Chapter 1

Feature:
Stirrings of u-Japan

Introduction

Four years have passed since the Japanese government enacted the IT Basic Law for promoting intensive and prompt formation of an advanced information and telecommunications network society. During this course, the e-Japan Strategy intended for making Japan "the world's most advanced IT nation by 2005" was launched in January 2001. While introduction of broadband was first considered to make a slow start, the infrastructure was developed at an unexpected speed, and Japan has come to boast the world's most affordable and high-speed broadband environment.

In light of such steady progress of broadband diffusion, the IT Strategy Headquarters reviewed the e-Japan Strategy in July 2003. In this process, the headquarters drastically shifted the focus from original infrastructure development to promotion of IT use, and positioned formation of a ubiquitous network society as the goal of the infrastructure development for a new IT society.

In response, with the aim of achieving a ubiquitous network society (u-Japan)—a society that allows connection to networks "anytime, anywhere, by anything and anyone" and enables an easy exchange of information—by 2010, the Ministry of Internal Affairs and Communications (MIC) outlined the future of such a society and summarized the necessary policies as the u-Japan Policy. While the e-Japan Strategy had aimed at catching up with other countries by making Japan "the world's most advanced IT nation by 2005," the u-Japan Policy sets a new goal to have Japan lead the world as a frontrunner by 2010.

Against such a background, this year's white paper features "Stirrings of u-Japan" and analyzes the current status toward achieving u-Japan in 2010. At the same time, it intends to clarify the progress in ICT use by individuals and companies since the launch of the e-Japan Strategy. Furthermore, international comparison was made with the United States (a country advanced in ICT use) and the Republic of Korea (a country making rapid growth in the ICT field) as much as possible.

"IT" and "ICT" are English terms used for information and communications technology including the Internet and mobile phones; the former is widely used in Japan at present, but the latter is widely established overseas such as in Europe, Latin America, Asia, as well as the United Nations and other international organizations.

Since the most important concept in the targeted ubiquitous network society is to achieve enhanced communications, the MIC basically uses the term "ICT" in this document in order to further clarify the significance of communications in the technology.

Section 1

Use of Ubiquitous Networks by Individuals and Companies

1 u-Japan

"u-Japan" is what Japan will be like in 2010 when information and communications technology (ICT) will be applied toward resolving various problems in society. It is based on four principles: ubiquitous (connects everyone and everything); universal (can be easily used by the elderly, etc.); user-oriented (based on users' viewpoints); and unique (creative and vigorous). Among these, "ubiquitous" plays the key role. Ubiquitous networks are characterized by the realization of easy "person-to-person" plus "person-to-goods" and "goods-to-goods" communications **(Figure 1-1-1)**. They allow easy connection to networks "anytime, anywhere, by anything and anyone" by attaching small, low-priced devices to all kinds of things in all kinds of places. As a result, ICT will penetrate every corner of daily life like grassroots.

On the other hand, new problems will arise in the process of achieving u-Japan. For example, if individuals' purchase history and activity history become easily accessible through networks, there would be a risk of leakage or misuse of such personal information. In addition, if various devices at home become connected to networks, these devices would also become subject to virus infections and unauthorized access.

In order to overcome these problems and to achieve u-Japan in an ideal way, the MIC established the Policy Roundtable for Realizing a Ubiquitous Network Society in March 2004 and compiled the "u-Japan Policy" in December of the same year.

2 People's expectations for ubiquitous networks

Users were asked what special expectations they had of the various benefits of ubiquitous networks. The top answer was a "safer and more secure life" at 55.7%, followed by "greater convenience" at 42.2%, "quicker response to disasters" at 27.4%, and "safer and more pleasant to drive and/or walk" at 22.3%. The result indicates that user expectations are particularly high for matters related to safety and security **(Figure 1-1-2)**.

3. Trend in corporate use of ubiquitous networks

Corporate use of radio frequency identification (RFID) tags, contactless smart cards, and new network-compatible devices (ubiquitous network tools) are making notable progress.

