoul shares the very low proportion in the Internet infrastructure industry compared with the share in Internet support and Internet application industries. Seoul shares only 57.2% of total Internet infrastructure industry, while 73.4% of total Internet application firms were located in Seoul(see Table 2). Also when we see the share of Seoul's Internet industries by 3-digit level, we can recognized striking point. The transaction support service industry of Seoul's share was 92% while the terminal equipment industry of that was only 40%(see Table 3). Relatively high shares of Seoul in the business support, application service and Internet content industries compared with the hardware industry indicate that more business-innovated and application- oriented firms in Internet industries are likely to concentrate toward Seoul, reinforcing the role of Seoul as a center for innovative businesses in the Internet economy.

Further, regional distribution of employment in

the Internet industry at the two-digit level shows very interesting and remarkable aspects. The employment share of the hardware industry is highest in the Gyeonggi province at 39.8 %, while its share of Seoul is relatively low at 38.8%. However, Seoul shares 93.4% in business support industries, 89.8% in application service industries, 83% in Internet content industries and 80.8% in software industries(see Table 4). The firms which are more dependent on an innovative and technological advance and more oriented in business innovated activities were located in Seoul. Such contrast in the distribution patterns reveals that a relatively low value chain of Internet industries such as the hardware industry are likely to disperse to the adjacent Gyeonggi province, while high value chain of industries such as business support and application service industries are more likely to concentrate to Seoul.

The most important reason for the over-concentration of those industries to Seoul may be explained by its social and economic milieu. Seoul maintains

Table 2. Regional distribution of the Internet industry by establishments, 2001

Regions	Internet Industries				Internet infrastructure		Internet support		Internet application	
	1995		2001		2001		2001		2001	
	No.	%	No.	%	No.	%	No.	%	No.	%
Seoul	2,041	60.8	9,122	65.6	3,099	57.2	2,409	67.5	3,614	73.4
Busan	121	3.6	560	4.0	213	3.9	157	4.4	190	3.9
Daegu	97	2.9	344	2.5	122	2.3	95	2.7	127	2.6
Incheon	122	3.6	379	2.7	233	4.3	51	1.4	95	1.9
Gwangju	60	1.8	252	1.8	102	1.9	96	1.8	84	1.7
Daejeon	84	2.5	454	3.3	205	3.8	119	3.3	130	2.6
Ulsan	26	0.8	115	0.8	37	0.7	48	1.3	30	0.6
Gyeonggi	419	12.5	1,411	10.1	839	15.5	234	6.6	338	6.9
Gangwon	18	0.5	108	0.8	43	0.8	35	1.0	30	0.6
Chungbuk	47	1.4	162	1.2	99	1.8	35	1.0	29	0.6
Chungnam	39	1.2	129	0.9	69	1.3	35	1.0	25	0.5
Jeonbuk	52	1.5	189	1.4	73	1.3	64	1.8	52	1.1
Jeonnam	39	1.2	112	0.8	36	0.7	42	1.2	34	0.7
Gyeongbuk	77	2.3	221	1.6	111	2.0	65	1.8	45	0.9
Gyeongnam	90	2.7	282	2.0	120	2.2	95	2.7	67	1.4
Jeju	23	0.7	75	0.5	21	0.4	19	0.5	35	0.7
Total	3,355	100.0	13,916	100.0	5,422	100.0	3,569	100.0	4,925	100.0

Source: Data set for this research was built from 3 handbooks¹⁾

Table 3. Seoul's share of the establishment in the Internet industry, 2001

1-digit	2-digit	3-digit	Seoul	6 Metropolis	Gyeonggi	Others	Nation
Internet Infrastructure	Hardware	Terminal Equipment	40.2	19.1	25.2	15.6	1549(100)
		Network Equipment	44.2	16.1	30.8	8.9	789(100)
	Software	Software for Development	64.8	17.3	6.2	11.7	162(100)
		Application Software	70.0	15.6	6.4	8.1	2526(100)
	Network Service	Internet Backbone	76.5	5.9	11.8	5.9	17(100)
		Subscriber Access Service	63.6	19.3	11.4	5.7	88(100)
Internet Access & Management Service		64.3	16.8	7.9	11.0	291(100)	
Internet Support	Technical Support	System Development	60.9	16.9	8.0	14.1	2483(100)
		Security Solution	77.6	15.6	4.6	2.3	263(100)
		Commercial Transaction Solution	79.7	13.5	3.8	3.0	237(100)
	Business Support	Consulting Service	83.7	8.8	2.3	5.2	307(100)
		Transaction Support Service	92.1	4.8	1.6	1.6	63(100)
		Marketing Service	87.0	6.0	2.8	4.2	216(100)
Internet Application	Application Service	Application Service Providers	83.4	9.4	3.8	3.4	235(100)
		Portal Service	80.8	12.1	1.0	6.1	99(100)
		Value Added Communication Service	84.7	8.2	5.9	1.2	85(100)
	Internet Content	Internet Media	79.6	11.9	4.0	4.4	226(100)
		Entertainment	84.4	9.1	3.3	3.1	514(100)
		Information Providing Service	74.6	11.7	6.9	6.7	2139(100)
	E-Commerce	B2B(Business to Business)	64.2	17.9	9.4	8.5	1513(100)
		B2C(Business to Consumer)	73.7	17.5	6.1	2.6	114(100)
All Internet Industries			65.6	15.1	10.1	9.2	13916(100)

Source: Data set for this research was built from 3 handbooks¹⁾

and upgrades its competitive advantage through the effects arising from the clustering of interdependent Internet industries. These effects stimulate sustainable growth milieu as they create innovative firms, and diffuse knowledge and technology.

