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Development of ICT Indicators in Korea

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Abstract

Digital economy has emerged and a transition to the knowledge-based economy has occurred in Korea. In response to the new socioeconomic changes, Korea continues to develop ICT indicators as follows: (1) ICT infrastructure such as PC, mobile phone, Internet; (2) ICT access and use in households and enterprises; (3) E-commerce (B to C and B to B) sales and its proportion in business transactions; (4) Growth and productivity of ICT industry (ICT sector and content sector); and (5) Digital divide of households. Major results of ICT statistics are delineated.

1. Introduction

Digital economy has emerged in Korea. ICTs and Internet are helping firms and individuals to move their supply networks and sales channels online and participating in new online marketplaces. The vitality of the digital economy is grounded in that ICT producing industries play a leading role in economic growth of Korea. Furthermore, Korean government, as an effort to facilitate the advance of knowledge-based economy, is trying to make the traditional industries more knowledge-intensive and to foster future-oriented 4T new industries, such as ICT, ET, BT, NT. Thus, statistical offices are experiencing a growing demand for statistics on knowledge-information economy and society.

ICT, in particular, is recognized to play two roles in the economic growth process, first by contributing to the increase in overall investment, secondly by contributing to MFP (multi-factor productivity) growth (Pilat and Lee, 2001). Advances in ICTs and penetration of Internet use are exerting a revolutionary impact on individuals, business processes, prices, economic growth, productivity, employment, etc.

As an attempt to measure new changes of knowledge and information society, researchers and private institutes in Korea are developing diverse ICT-related composite indexes, such as informatization index, information culture index, information use index, information welfare index, knowledge-information production index, digitalization index, etc. This paper, however, focuses on how government agencies led by Korea National Statistical Office (KNSO) develop ICT indicators and make improvements in ICT statistics. The followings describe efforts and plans to produce ICT statistics, and summarize major statistical methods and results of ICT indicators.

2. Development of ICT Indicators

(1) ICT Infrastructure

As the first thing that should be done for the establishment of information infrastructure is 'the use of Internet as a universal service', basic indicators of ICT infrastructure are examined in terms of PCs, mobile phone subscribers, Internet users, Internet hosts, and Internet Service Providers (ISPs). In Korea, the number of PCs increased from 6,931 thousands units (15.0 units per 100 persons) in end-1997 to

11,530 thousands (24.6 units per 100 persons) in end-Dec. 1999, showing an annual growth rate of 29.4% and indicating that people have a better opportunity to use PCs.

In the telecommunications area, the number of mobile phone subscribers increased from 6,910 thousands persons (15 out of every 100 persons) in 1997 to 26,107 thousands (55.2 out of every 100 persons) in March 2000, at the annual growth rate of 59.1%. In the meantime, the subscribers to wired phones numbered 21,480 thousands (45.0 out of every 100 persons) as of March 2000, showing that the demand for mobile phones has outrun that for wired phones. This development means an expanded opportunity to exchange information beyond the limit of space.

With regard to Internet use, Korea Internet Information Center defines "Internet user" as 'a person aged 7 years and over who uses Internet once or more per month regularly. The Center conducts a survey four times or more every year to estimate the number of Internet users in Korea. The number of Internet users, which was 1,634 thousands persons (4 out of every 100 persons aged 7 years and over) in 1997 increased by annual growth rate of 136.2% to 22,230 thousands (52 out of every 100 persons aged 7 years and over) in March 2001. Furthermore, the number of high-speed Internet subscriber recorded 590 thousands in May 2001, and expect to reach 700 thousands (one out of two households) at the end of this year (MIC, 2001).

The number of Internet hosts is a typical indicator that shows the quantitative expansion of the Internet use. This indicator refers to the number of computers which are connected to Internet and have an IP address and whose name is registered on the name server. The Internet hosts in Korea, which numbered 131 thousands units (2.8 units per 1,000 persons) in 1997, increased by annual growth rate of 60.9% to 484 thousands (10.2 units per 1,000 persons) in July 2000.