Figure 1-1-1 The u-Japan concept
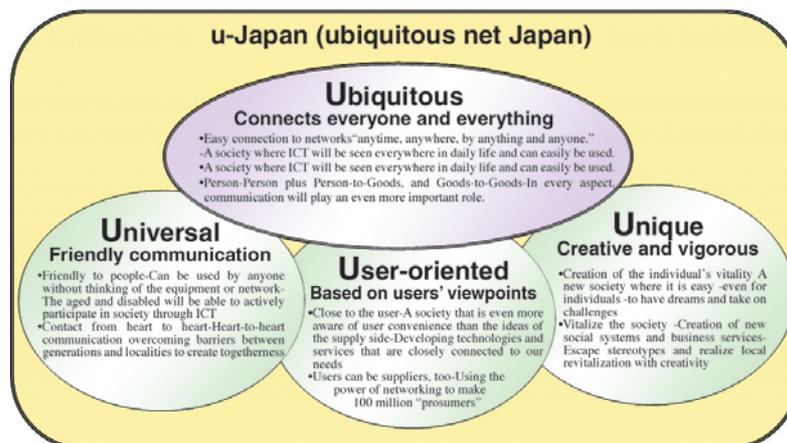
Produced from MIC, Final Report of the Policy Roundtable for Realizing a Ubiquitous Network Society

(1) Introduction of ubiquitous network tools in intra-corporate/inter-corporate operations

Comparing the status of the introduction of ubiquitous network tools in intra-corporate/inter-corporate operations between FY 2003 and FY 2004, the percentage of companies that answered "already introduced" increased by 4.4 points for RFID tags and 9.2 points for contactless smart cards, while the percentage of companies that answered "introduction under consideration (including 'introduction scheduled')" increased by 15.3 points for RFID tags and 17.2 points for contactless smart cards. This suggests that the introduction of ubiquitous network tools has progressed and that more companies have come to consider introducing them **(Figure 1-1-3)**.

(2) Offer of general consumer products and services using ubiquitous network tools

Comparing the status of offer of general consumer products and services using ubiquitous network tools between FY 2003 and FY 2004, the percentage of companies that answered "already offered" increased by 4.3 points for RFID tags and 4.5 points for contactless smart cards, while the percentage of companies that answered "offer under consideration (including 'offer scheduled')" increased by 6.4 points for RFID tags and 7.7 points for contactless smart cards. The result indicates that more companies have come to consider offering products and services using ubiquitous network tools in line with the increased offer of such products and services **(Figure 1-1-4)**.

Figure 1-1-2 Benefits expected in ubiquitous networks (multiple responses possible)

Benefit	%
Safer and more secure life	55.7
Greater convenience	42.2
Quicker response to disasters	27.4
Safer and more pleasant to drive and/or walk	22.3
Improved disaster prevention/prediction	19.5
Safer and more secure food	17.6
Friendlier society for the more vulnerable among us, such as the elderly	17.6
Easier health maintenance/control	15.5
Increased use of contents (videos, music, etc.)	14.8
More diverse working styles	12.1
Increased focus on user needs	10.8
Reduced environmental load	9.9
More empowered individuals (more vitality)	8.2
Other	0.5

Source: Survey on Trends Concerning a Ubiquitous Network Society (Web survey)

Figure 1-1-3 Introduction of ubiquitous network tools in intra-corporate/inter-corporate operations

RFID tags

	Already introduced	Introduction scheduled	Introduction under consideration
FY 2003	0.2	3.8	
FY 2004	4.6	5.5	13.6

Contactless smart cards

	Already introduced	Introduction scheduled	Introduction under consideration
FY 2003	3.9	4.0	
FY 2004	13.1	5.7	15.5

New network-compatible devices

	Already introduced	Introduction scheduled	Introduction under consideration
FY 2004	6.1	4.7	15.8

Positioning functions such as GPS

	Already introduced	Introduction scheduled	Introduction under consideration
FY 2004	4.1	5.2	12.5

■ Already introduced
□ Introduction scheduled
□ Introduction under consideration

Source: Survey on the Status of Corporate Use of ICT (Web survey)

Figure 1-1-4 Offer of general consumer products and services using ubiquitous tools

RFID tags

	Already offered	Offer scheduled	Offer under consideration
FY 2003	0.8	6.2	
FY 2004	5.1	4.1	8.5

0　10　20　30 (%)

Contactless smart cards

FY 2003	1.6	7.2	
FY 2004	6.1	4.2	10.7

0　10　20　30 (%)

New network-compatible devices

FY 2004	4.2	3.5	10.3

0　10　20　30 (%)

Positioning functions such as GPS

FY 2004	3.4	4.6	7.9

0　10　20　30 (%)