If we consider the money flows on the Internet shown in Fig. 4, it is very easy to understand why Internet industries have been continuously concentrated to Seoul. This economic map of the Internet which represents fundamental concept of treating Internet economy as elements in value chains show how money flows on the Internet. Each of the blocks represents a distinct type of service provided on the Internet, and the arrows between the blocks represent dependencies among the services. Money enters from consumer and business ISP fees as well as from advertisers and through e-commerce and pay-for-content sites. Eventually money makes its way down to the backbone providers at the heart of

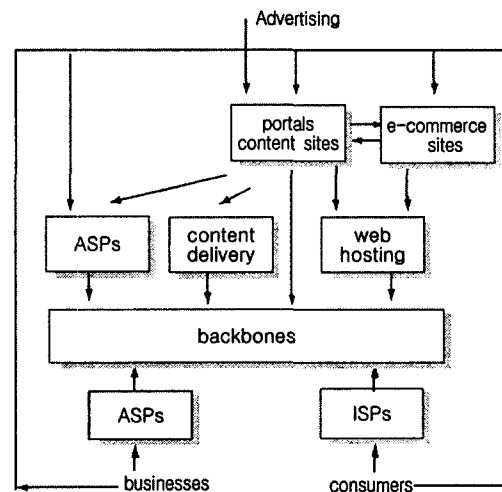


Fig. 4. A Map of money flows on the Internet

Note: ASPs(Application Service Providers) and ISPs(Internet Service Providers)

source: O'Donnell, S., 2002, An Economic Map of the Internet, p.3.

Table 4. Regional distribution of the Internet industry by employment, 2001

(unit: %)

Regions	Industry	Internet infrastructure			Internet support		Internet application		
		hardware	software	network	technical support	business support	application service	Internet contents	E-commerce
	Seoul	38.8	80.8	65.6	75.8	93.4	89.8	83.0	78.4
	Busan	0.8	2.1	0.5	2.1	0.5	3.1	1.6	1.3
	Daegu	0.3	1.1	1.4	1.0	0.4	0.7	0.6	2.3
	Incheon	3.8	1.0	0.2	0.9	0.1	0.8	1.6	2.9
	Gwangju	0.7	0.8	0.3	0.6	0.7	0.2	1.1	0.4
	Daejeon	0.7	1.9	1.2	1.3	1.9	1.2	1.5	0.7
	Ulsan	0.0	0.3	0.1	1.0	0.2	0.3	0.2	0.2
	kyoenggi	39.8	7.5	29.1	10.9	0.9	2.9	7.0	6.5
	Gangwon	0.2	0.2	0.3	0.9	0.1	0.0	0.8	0.2
	Chungbuk	3.6	0.4	0.1	0.5	0.0	0.0	0.3	0.2
	Chungnam	2.4	0.7	0.0	0.3	0.0	0.1	0.4	0.5
	Jeonbuk	2.1	0.5	0.4	0.5	1.1	0.0	0.3	0.9
	Jeonnam	0.2	0.3	0.2	0.3	0.2	0.1	0.0	0.4
	Gyeongbuk	2.9	1.5	0.1	2.0	0.1	0.3	0.3	3.0
	Gyeongnam	3.6	0.8	0.3	1.8	0.4	0.5	1.1	1.9
	Jeju	0.1	0.1	0.2	0.1	0.0	0.2	0.2	0.2

Source: Data set for this research was built from 3 handbooks¹⁾

the Internet(O'Donnell, 2002).

The high value added Internet support and Internet application industries have been attracted to the impressive Internet infrastructure of Seoul. Clearly, the development of Internet industries is not based on an individual industry, instead they are value chains which require a support of related Internet industries. Therefore, the development and advance of Internet industries such as the application industry and the business support industry are strongly based on the development of the Internet infrastructure industry, and also on the support of development in system development and marketing services industries. The Internet industry is grown as value chains, inducing strong impacts of spillover effects in the economy, let alone their strong influence on the structural changes in the spatial economy.

3) Local Variation of the Internet Industry in Seoul

This section examines the local variation of sub-categories of Internet industries within Seoul. Especially,

this research examines the characteristics in the local variation of Internet industries according to their use of information and technology, and to their innovative ways for business activities as value creating.

The share of the number of establishments in the Internet industry at the Gu-level of Seoul is shown in Table 4. Gangnam-gu has the highest share in the number of establishments at 30.6% in 2001, followed by Seocho-gu(17.6%) and Yeongdungpo-gu(8.8%). Those three Gus share 57% of total establishments in the Internet industry. The Internet industry clearly favors to locate in Gangnam, as its share increased from 24.9% in 1995 to 30.4% in 2001. Also Gangnam shares 35% of workers in the Internet industry. Thus, as like the spatially concentrated pattern of the Internet industry at the national level, this industry is highly concentrated to specific location at the intra-metropolitan level.

At the sub-categories of Internet industries by the number of employment, Gangnam-gu is a leading place in the share of employment in the Internet infrastructure industry(40.1%) and the Internet

Table 5. The share of the Internet industry at the level of Gu in Seoul, by establishment and employment.