The number of ISPs (Internet Service Providers), which mean businesses providing Internet access services for individual and institutional users, rose by annual growth rate of 59.5% from 23 in 1997 to 89 in 2001. As the domestic wireless Internet users have increased, more than 300 CPs (Contents Providers) are offering over 8,000 types of contents in December, 2000, 90 percent of the 300 CPs are also offering contents on wired internet (NCA, 2001).

<Table 1> Indicators of ICT infrastructure

	1997	1998	1999	2000	2001	Annual Growth
PCs owned per 100 persons	15.0	17.8	24.6	-	-	29.4
Mobile phone subscribers per 100 persons	15.0	30.2	50.0	55.2	-	59.1
Internet users aged 7 years and over per 100 persons	4.0	7.5	25.9	45.0	52.0	136.2
Internet hosts per 1,000 persons	2.8	4.4	9.8	10.2	-	60.9
ISPs (unit)	23	25	54	83	89	59.5

Sources: 1) http://stat.nic.or.kr for data on Internet (Korea Network Information Center, 2001).
2) National informatization White Paper and Informatization Statistics Yearbook for data on the number of PCs and mobile phone subscribers (National Computerization Agency, 2001).
3) Population Projection for data on population (KNSO, 1996).

(2) ICT Access

Easy access to computers, Internet, and cyber network is crucial to the growth and development of the digital economy, and paves the groundwork for a digital economy. The penetration rate of computers and Internet and the ability to use them indicate the level of informatization of the society. For the purpose of measuring informatization level of individuals in households, computer ownership per household, the

ability to use computers and Internet, hours spent for use of computers and Internet, PC communications subscription, and hours spent on PC communications are examined. Meanwhile, the degree of PC availability, the access to the Internet, and the extent of network setup are considered as the indicators of ICT access in enterprises.

1) ICT Access in Households by individuals

With a view to measure the degree of access to ICT in households by individuals, KNSO conducted the Social Statistical Survey among 30 thousands sample households across the nation in 1997 and 2000. The Survey contained the following items:

- ownership of computers and other ICT equipment (TV, telephone, PC, fax, etc.) per household
- ownership of telecommunications devices (mobile phone, pager, etc), per person
- ability to use computers and hours spent on computers, per person
- internet subscription per household
- ability to use Internet and hours spent on Internet, per person
- ownership of e-mail account and hours spent on e-mail, per person
- PC communications subscription and hours consumed for PC communications
- use of PC cafe and hours spent in PC cafe, per person.

The survey results reveal that computer ownership by household rose from 29% in 1997 to 46.4% in 2000, and computer literacy rate among people aged 6 years and over also soared from 39.9% in 1997 to 51.6% in 2000. The hours spent on computer per week averaged 5.9 hours in 1997 and 17.2 hours in 2000, increasing by 11.3 hours over the period. In terms of the main purposes of computer use, PC communications and Internet access accounted for 7.9% in 1997 and 40.4% in 2000. The hours spent by computer users on PC communications and Internet access per week also increased from 4.2 hours in 1997 to 10.4 hours in 2000. These figures all show that there has been a rapid progress in household digitization.

<Table 2> ICT access and opportunity of individuals and households

	Proportions Of households with Computers (%)	PC literacy rate of aged 6 years and more (%)	Hours spent on computer use per week (hours)	Individuals whose purpose of computer use is PC comm. & Internet (%)	Hours spent on PC communication & Internet per week (hours)
Apr. 1997	29.0	39.9	5.9	7.9	4.2
July. 2000	46.4	51.6	17.2	40.4	10.4
Increase	17.4%p	11.7%p	11.3 hrs	32.5%p	6.2 hrs

Source: *2000 Social Statistical Survey* (KNSO, 2001)

The 2000 Population and Housing Census also contained additional survey questions on ICT access and use. In the process of the Census of which the reference date is Nov. 1, 2000, a 10% sample (1.5 million households) of the total population were interviewed for the survey. The survey questions concerned:

- ownership of ICT equipment (PC, telephone, fax, satellite dish, PP (program provider) service or cable TV or Internet line (ISDN or ADSL)) by household; and
- PC use, Internet use, and ownership of mobile communications equipment (mobile phone, wireless pager, etc.) by individual.

The census results, which are expected to be available by the end of this year, may be used to analyze the ICT access and use in various aspects.