- ■ Already offered
- □ Offer scheduled
- ■ Offer under consideration
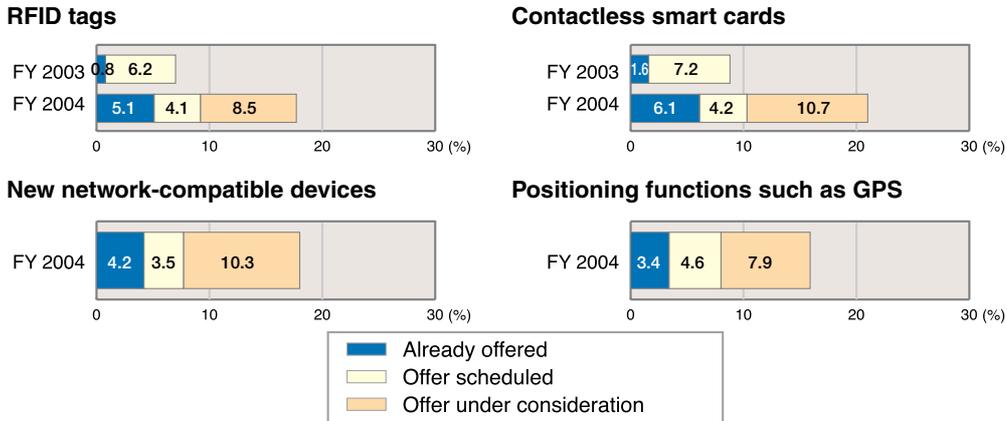
Source: Survey on the Status of Corporate Use of ICT (Web survey)

Figure 1-1-5 Introduction of ubiquitous network tools

RFID tags

Intra-corporate/inter-corporate operations

(%) 40　30　20　10　0

Japan	13.6	5.5	4.6
USA	11.1	6.9	9.4
ROK	10.7	9.5	9.0

General consumer products and services

0　10　20　30　40 (%)

Japan	5.1	4.1	8.5
USA	7.0	4.6	5.8
ROK	5.3	3.4	12.1

Contactless smart cards

Intra-corporate/inter-corporate operations

(%) 40　30　20　10　0

Japan	15.5	5.7	13.1
USA	5.0	3.0	5.9
ROK	10.8	6.7	10.0

General consumer products and services

0　10　20　30　40 (%)

Japan	6.1	4.2	10.7
USA	3.5	2.3	3.4
ROK	9.3	5.2	11.1

New network-compatible devices

Intra-corporate/inter-corporate operations

(%) 40　30　20　10　0

Japan	15.8	4.7	6.1
USA	8.5	4.0	18.5
ROK	13.0	6.8	4.7

General consumer products and services

0　10　20　30　40 (%)

Japan	4.2	3.5	10.3
USA	5.3	3.0	2.9
ROK	2.8	5.0	12.3

Positioning functions such as GPS

Intra-corporate/inter-corporate operations

(%) 40　30　20　10　0

Japan	12.5	5.2	4.1
USA	8.2	4.6	10.6
ROK	10.2	6.4	4.4

General consumer products and services

0　10　20　30　40 (%)

Japan	3.4	4.6	7.9
USA	6.9	2.1	4.6
ROK	2.7	5.2	10.0

- ■ Already introduced/offered
- □ Introduction scheduled/offer scheduled
- ■ Introduction under consideration/offer under consideration

Source: Survey on the Status of Corporate Use of ICT (Web survey)

(3) Comparison among Japan, the United States, and the Republic of Korea concerning the trend in corporate use of ubiquitous networks

The percentage of companies that have "already introduced" ubiquitous network tools in intra-corporate/inter-corporate operations was high in Japan for contactless smart cards and high in the United States for the other tools. Meanwhile, the percentage including companies that are "scheduled or considering introduction" was high in Japan for contactless smart cards, high in the Republic of Korea for RFID tags, and high in the United States for the other tools.

The percentage of companies that "already offer" products and/or services using ubiquitous network tools was high in the Republic of Korea for contactless smart cards and high in the United States for the other tools. Meanwhile, the percentage including companies that are "scheduled or considering offering" was high in the Republic of Korea for all tools, followed by Japan **(Figure 1-1-5)**.

4. Example use of ubiquitous networks

(1) Services provided through mobile phones with contactless smart card technology

While the functions of mobile phone terminals are becoming more and more advanced, such as the Internet access function and the camera function, various services provided through mobile phone terminals with contactless smart card technology were launched in July 2004 **(Figure 1-1-6)**.