(unit: number, person, %)

Gu	Industry	Establishment				Employment		Internet Infrastructure		Internet Support		Internet Application	
		1995	%	2001	%	2001	%	Establish.	Employ.	Establish.	Employ.	Establish.	Employ.
Jongno-gu		106	5.2	322	3.5	18,251	4.5	2.3	1.0	3.1	5.1	4.9	7.3
Jung-gu		140	6.9	404	4.4	43,562	10.7	2.7	7.2	4.6	13.9	5.8	11.8
Yongsan-gu		130	6.4	426	4.7	9,983	2.4	4.2	2.0	3.1	2.5	6.1	2.8
Seongdong-gu		28	1.4	130	1.4	15,502	3.8	1.6	8.5	1.5	0.6	1.3	1.3
Dongdaemun-gu		27	1.3	108	1.2	2,261	0.6	0.6	0.1	1.4	0.8	1.6	0.8
Jungnang-gu		6	0.3	32	0.4	247	0.1	0.4	0.1	0.2	0.1	0.4	0.1
Seongbuk-gu		17	0.8	87	1.0	1,534	0.4	1.1	0.2	1.0	0.6	0.8	0.4
Dobong-gu		2	0.1	21	0.2	141	0.0	0.1	0.0	0.2	0.0	0.4	0.1
Nowon-gu		9	0.4	47	0.5	578	0.1	0.3	0.1	0.7	0.2	0.6	0.1
Eunpyeong-gu		13	0.6	37	0.4	788	0.2	0.4	0.1	0.2	0.2	0.6	0.3
Seodaemun-gu		17	0.8	98	1.1	2,099	0.5	1.1	0.4	0.7	0.4	1.3	0.6
Mapo-gu		95	4.7	462	5.1	13,064	3.2	4.9	3.8	5.1	3.2	5.2	2.6
Yangcheon-gu		33	1.6	142	1.6	4,137	1.0	1.6	1.2	1.2	0.5	1.7	1.1
Gangeo-gu		42	2.1	144	1.6	10,954	2.7	1.8	1.5	1.7	7.8	1.3	0.5
Guro-gu		53	2.6	207	2.3	6,876	1.7	3.0	2.2	2.0	1.7	1.8	1.2
Yeongdeungpo-gu		202	9.9	800	8.8	49,961	12.2	9.5	9.7	11.2	12.7	6.6	14.3
Dongjak-gu		38	1.9	166	1.8	5,617	1.4	2.1	0.9	1.7	2.6	1.6	1.0
Gwanak-gu		30	1.5	211	2.3	6,958	1.7	2.5	0.5	2.3	1.0	2.2	3.3
Seocho-gu		342	16.8	1,601	17.6	46,967	11.5	19.6	12.9	17.6	12.4	15.8	9.6
Gangnam-gu		509	24.9	2,794	30.6	144,038	35.2	29.6	40.1	32.4	25.8	30.4	36.7
Songpa-gu		97	4.8	405	4.4	11,503	2.8	4.9	2.6	4.3	4.6	4.2	1.9
Gangdong-gu		18	0.9	105	1.2	3,191	0.8	1.0	0.6	0.9	1.3	1.4	0.6
Gwangjin-gu		40	2.0	218	2.4	4,438	1.1	2.2	0.7	1.8	1.1	2.9	1.4
Gangbuk-gu		3	0.1	25	0.3	594	0.1	0.5	0.3	0.1	0.0	0.2	0.1
Geumcheon-gu		44	2.2	130	1.4	5,615	1.4	2.4	3.0	1.0	0.6	0.9	0.3
total		2,041	100.0	9,122	100.0	408,859	100	100.0	100.0	100.0	100.0	100.0	100.0

Source: Data set for this research was built from 3 handbooks¹⁾

application industry(36.7%), while Internet support industries are highly developed in Jung-Gu, Yeongdeungpo-gu, and Seocho-Gu.

Although, spatial patterns in the employment of the Internet industry are similar to those in the establishment, the employment shares of Gangnam-gu and Seocho-gu have been differently represented. Gangnam-gu's employment shares in Internet infrastructure and Internet application industries are higher than the share of the establishment, while Seocho-gu has an opposite phenomenon. Thus, it is implied that the size of firms located in Gangnam-gu is relatively large, indicating that firms in Gangnam-gu have already experienced an initial stage of start-

up, now turning toward stable and maturing stage.

In short, within Seoul, Internet industries have been concentrated into Gangnam-gu. Gangnam's overwhelmingly high proposition of the Internet industry is mainly attributed to its strong attractive local environment such as social structures of innovation, culture of risk-taking, institutional endowment and so on. The local environment of Gangnam contributes to the concentration of Internet related industries despite of high rental price of office buildings and traffic congestion. The rise of the Internet industry has added attractiveness to Gangnam which enjoys a kind of cumulative and circular advantages. The existence of business and social

Table 6. The shares of five leading district(Gu) in the establishment of Internet Industries by 3-digit level, 2001