2) ICT Access in Enterprises

MIC (Ministry of Information and Communication) and NCA (National Computerization Agency), a subsidiary organization of the Ministry has conducted an annual survey on digitalization in entrrpises since 1998. Interviews were made for a total 2,178 companies with 5 employees and over.

According to the survey results, a total of 4,033 thousands units of computers (14.7 units per establishment) were placed in 274 thousands private companies as of July 2000. This is an increase of 3.6 units per establishment from the year 1999 when 3,151 thousands of PCs were owned by 284 thousands companies (11.1 units per company). The rate of private companies that can access to Internet also rose from 73.9% in August 1999 to 87.4% in July 2000. Besides, the rate of intranet/group ware setup increased from 18% to 20% over the period. These survey results are a clear indication that the digitization in enterprises is moving fast forward.

<Table 3> ICT access of business

	August 1999	July 2000	Increase
PCs owned per company (unit)	11.1	14.7	3.6 units
Proportion of company with Internet access (%)	73.9	87.4	13.5%p
Rate of Intranet/group ware setup per company (%)	18	20	2%p

Note: Includes companies with 5 employees and over.
Source: Digitalization Statistical Survey (National Computerization Agency, 2000)

ICT utilization at the establishment level plays an important role in spreading information and knowledge, and thus enhances innovation and economic growth. In this view, KNSO has added questions on ICT utilization to the Knowledge-based Industry Survey in order to estimate the extent of ICT utilization by industry. The survey was administered this year for the first time for most service sectors except wholesale and retail trade. The survey results will be available by the end of this year. The following shows a list of survey items on ICT use:

- PCs connected to Internet;
- ICT workforce;
- ICT investment;
- barriers to the use of ICT;
- computerizing equipment and devices (large server, medium-sized server, workstation, PC server, PC and peripheral devices)

(2) E-commerce

The surveys on e-commerce need to cover Business-to-Consumer (B2C), Business-to-Business (B2B), Business-to-Government (B2G) to identify the status of e-commerce among different economic entities such as households, businesses and the government. B2C, B2B and B2G, however, constitute separate surveys, as the three sectors require different scopes of survey coverage and show different development stages in e-commerce. KNSO began B2C survey and B2B survey in 2000 and B2G survey in 2001. Each survey measures the type of e-commerce, the amount of e-commerce sales/purchases, and the number of business establishments involved.

1) Survey on Business to Customer (B to C) E-commerce

Cyber shopping malls are the predominant sites for B to C electronic transactions. KNSO has carried out monthly surveys among cyber shopping malls since April 2000, in order to get a clear picture of B to C e-commerce. Major survey questions are shown below:

- number of employees
- amount of revenues (sales amount, advertising income, commissions received, etc.)
- type of shopping mall
- cost of business operation
- composition of consumer prices (cost of sales, delivery charges, settlement fees, etc.)
- composition of buyers (industrial users, ordinary consumers, intermediary distributors)
- E-commerce support system (for delivery, payment settlement, security, etc.)
- plans or measures to stimulate e-commerce

According to the results of the second quarter of 2001 survey, the total number of cyber shopping mall businesses was 1,998 and the sales combined amounted to KRW 790 billion. Out of the total sales, B2C accounted for KRW 588 billion, which took up 1.7% of the sales in the retail trade. The ratio of B2C e-commerce to the retail trade shows a steady rise from 0.9% in the second quarter of 2000. The monthly average B2C sales also jumped to KRW 196 billion in the 1st quarter of 2001 from KRW 98 billion in the 2nd quarter of 2000 with a quarterly growth rate of 19.4%. This rapid growth in e-commerce will surely bring profound changes to the existing market structure and transaction types.