The users of mobile phones with contactless smart card technology (379 persons) were surveyed with regards to the services they use, the degree of satisfaction with the services, and the intent to continue using the services. The most frequently used service was "electronic money settlements" at an overwhelming 76.5%, followed by "membership cards, reward cards, etc." at 33.2% **(Figure 1-1-7)**.

With regard to the degree of user satisfaction for the services, 34.0% answered "very satisfied/satisfied," which exceeded the 11.6% who answered "very dissatisfied/somewhat dissatisfied" **(Figure 1-1-8)**.

In terms of the intent to continue using the services, "want to continue" was high at 65.7%, and as many as 87.1% of the users predicted that the services "will spread widely/will spread to a certain extent."

(2) Utilization of RFID tags for safety of school children

In order to understand the effectiveness and problems involved in use of RFID tags for safety of elemen-

Figure 1-1-6 Examples of the services of mobile phones with contactless smart card technology

Paying is made easier just by holding up the mobile phone in front of the checkout counter.

Flight check-in is made easier, just by holding up the mobile phone in front of the check-in machine.
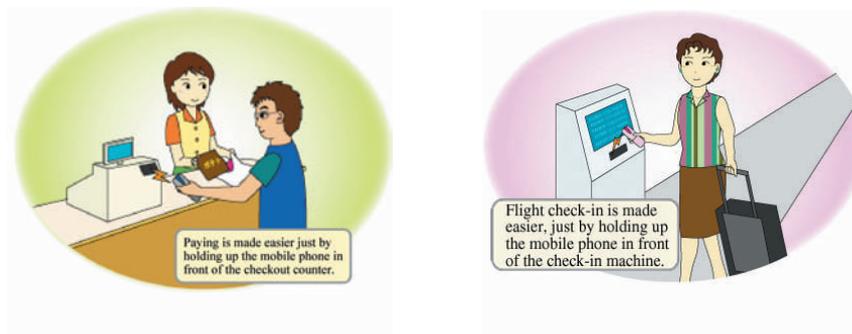
Figure 1-1-7 Services of mobile phones with contactless smart card technology used by users (multiple responses possible)

|	%
Electronic money settlements	76.5
Membership cards, reward cards, etc.	33.2
Credit card transactions	24.3
Electronic tickets	22.7
Electronic public transportation tickets	14.5
Employee identification, access control in companies, etc.	5.3
Keys for main entrances of housing complexes	1.6
Other	4.7
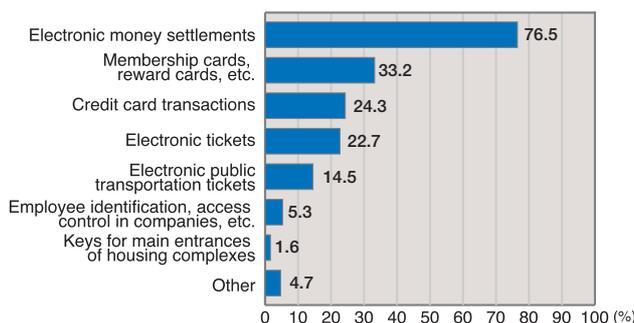
Figure 1-1-8 Degree of user satisfaction for the services of mobile phones with contactless smart card technology

6.3	27.7	54.4	8.2	3.4

■ Very satisfied
■ Satisfied
□ Neither satisfied nor dissatisfied
■ Somewhat dissatisfied
■ Very dissatisfied
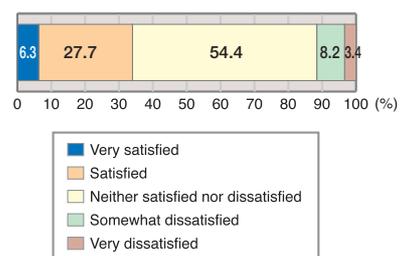
Source for Figures 1-1-7 and 1-1-8 : Survey on Trends Concerning a Ubiquitous Network Society (Web survey)

tary school children, the Kinki Bureau of Telecommunications of the Ministry of Internal Affairs and Communications (MIC), implemented a demonstration test for a system that records the school arrival and departure times using RFID tags and notifies parents of this information by e-mail under the cooperation of Shinjo Daini Elementary School in Tanabe City, Wakayama Prefecture (October 25 - November 5, 2004) **(Figure 1-1-9)**.