1-digit	2-digit	3-digit	Gangnam -gu	Yeongdeu ngpo-gu	Seocho -gu	Jung-gu	Jongno -gu	others
Internet Infra- structure	Hardware	Terminal Equipment	39.6	9.2	8.5	6.6	0.9	35.2
		Network Equipment	15.6	5.0	18.9	7.9	0.8	51.8
	Software	Software for Development	81.3	5.0	3.4	1.5	0.3	8.5
		Application Software	36.6	11.6	14.4	10.2	1.5	25.7
	Network Service	Internet Backbone	76.9	1.4	20.1	0.0	0.0	1.6
		Subscriber Access Service	48.3	0.5	37.7	7.3	0.5	5.7
Internet Access & Management Service		24.8	41.0	14.2	3.5	1.2	15.3	
Internet Support	Technical Support	System Development	22.3	9.4	12.5	17.6	5.7	22.5
		Security Solution	30.4	6.6	13.0	7.0	2.3	40.7
		Commercial Transaction Solution	39.4	10.0	12.9	7.0	1.5	29.2
	Business Support	Consulting Service	23.9	38.8	12.1	6.3	4.9	14.0
		Transaction Support Service	47.2	21.1	2.2	15.0	9.7	19.8
		Marketing Service	28.8	8.7	19.9	3.2	2.0	37.4
Internet Application	Application Service	Application Service Providers	56.0	4.8	14.3	1.7	0.9	22.3
		Portal Service	52.8	4.9	17.0	2.4	1.2	21.7
		Value Added Communication Service	42.6	2.3	13.1	3.4	6.7	31.9
	Internet Content	Internet Media	9.8	36.3	7.1	15.2	7.5	24.1
		Entertainment	35.7	31.1	9.1	1.9	1.5	20.7
		Information Providing Service	36.3	8.3	10.5	9.8	11.2	23.9
	E-Comme rce	B2B(Business to Business)	46.7	6.7	8.6	17.8	6.4	15.8
		B2C(Business to Consumer)	32.9	14.6	14.2	6.5	3.6	28.2
All Internet Industries (share:%)			35.2	12.2	11.5	10.7	4.5	25.9
(employment)			144,038	49,961	46,967	4,3562	18,251	106,080

Source: Data set for this research was built from 3 handbooks¹⁾

milieu with strong cultural connotation, and prestige of initial location of high technological and venture firms and organizations in Gangnam may have induced additional attraction of Internet industries.

Also when we see major leading districts(Gu) of Internet industries by 3-digit level, we can recognize very meaningful aspects. Internet backbone, subscriber access service, and software for development industries are highly concentrated in a few districts, while network equipment, terminal equipment, and security solution industries are distributed more evenly. More Internet business-intensive and more application-innovated service firms tend to concentrate in Gangnam-gu. Gangnam's average share of total establishments in the Internet industry was about 35%, but certain three-digit level of Internet industries are highly concentrated into Gangnam, e.g.

software for development(81%), Internet backbone(77%), application service providers(56%), portal service(53%). Its existing concentration of those firms create a high level of demand for further advance in Internet infrastructure such as Internet backbone, and software for development industries. This, in turn, brings forth the supply, creating additional incentive for the kinds of activities that depend on these services. Similarly, Internet access and management service, consulting service, and Internet media industries are relatively concentrated in Yeongdeungpo-gu. The shares of those industries in Yeongdeungpo are three times higher than the average share(12%).

This study also tries to examine whether the advance of the Internet industry is likely to be clustered at specific places in Seoul. In order to explore the clustered pattern of the Internet industry, The small-

Table 7. Dongs with the share over 2% in the Internet industry in Seoul, 2001

(unit: %)

Dong	Industry	Internet Infrastructure			Internet Support		Internet Application			Internet Industry
		Hardware Industry	Software	Network Service	Technical Support	Business Support	Application Service	Internet Content	Electronic Commerce	
Gangnam/Seocho	Yeoksam-dong	6.8	11.9	15.6	11.4	14.5	17.5	10.9	6.0	10.8
	Seocho-dong	7.4	10.9	12.5	9.5	10.5	8.6	8.8	6.3	9.1
	Nonhyeon-dong	3.5	5.0	4.7	4.5	5.8	6.9	5.2	3.4	4.7
	Samseong-dong	3.6	4.4	1.6	4.7	10.5	5.2	4.3	4.3	4.6
	Yangjae-dong	6.0	5.1	5.5	4.4	1.6	4.0	2.4	3.4	4.0
	Daechi-dong	2.6	3.9	4.3	3.3	3.8	3.7	3.3	2.3	3.3
	Dogok-dong	2.4	2.5	2.0	1.9	1.2	2.9	2.0	1.6	2.1
	Bangbae-dong	2.9	2.6	2.7	2.8	1.8	2.3	2.6	2.4	2.6
	Sinsa-dong	1.6	1.7	2.3	1.9	3.0	1.4	3.4	2.5	2.3
Cheongdam-dong	0.8	0.9	2.3	1.0	1.0	1.1	1.5	0.9	1.1	
Jongno/Jung-gu	Jongno 1,2,3,4-dong	0.9	1.1	1.6	1.0	2.4	0.9	2.6	2.9	1.6
	Myeong-dong	0.5	0.5	0.8	0.7	2.8	1.1	1.8	1.4	1.1
Yeongdeungpo-gu	Yeouido-dong	5.7	7.6	3.5	8.5	9.3	6.3	4.7	3.1	6.3
Yongsan-gu	Hangangno 2-ga	2.2	0.6	0.8	0.6	0.6	0.0	0.3	3.7	1.0
	Hangangno 3-ga	2.1	0.7	0.8	0.5	0.2	0.3	0.9	2.7	1.0
Others	Guro-dong	5.7	1.8	0.8	2.0	1.4	2.6	0.8	1.9	1.9
	Gasan-dong	3.0	0.6	0.8	0.6	0.0	0.3	0.3	0.3	0.7
	Guui-dong	0.8	1.5	0.4	1.2	1.0	1.4	2.3	1.3	1.5
	Garak-dong	2.1	0.9	0.4	1.2	0.8	0.9	0.5	1.5	1.0
	Bongcheon-dong	0.8	1.6	0.4	1.4	1.0	2.0	1.4	0.8	1.3
Total		61.3	65.8	63.7	63.2	73.2	69.3	60.0	52.5	62.1