<Table 4> B to C (cyber shopping malls) survey results

	2nd qtr, 2000	3rd qtr, 2000	4th qtr, 2000	1st qtr, 2001	2nd qtr, 2001	Quarterly Growth(%)
No. of establishments (Unit)	1,708	1,832	1,866	1,915	1,998	4.0
Sales (KRW billion)						
- Cyber mall sales	397	476	666	708	790	19.4
- B to C sales	294	356	489	525	588	19.5
- (B to C sales monthly average)	(98)	(119)	(163)	(175)	(196)	19.4
Proportion of B to C in retails(%)	0.9	1.1	1.5	1.6	1.7	-

Source: Cyber Shopping Malls Survey (KNSO, 2001)

2) Survey on Business to Business (B to B) E-commerce

The quarterly survey on B to B e-commerce has been conducted since the 1st quarter of 2000. The survey was based on the KSE (Korea Stock Exchange)-listed enterprises(both large and SMEs), KOSDAQ-listed enterprises (venture firms) and public corporations. The survey items, designed to understand B2B e-commerce, are shown below:

- total sales, and breakdown of sales by product
- cost of business operation
- amount of purchases
- transaction means
- delivery means
- payment means, etc.

The B2B survey results show that e-commerce reached KRW 71,710 billion in 2000, in which B2B accounted a total KRW 66,479 billion (92.7%), B2C took up KRW 734 billion (1.0%), and oversea exports amounted KRW 4,449 billion (6.2%). Out of the total B2B purchases, 78.2% were Internet-based and the remaining 21.8% were based on non-Internet channels, such as VAN and EDI. The proportion of Internet-based purchases in the total e-commerce purchases is on the rise from 67.9% in the 1st quarter of 2000 to 86.7% in the 1st quarter of 2001. In 2000, the amount of electronic transactions accounted for 5.2% of the total business transactions done by Korean firms, and the manufacturing sector accounted for 85.4% of the total electronic transactions.

<Table 5> B to B survey results

	1st qtr, 2000	2nd qtr, 2000	3rd qtr, 2000	4th qtr, 2000	2000	1st qtr, 2001	Quarterly Growth (%)
E-commerce transaction amount (purchases, KRW billion)	13,365	15,845	18,074	19,195	66,479	19,785	10.5
Internet-based purchase(%)	67.9	72.6	78.0	81.9	78.2	86.7	
Non-Internet-based purchase(%)	32.1	27.4	22.0	18.1	21.8	13.3	
Proportion of e-transactions in the whole business transactions (%)	-	-	-	-	5.2		

Source: Survey on B2B E-commerce (KNSO, 2001)

3) Survey on Business to Government (B to G) E-commerce

The quarterly survey on B to G e-commerce has been conducted since the 1st quarter of 2001. The total transaction was KRW 716 billion for the 1st quarter. Out of total transactions, purchase accounted for KRW 635 billion (88.7%), and construction contracted accounted for KRW 81 billion (11.3%). The major survey items are as follows:

- numbers and amount of purchase by types of goods
- numbers and amount of contract by types of construction
- Current situation of e-commerce
- Plans of e-commerce

(4) ICT Industry

ICT industry played a leading role for the economic growth of Korea. According to summary indicators of ICT production in OECD economies, Korea recorded the first rank in share of ICT producers in business sector value added in 1998, and the second in GDP per capital growth during 1990-99, trend adjusted (Pilat and Lee, 2001). Another international comparison as presented in Table 6 also shows that ICT industry of Korea was very important in value-added, R&D, export, import and trade.

<Table 6> International comparison of contribution index of ICT industry to economy, 1997

	Employment	Value-added	R&D	Export	Import	Trade
Korea	64.1	123.0	107.6	143.4	109.7	127.0
Japan	87.2	66.6	106.3	157.9	82.3	120.7
U.S.A	100	100	100	100	100	100

Note: Data are for the reference year 1997.
Source: Measuring the ICT sector (OECD, 2000).

ICT industry grew further recently. The annual growth rate of value added in ICT industry recorded 23.9% over the 1991~99 period, which far surpassed the average economic growth rate of 5.9%. In the 1st half of 2000, the growth rate of ICT industry was 41.2% and the contribution rate of ICT to economic growth jumped up to as much as 45.9% (Bank of Korea, 2000).