After the test, a questionnaire survey was conducted on the participants to check their evaluations of the demonstration test. According to the survey results, the school arrival and departure notifications sent to the parents' mobile phones had been "checked almost everyday" by 81.0% of the parents, while 82.9% "felt more reassured/felt slightly more reassured" throughout the demonstration test **(Figure 1-1-10)**. As for the future need for safety or security programs using ICT technology, such as RFID tags and network cameras, 71.3% answered that they were "necessary/somewhat necessary." The biggest reason was "because the social conditions have changed, and criminal incidents occur frequently," which was mentioned by 65.8% **(Figure 1-1-11)**.

(3) Utilization of Contactless Smart Cards for Production Management

A factory of a PC manufacturer had conducted operations by allotting one instruction sheet per PC unit, and having the respective production line staff members confirm the specifications and precautions indicated in the relevant part of the production instruction sheet. However, it was time-consuming to check the relevant part of the sheet. In addition, a barcode printed on the sheet had been read in each process of assembly, inspection, shipment, etc. for production management, and this reading process was conducted about 100,000 times a day. Thus, in order to facilitate confirmation of the content of the production instruction sheet, reduce the barcode reading process load, and reinforce traceability, contactless smart cards were introduced in September 2004.

Due to the introduction of the contactless smart cards, the factory became able to facilitate confirmation of the operation content, automatically store data such as production history and inspection results in the assembly/inspection phases, and improve efficiency of the

Figure 1-1-9 Outline of the demonstration test of the use of RFID tags for safety of school children
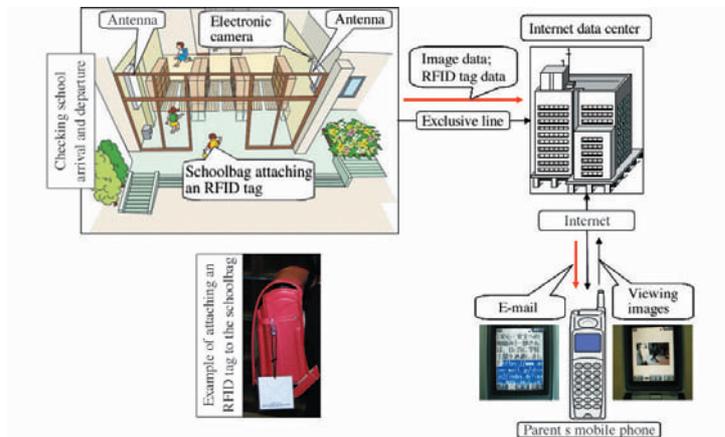
**Figure 1-1-10 Overall impression of the program**

| 41.8 | 41.1 | 13.7 | 2.1 | 1.4 |

0 10 20 30 40 50 60 70 80 90 100 (%)

- Felt more reassured
- Felt slightly more reassured
- Neither felt reassured nor anxious
- Felt slightly more anxious
- Other
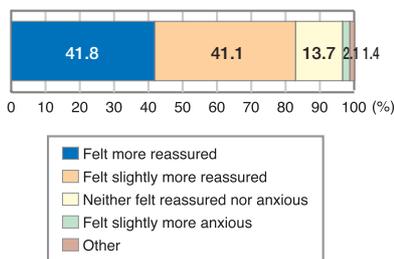
Figure 1-1-11 Future need for safety or security programs using ICT technology

| 37.2 | 34.1 | 22.0 | 6.1 | 0.6 |

0 10 20 30 40 50 60 70 80 90 100 (%)

- Necessary
- Somewhat necessary
- Neither necessary nor unnecessary
- Somewhat unnecessary
- Unnecessary
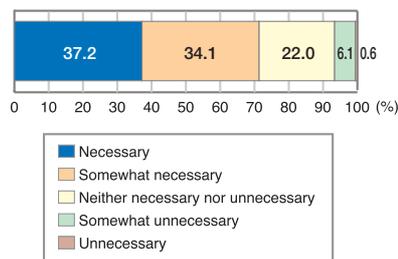
Source for Figures 1-1-9 to 1-1-11: Kinki Bureau of Telecommunications, MIC, Study Group on Utilization of RFID Tags in the Public Sector (March 2005)

shipping/delivery processes by reading multiple contact-less smart cards in a batch, and improve the productivity by more than 10% as a result.

5. Japan's future challenges and solutions using ubiquitous networks

The "Policy Roundtable for Realizing a Ubiquitous Network Society" conducted a questionnaire survey on 6,000 consumers concerning the important themes that Japanese society should address toward 2010. As a result, the theme that was most mentioned as being extremely important was "achieving a safe and secure living environment," indicated by nearly 70% of the respondents, followed by energy, medical care, and the environment **(Figure 1-1-12)**.