Note: Dongs with the share over 2.0% in 8 sub-categories of the Internet industries were extracted.

Source: Data set for this research was built from 3 handbooks¹⁾

est unit of administrative district, namely Dongs, which had over 2% in share of Internet industries and had above 2.0 in LQ(location quotients) were extracted among about 540 Dongs of Seoul. There were 20 Dongs over 2% in the share of Internet industries, 27 Dongs above 2.0 in LQ . Generally, Dongs extracted from the two methods coincide with each other, indicating the fact that the more Dong has in establishments, the higher Dong is in specialization.

The top 20 Dongs comprise 62.1% of total establishments in Internet industries as a whole(see Table 7). Especially, the top 20 Dongs contain 73% and 69% in Internet business support and Internet application industries, clearly representing these industries are clustered at specific places. The clustering of Internet industries was most strikingly occurred in two Dongs, namely Yeoksam-dong and Seocho-

dong which comprise 20% of Internet industry establishments in Seoul. These two top places are evenly developed in all sub-categories of Internet industries. Yeoksam-dong, especially, shares over 15% of total establishments in Internet application services, network services and business support industries with particularly high representation of LQ of 10.4, 9.3, and 8.6 in each. Thus, Yeoksam-dong is a leading place in the advance of Internet industries with innovation in technological development and business activities, inducing the development of clustering among these industries. Seocho-dong which comprises over 10% of network service, software, and business support industries with high figures of LQ, at 6.9, 6.0 and 5.8 respectively, forming another cluster in Internet industries(see Fig. 5).

The second ranked top place is Yeouido-dong

Table 8. Dongs with LQ above 2.0 in the Internet industry in Seoul, 2001

Dong		Industry	Internet Infrastructure			Internet Support		Internet Application		
			Hardware	Software	Network Service	Technical Support	Business Support	Application Service	Internet Content	Electronic Commerce
Gangnm/ Seocho	Yeoksam-dong		4.0	7.1	9.3	6.8	8.6	10.4	6.4	3.5
	Seocho-dong		4.1	6.0	6.9	5.3	5.8	4.8	4.9	3.5
	Nonhyeon-dong		3.2	4.6	4.3	4.2	5.3	6.4	4.8	3.2
	Samseong-dong		4.5	5.5	1.9	5.9	13.1	6.4	5.4	5.3
	Yangjae-dong		6.5	5.5	5.9	4.7	1.7	4.4	2.6	3.7
	Daechi-dong		3.2	4.7	5.3	4.1	4.6	4.6	4.1	2.8
	Dogok-dong		6.4	6.7	5.2	5.1	3.2	7.7	5.3	4.3
	Bangbae-dong		2.8	2.5	2.6	2.7	1.7	2.2	2.5	2.3
	Sinsa-dong		3.6	3.6	5.1	4.1	6.5	3.2	7.5	5.4
	Cheongdam-dong		1.9	2.1	5.4	2.4	2.3	2.7	3.5	2.0
Jung-gu	Myeong-dong					2.4		1.6		
	Sogong-dong					1.7		2.3		2.1
Yeongdeungpo-gu	Yeouido-dong		6.3	8.4	3.9	9.4	10.3	7.0	5.2	3.4
Yongsan-gu	Hangangno 1-ga		2.3							6.0
	Hangangno 2-ga		4.8		1.7					8.3
	Hangangno 3-ga		5.8	2.1	2.2			2.6		7.5
	Wonhyoro-dong		3.6		4.5			4.9		5.2
	Singye-dong		1.9							3.8
Others	Guro-dong		2.7							
	Gasam-dong		9.8	1.9	2.6	2.1				
	Guui-dong			1.9				1.7	2.8	1.6
	Sindaebang-dong		2.5	4.7	5.4	3.7		2.0	1.7	2.6
	Seongsu-dong 2ga		1.9		2.7					
	Sincheon-dong			2.8		3.0		1.7		3.8
	Mok-dong							1.7	2.1	
	Gayang-dong		2.6		2.5					
	Deungchon-dong		1.5					2.1		

Note: Dongs with LQ above 2.0 in 8 sub-categories of the Internet industries were extracted.

Source: Data set for this research was built from 3 handbooks¹⁾

with 6.3% share of total establishment in Internet industries. Yeouido-dong is highly developed in business support and technical support industries with high representation of L.Q. of 10.3 and 9.4 in each(see Fig. 5). Thus, Yeouido-dong is viewed as a cluster which is more specialized in Internet support industries.