Recognizing the importance of ICT industry in Korean economy, KNSO started a comprehensive survey on ICT in 1998. The survey covers manufacturing of ICT equipment, software development, telecommunications services and ICT construction. For the reference year 1999, the information content sector such as printing and publishing, video and music recording

were added to the scope of ICT industry survey. For classifications of "ICT sector" and "content sector", there is a slight difference between KNSO(2000) and OECD(2000b; 2001). The following are major survey items:

- number of ICT businesses related to computer, semiconductor, telecommunications equipment or other types of ICT;
- number of companies related to hardware or software of telecommunications services;
- structural organization of the ICT-related companies;
- number of ICT workers and their annual wages;
- production volume, sales, costs and values added of the ICT-related companies;
- size of facility investments and tangible/intangible fixed assets of the companies;
- R&D investment and export/import

The survey results show that, in 1999, the number of ICT (ITT) establishments grew by 7.5% to 30,596; the number of employees of the ICT companies also increased by 6.5% to 552,121 persons; and value added grew by 25.7% to KRW 54,246 billion. In a comparison of the ICT and the entire industry over the 1998-1999 period, the proportion of ICT companies grew from 1.02% to 1.05%; the ICT workers increased from 2.4% to 2.5% of economically active population; and the value added in the ICT industry also rose from 9.7% to 11.2% of GDP. In addition, the value added in ICT recorded a 25.7% growth rate, while the GDP of the entire industry rose by 8.6%, clearly indicating that ICT made substantial contribution to economic growth.

<Table 7> Information and telecommunications technology Industry statistics

	ITT Industries			All Industries			% of ITT in All Industries		
	No. of companies	No. of employees	Value added (KRWb)	No. of companies	EAP**	GDP (KRW b*)	No. of companies	No. of employees	Value Added
1998	28,456	518,276	43,166	2,785,659	21,654	444,367	1.02	2.4	9.7
1999	30,596	552,121	54,246	2,927,330	21,750	482,744	1.05	2.5	11.2
Increase (%)	7.5	6.5	25.7	5.1	0.4	8.6	-	-	-

Notes: 1) *KRWb = KRW billion
2)** Economically active population (in 1,000 persons)
3) The definition of ITT (Information and telecommunication technology) industry is rather different from those of ICT sector of OECD.
4) ITT industry includes establishments with 5 and more workers, but all industries includes all establishments with one and above so that the proportion of ITT in all industries is under-estimated. There is a difference in statistical approaches between the value-added of ITT industries and GDP of all industries.

Sources: 1) Information and Telecommunications Survey (KNSO, 2000)
2) National Accounts (Bank of Korea, 2001)
3) Economically Active Population Survey (KNSO, 2001)
4) Census on Basic Characteristics of Establishments (KNSO, 1999; 2000)

(5) Digital Divide

The progress of digitalization has brought the country a widening digital divide among sub groups of individuals and enterprises, just like in advanced countries. Therefore, the policy concerns are as follows: (a) How big is the divide, how rapidly is it changing, and in what directions?; (b) To what extent are different social, cultural, business and spatial characteristics important?; and (c) How can we improve the common information base on the digital divide, etc.

Different levels of ICT access and use in households by individuals can be measured to some extent by the Social Statistical Survey and the 2000 Population Housing Census. However, these surveys did not include details on digital divide so that KNSO conducted comprehensive Computer and Internet Use Survey in March 2000, and will continue the survey every year for in-depth analysis. Some of 22 survey items included are as follows:

- PC or peripherals owned
- money spent on S/W purchase or PC equipment etc.
- ownership communications equipment or lines
- plan to purchase a computer;
- education/training on computer skills; ability to use computers
- use of Internet.

The results of the survey will be analyzed by the end of this year and help us have a better understanding of the ICT usage. Using this Survey, KNSO plans to analyze digital divide by sex, age, education, income, region, and occupation. As the survey included various items of ICT access, it will be very useful data for measuring digital divide issues such as, the mechanism of digital divide and the effects of digital divide on income distribution, etc.

3. Conclusion

The ICT indicators in Korea cover basic items on digital intensity in households and enterprises as well as economic performance of ICT industries. In order to produce statistics about the impacts of ICT, however, we need to collect productivity-related data, such as intangible assets and value-added especially in service industries and ICT-using industries. For household surveys, in-depth analysis can be attempted in order to examine the impact of ICT on income distribution. Most of all, for a better international comparison of ICT statistics, consensus should be made on definition and classification, especially in e-commerce, ICT sector, the content sector, ICT-producing industry, ICT-using industry, and ICT commodities.

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