In addition, more specific challenges were investigated regarding these individual important themes, and examples of solutions using ubiquitous networks were identified through consumer group interviews and corporate interviews **(Figure 1-1-13)**.

Figure 1-1-12 Important theme that Japanese society should address toward 2010 (multiple responses possible)

Theme	%
Achieving a safe and secure living environment	69.2
Resolving energy problems	55.5
Increasing patient-oriented medical services	54.9
Building a recycling-oriented society/environmentally symbiotic society	52.7
Promoting motivation in life and social participation of the elderly and the disabled	50.1
Promoting sound development of youth	47.3
Managing risks in a network society	44.8
Expanding and diversifying employment opportunities	38.0
Forming sustainable and safe urban transportation systems	32.6
Developing new industries	32.3
Diversifying employment patterns and working styles	32.1
Realizing diverse community activities	30.0
Promoting globalization	27.4
Building a rich nation through cultural, artistic, and sporting activities	20.0
Spreading lifelong learning	19.6
Achieving e-government and administrative reform	19.2
Upgrading universities and graduate schools	17.1

* Respondents who answered "very important"

Figure 1-1-13 Specific future challenges and solution examples using ubiquitous networks

Senior-friendly housing
Example: Enabling monitoring of the location and conditions of an elderly person or a small child of working parents by using various sensors and checking the operation status of electric home appliances
→**Lifestyle support**

Social participation of young, middle-aged, and elderly people
Example: Matching between the evaluated skills and job offers, and introducing skill development programs in order to support reemployment of women as well as middle-aged and elderly age groups and employment of young people
→**Support for job-changing, reemployment, etc.**

Reduction of traffic congestions/accidents
Example: Eliminating/controlling traffic congestions by increasing traffic information and route information, and reducing traffic accidents by using automobiles' autonomous systems as well as inter-vehicle and vehicle-roadside communications
→**Network-based driving assistance**

Relief of passengers' frustrations
Example: Enabling passengers to acquire real-time information on the time of arrival, delays, and alternative transportation means of public transportation systems
→**Public transportation information navigation**

Ensuring safety at times of disaster
Example: Enabling victims and their families to exchange necessary information at times of disaster, including confirmation of personal safety
→**Confirmation of safety of people at times of disaster**

Food safety/security
Example: Enabling consumers to easily check data of production and distribution records by attaching RFID tags, etc. to food (vegetables, meat, fresh fish, processed foods, etc.)
→**Food traceability**

Efficient use of clinical information
Example: Improving quality and efficiency of medical care and providing patient-oriented medical services by facilitating exchanges of clinical data between hospitals, etc. in the form of electronic medical charts
→**Electronic medical chart network**

Promotion of recycling/waste treatment
Example: Gaining understanding of the amount of collected waste by type of waste and ensuring appropriate recycling by attaching RFID tags to general waste from homes and offices after seperating them by type of waste
→**Resource/waste traceability**

Improving efficiency of shopping
Example: Making shopping enjoyable and efficient by enabling customers to easily check the location and remaining stock of their desired product via a terminal device
→**Shopping system using terminal devices**

Promotion of online administrative procedures
Example: Once the resident card, marriage registration, etc. are updated, all other administrative procedures are also updated automatically
→**Automatic updating of administrative procedures**

Free access to contents
Example: Allowing use of various contents anywhere and at any time from any terminal by achieving both copyright protection and usability through controlling metadata (information on content attributes, etc.)
→**Ubiquitous content distribution**

Spread of lifelong learning
Example: Unearthing hidden knowledge in the local community by enabling anybody to become a teacher or a student and teach others through networks
→**Network-based community classes**

Diversification of working styles
Example: Enabling a not-so-crowded store to provide remote service to a customer in another store when face-to-face service is not required
→**Remote service between stores**

Support for collaborative work among white collars
Example: Allowing executives in different places to virtually come together and hold discussions in order to support planning, deliberation, and decision-making of the management team
→**Management team collaboration support**

* A key ICT solution for each issue is exemplified after the arrow.