The third ranked top places are Nonhyeon-dong, Samseong-dong, Yangjae-dong. Internet application industries and business support industries are highly developed in Nonhyeon-dong, while Samseong-dong has a high share of the business support industry at

10.5 % with 13.1 of L.Q., representing the top specialized place for this industry in Seoul. Yangjae-dong is relatively highly developed in the Internet infrastructure industry, especially the hardware industry.

Hangangno-dong, Wonhyoro-dong, and Singye-dong in Yongsan-gu have benefited from the existence of the Yongsan Electronic Land for the development of hardware and e-commerce industries. While, Guro-dong, which has been a typical place for traditional manufacturing district, is developed in the hardware industry(5.7%), benefiting from the establishment of the Seoul Digital Industrial Center²⁾

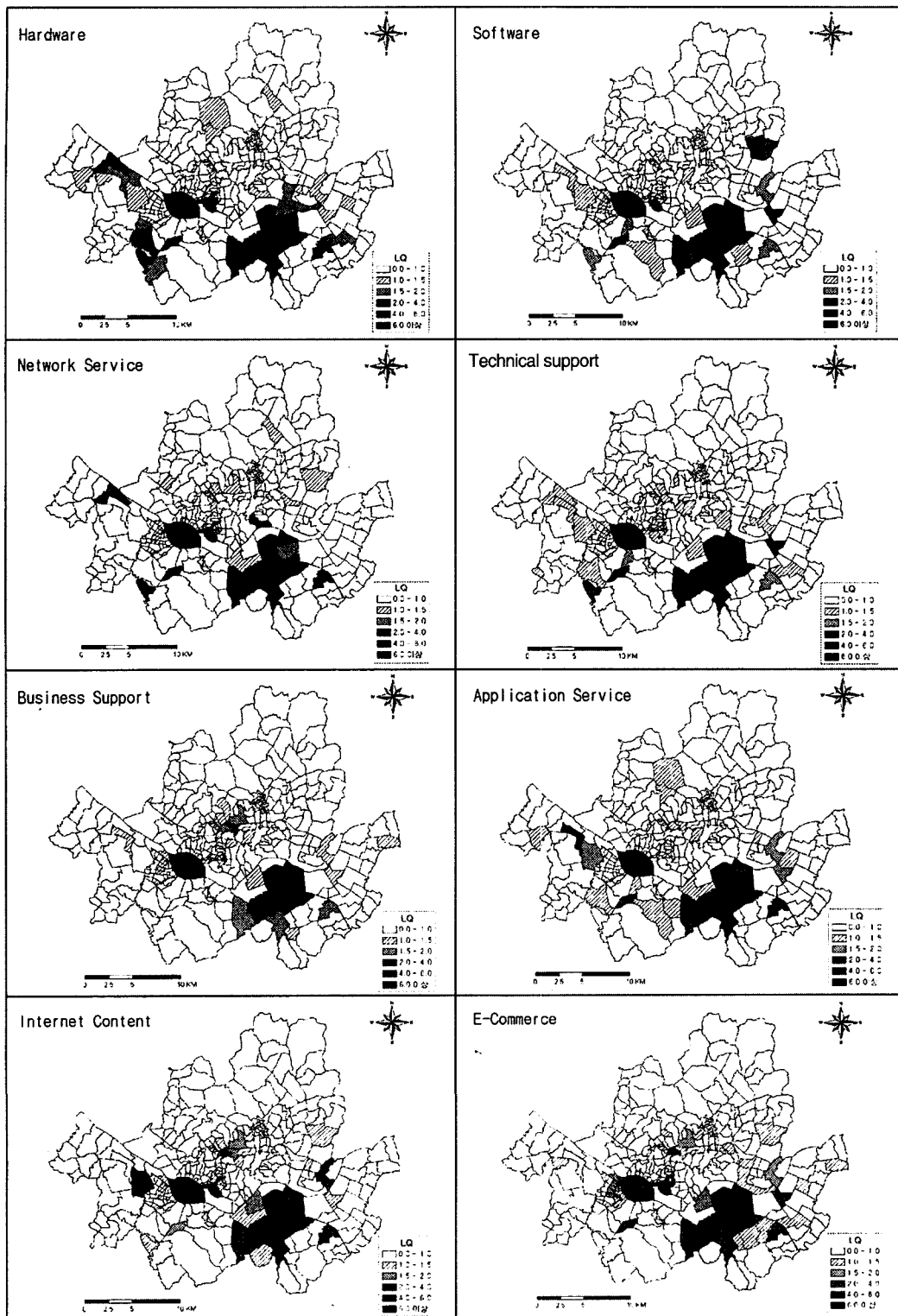


Fig. 5. LQ for 2 digits level of Internet industries by Dongs, 2001

which was found to boost technological venture enterprises. Gasan-dong in Geumcheon-gu is specialized in the hardware industry with high representation of LQ of 9.8.

However, Jongno 1,2,3,4-dong and Myeong-dong, which are located in the CBD, are relatively lowly developed in the Internet industries. Myeong-dong has 2.8% of share in the business support industry, and Jongno 1,2,3,4-dong has just over 2% in business support, Internet content and e-commerce industries. Therefore, only business related Internet industries are relatively developing in the CBD, staying out from a leading role in Seoul.

As explained above, Internet industries are highly clustered and specialized to specific places. The major clusters of Internet industries are Yeoksam-dong, Seocho-dong, Nonhyeon-dong, Samseong-dong, Yangjae-dong from the Gangnam area, and Yeouido-dong in Yeongdeungpo-gu. Thus, these six dongs are leading the advance of the Internet economy. The development of clusters is closely related to strong attractive locational factors such as a highly skilled labor force, a high level of entrepreneurship, the ease access to venture capital and Internet infrastructure, and the location of financial institutions and various business firms. Also the formation of clusters in Internet industries may be strongly affected by the localized networking from inter-related industries and institutions. For example, the location of the venture enterprises of manufacturing is strongly affecting the clusters of technical support, application service, and hardware industries in Guro-dong and Gasan-dong. Also, Hangangno-dong's development in hardware industries and e-commerce is closely related to the benefits arising from the location of the Yongsan Electronic Land, and also the development of the Internet content industry in Guui-dong has been affected by the location of Techno-Mart³⁾.

5. Conclusion and Policy Implications

The development of ICT and the wide expansion

of the Internet have made fundamental changes in Korea. Korea has been a leader in embracing the Internet-related economy in which major competitive advantages are coming from knowledge and the utilization of information. The emergence of the Internet economy in Korea coincided with the Financial Crisis. The innovation of ICT increases the development of its market and industries, and the competition of its market triggers a reduction in cost and an increase in capacity and quality, bringing about the emergence of the Internet economy as a cumulative causal process.

The development of the Internet industry has affected on the changes in spatial economic structure, since ICT driven economic growth requires a highly skilled labor force, well developed Internet infrastructure, a high level of innovate activities, and easy access to venture capital and technological information and so on. Because these conditions are unevenly distributed among regions, so are the effects of regional economic restructuring towards the Internet economy. Different regions undergo restructuring with varying degrees of difficulty in regional adjustment.

The most important finding from this study was the concentration of the Internet industry toward Seoul at the national level and toward the Gangnam area within Seoul. The spatial concentration of the production and employment that were generated by the emerging Internet economy has been remarkable. The development of the Internet industry has reinforced the functions of Seoul resulting in the highly centralized pattern. The emerging Internet economy thus derives innovative firms to concentrate to a primary city as it increases a gap in the development of the Internet industry among large metropolitan cities.

Especially, the regional distribution of the Internet support and the Internet application industries shows highly concentrated pattern, thereby exacerbating the unequal geography of job opportunity in those industries. Seoul comprised over 90% of employment in

business support industries and application service industries, indicating that Internet industries which are more depended upon innovations in technology and business activities, and upon specialized skill and expertise show over-concentrated patterns. Even, Busan, the second largest city in Korea, has been suffering from the shadow effect as Seoul has increased its dominance in the Internet economy. Seoul city which holds the economic, social, and cultural power of Korea has retained its paramount position in the development of the Internet industry, with even much faster growth and greater concentration in the Internet application industry.

At the intra-metropolitan level of Seoul, the development of the Internet industry mainly occurred in only a few places, affecting splintering effects in socio-spatial structure. Within Seoul metropolitan area, Internet industries are highly concentrated in the Gangnam area such as Yeoksam-dong, Seocho-dong, Nonhyeon-dong, Samseong-dong. The existence of business and social milieu with strong cultural connotation, and prestige of initial location of high technological and venture firms and organizations in this area may have induced additional attraction of Internet industries, especially more Internet business-intensive firms.

The Internet is the most recent manifestation of restructuring process and has allowed people and places to connect and interact in new ways, and in so doing has helped shape what Castells(1989, 1996) refers to as "the space of flows". This process, however, does not undermine the relevance of distance and places but provides the means for the reconstitution and reorganization of geographic concentrations within the economy. This study revealed that concentration and agglomeration were the most distinguished locational phenomena in the Internet industry at the national level and at the intra-metropolitan level in Korea. An advance in innovative and knowledge based Internet economy has reinforced a leading role of Seoul, and the rise of the Internet industry has added attractiveness to Seoul which

enjoys a kind of cumulative and circular advantages.

In the light of the result of this study, the Internet industry is not likely to disperse soon to the other regions, despite of the technological innovations in ICT and Internet which remove the friction of distance and reduce locational constraints. Spatial inequality relating to the geography of the Internet industry will not easily disappear in the near future, since the Internet does not facilitate mobility of services and skilled labor from Seoul to other regions. The existence of the cluster of corporate enterprise and small start-ups in Internet industries will itself result in the gravitation of skilled labour, agglomeration economies, venture capital and well-provided Internet infrastructure towards Seoul. It is therefore expected that Seoul is likely to benefit from future change and development in technological innovation in the Internet industry. On the other hand, The Internet industry as a whole in peripheral regions is operating in the very unfavorable context. The poor performance of the Internet industry in those regions is likely to continue to act as a constraint on the development of Internet related activities in the future, despite that the Internet sector seems to be the main source of future employment growth.

The Internet industry will clearly continue to have a key role in the Korean economy in the near future. In the point of the evolution of production system and value chains in Internet industries, interdependent and complementary functions of Internet industries will do more deterministic role in the performances of regional economic development. In an era of the Internet economy, regional economic growth would occur not only through exports but also through the creation and supply of effective demand in Internet related activities.