Source for Figures 1-1-12 and 1-1-13: Produced from MIC, Final Report of the Policy Roundtable for Realizing a Ubiquitous Network Society

Section 2

ICT Use by Individuals

1. Progress in ICT Use

(1) Increase in the number of Internet users

The number of Internet users at the end of 2004 was estimated to be 79.48 million (an increase of 2.8% over the previous year), and the penetration rate was 62.3%, increasing by 1.7 points over the end of 2003 (60.6%) **(Figure 1-2-1)**. Since the penetration rate exceeded 60% at the end of 2003 and significant diffusion has already been achieved, the speed of the increase is slowing down. Compared to the end of the year preceding the launch of the e-Japan strategy (2000), the number of Internet users increased by about 32 million, and the penetration rate by 25.2 points. This indicates that Internet use by individuals has steadily progressed in these four years.

(2) Increase in the number of broadband households

The percentage of broadband households (using FTTH, DSL, cable Internet, or wireless access (FWA, etc.)) to the total households accessing the Internet via home PCs was 62.0% at the end of 2004, increasing by 14.2 points over the percentage at the end of 2003 (47.8%). On the other hand, the percentage of dial-up households was 20.4%, decreasing by 9.8 points from the end of 2003 (30.2%). Compared to the end of the year preceding the launch of the e-Japan strategy (2000), the number of broadband households rapidly expanded, increasing by 55.2 points **(Figure 1-2-2)**.

Figure 1-2-1 Number of Internet users and penetration rate
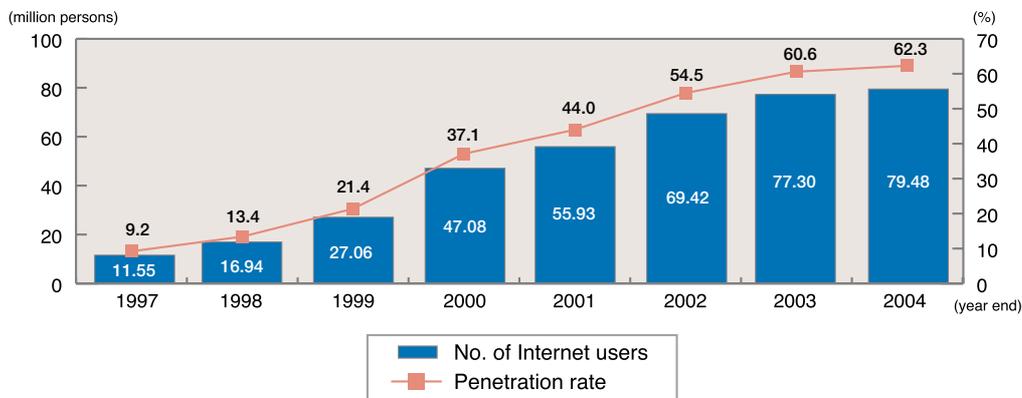
Source: MIC, Communications Usage Trend Survey

Figure 1-2-2 Internet access method at home
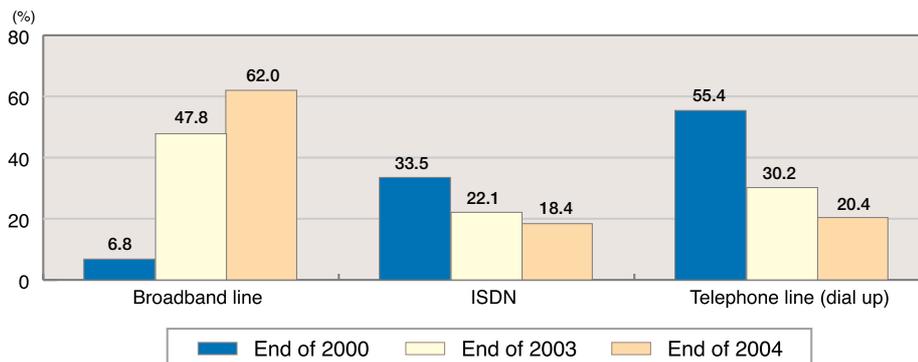
* Broadband line: FTTH (from "End of 2001"), DSL, cable Internet, wireless (FWA, etc.),
  and third-generation mobile phones (only for "End of 2004")

Source: MIC, Communications Usage Trend Survey

(3) Degree of Satisfaction with the Internet

When Internet users were asked how satisfied they were with the present Internet use, they generally indicated a high degree of satisfaction with PC Internet use. However, the degree of dissatisfaction was comparatively high for Internet use through mobile phones (in this white paper, "mobile phones" collectively refer to mobile phones, PHS, and PDA). This is presumably because users accustomed to PC Internet use find that the usability (ease of viewing the screen, ease of operation, etc.) of mobile phones does not match up to that of PCs. In addition, the number of respondents answering "don't know" is high for mobile phones compared to PCs. The users' opinions are likely to be still unfixed because they have not used the mobile phone Internet for as long time as the PC Internet and the services provided are undergoing rapid changes **(Figure 1-2-3)**.