In Korea, the concentration of population and economic activities towards Seoul has been one of the unavoidable concerns to policy makers as well as planners from the viewpoints of more balanced regional development. Considered the result of this study, the absence of policies directed at enhancing

the Internet sector of peripheral regions, concentration tendency would continue to reinforce the Seoul's predominant position in the national urban system. Therefore, policy intervention is needed to ensure that spatial economic disparities should not be exacerbated by the development of the Internet economy. The policy should emphasize that the opportunities associated with the Internet economy be shared among regions in Korea. The desirable approach should pursue policies that focus upon ways of enabling less favored regions to make better use of new opportunities for the rise of the Internet industry. The provision of Internet infrastructure and Internet support activities to peripheral regions would lead not only to generate and retain endogenous development but also to attract Internet startups which drives the development of Internet application activities. Critical thought of the strategy to develop the Internet industry is the change from previous approached involving location incentives for the firms to new approach improving the local environment in favor of the Internet workforce and firms. The policy should also try to support the formation of social and cultural networks which is more important to the location decision of Internet firms, rather than physical inputs.

This study is only a starting point for a new perspective which asserts the role and the potential of the Internet industry for regional economic development. We need to analyze the differences of the locational patterns among the sub-category of Internet industries in detail, since Internet industries are heterogeneous and some industries are more important as revenue generators or attractors of more inter-linked industries than other. Also clear understanding of money flows among the Internet industries is needed. Further, there is a need to analyze what are the determinants for the location of Internet industries by two or three digit level and the relative performance of Internet industries among regions and how significant is their dependence upon Internet environment as the engine of growth.

Notes

- 1) Data set for this study was built by referencing Directory of the Korean Information Telecommunication Industry(2002), the Korean Software Industries Directory(2002), and Internet Membership Directory (2003), and the number of establishments for each year(1995-2001) was measured from the establishment year of each firm.
- 2) Seoul Digital Industrial Complex, previously the "Guro Industrial Complex", which is located in Guro-gu, is currently being reborn as a high-tech "Techno-Park". This complex would become a R&D, sophisticated info-tech industrial complex which houses a techno-park to foster venture companies.
- 3) Techno Mart which is located in Guui-dong is the largest complex distribution center in Seoul. It houses special stores of electronic and information communications as well as subsidiary facilities, such as a central center, convenience facilities, etc. It is well known as being the "Prime Venture Mecca" for clustering of over 160 IT venture firms, including R & D for software development and game research centers and so on.

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Appendix

Table A. The classification of the Internet industry in Korea

1-Digit	2-Digit	3-Digit	Internet Industries	
Internet Infrastructure Industry	Hardware	Terminal Equipment	computer, server, computer peripheral equipment, wireless telecommunication terminal, Internet phone, set top box, PDA(personal digital assistants), multimedia image equipment etc.	
		Network Equipment	switch, router, hub, LAN(local area network) equipment, wireless LAN equipment, cable modem, modem for subscriber, home network equipment, optical transmission equipment etc.	
	Software	Software for Development	operating system S/W, DBMS(database management system), content development S/W, web development tool, Web-page authorizing tool, game authoring Tool, Multimedia Authoring Tool etc.	
		Application Software	communication application S/W, communication network management S/W, Web-mail system S/W, file transmission S/W, mobile solution, messenger solution, education S/W etc.	
	Network Service	Internet Backbone	backbone network service, Internet line leasing service, circuit switching service, Internet Exchange(IX) service etc.	
		Subscriber Access Service	high-speed network service, ISP(Internet service provider), ADSL(asymmetric digital subscriber line), service based Internet connecting, cable access service, personal computer communication service etc.	
		Internet Access & Management Service	domain registration & management service, web hosting, server hosting, IDC(Internet data center), circuit switching service, ATM(asynchronous transfer mode) service, VPN(virtual private network) service, web agency etc.	
	Internet Support Industry	Technical Support	System Development	web-site construction service, homepage construction service, SI(system integration), system management, network integration, web design service, system development service etc.
			Security Solution	web-site security solution, virus vaccine development, data security solution, firewall solution, security solution, information protect service etc.
Commercial Transaction Solution			E-commerce solution, online shopping mall construction solution, authentication management solution, Internet charge solution etc.	
Business Support		Consulting Service	Internet consulting service, management consulting, legal advice service, IT firm management consulting, IT firm strategy & technology consulting, market research service, capacity analysis service, etc	
		Transaction Support Service	Internet banking, Internet trading support service, E-mail banking, Internet payment service, payment security service, electronic cash, credit scoring service, delivery service etc.	
		Marketing Service	Internet marketing, advertising & PR agency, Internet research service, market survey, research, electronic catalog delivery service, web marketing agency etc.	
Internet Application Industry	Application Service	Application Service Providers	application program development & leasing service, ASP(application service providers), online program leasing service etc.	
		Portal Service	portal service, wireless portal service, information retrieval service, community portal, search engine provider, Internet-site ranking service, commodity-price providing service etc.	
		Value Added Communication Service	Internet phone service, VoIP(voice over Internet protocol) service, multimedia chatting service, video conference service etc.	
	Internet Content	Internet Media	digital broadcasting, digital newspaper, digital magazine, web-zine etc.	
		Entertainment	digital cinema, digital music, online game etc.	
	Electronic Commerce	Information Providing Service	special information service providers (living, education, medical information, arts, culture, etc.)	
		B2B(Business to Business)	B2B, Internet trading, Internet trading agency	
	B2C(Business to Consumer)	online shopping mall, online bookstore, online auction, online seller, E-market place		