(4) Progress of ICT in respective fields

When Internet users were asked about the progress of ICT use in main fields, more than 80% believed that

ICT use has "made a lot of progress/made some progress" in the fields of information gathering, shopping, communication, amusement/contents, and financial transactions, but as many as 30 to 40% believed that ICT use has "made little progress/made no progress" in the fields of medical care, administration, and education **(Figure 1-2-4)**.

2 Changes in people's lives

The users are aware of both positive and negative influences of the Internet on society. The most mentioned positive influences included "makes life more convenient through the information search function and online shopping," "generates various new businesses and changes the industrial structure," and "improves the capacity to convey knowledge and know-how." On the other hand, the most mentioned negative influences included "flooded with information and makes selection of the necessary information difficult," "encourages crimes such as libel and providing illigal/harmful information" and "reduces the ability to give in-depth thought

Figure 1-2-3 Degree of satisfaction in the PC/mobile phone Internet

PC Internet users

	Very satisfied	Generally satisfied	Somewhat dissatisfied	Dissatisfied	Don't know
Overall evaluation	2.5	65.1	27.3	3.5	1.6
Plentiful and diverse information	9.3	69.8	14.8	3.5	2.6
Ease of information searches	6.6	66.3	20.6	4.2	2.3
Content of the accessible services	5.3	65.7	20.7	3.4	4.8
Ease of operation/use	3.6	56.6	28.0	7.4	4.4
Information credibility	2.7	44.7	35.9	11.1	5.5
Security	1.8	28.3	40.1	23.0	6.8
Access environment	4.5	41.2	27.3	25.9	1.1
(BB) access environment * (fixed charge)	6.0	55.5	25.9	11.4	1.2

Mobile phone Internet users

	Very satisfied	Generally satisfied	Somewhat dissatisfied	Dissatisfied	Don't know
Overall evaluation	0.4	20.5	39.6	28.9	10.6
Plentiful and diverse information	1.0	18.3	30.8	34.1	15.2
Ease of information searches	0.8	14.6	31.0	40.2	13.4
Content of the accessible services	1.0	25.4	31.1	22.3	20.1
Ease of operation/use	1.8	26.4	29.8	29.9	12.6
Information credibility	0.8	26.2	30.8	22.8	19.4
Security	0.9	19.7	32.5	29.8	17.1
Access environment	1.8	24.5	30.0	34.4	9.7
(BB) access environment * (fixed charge)	2.5	29.1	27.6	22.8	18.0

Legend:
- Very satisfied
- Generally satisfied
- Somewhat dissatisfied
- Dissatisfied
- Don't know

* The degree of satisfaction with the Internet access environment was investigated for only broadband users (BB) and users of fixed-charge packet transmission services (fixed charge).

Source: Survey on Networks and People's Lives (Web Survey)

Figure 1-2-4 Progress of ICT use in main fields

	Made a lot of progress	Made some progress	Made little progress	Made no progress	Don't know
Information gathering	42.9	46.2	6.3	0.2	4.4
Shopping	49.7	39.3	6.4	0.6	4.0
Communication	42.0	40.5	9.7	1.2	6.5
Amusement/contents	38.8	42.7	8.8	2.5	7.2
Financial transactions	47.9	33.2	4.9	3.5	10.5
Transportation	22.6	44.6	17.4	4.8	10.7
Employment/labor	15.9	38.3	26.8	6.3	12.6
Education	15.2	35.8	27.2	6.5	15.3
Administration	16.2	31.3	30.9	10.9	10.7
Medical care	12.5	27.7	31.0	11.5	17.2

Legend:
- Made a lot of progress
- Made some progress
- Made little progress
- Made no progress
- Don't know

Source: Survey on Networks and People's Lives (Web Survey)

to things." The percentage of users who have a positive impression that the Internet "has a favorable impact on society on the whole" was 75.6% **(Figure 1-2-5)**.

3 Stimulation of communication

The utilization rate of PC e-mail in Japan is 94.2%, and 90% of Internet users send less than five e-mail messages per day. In the meantime, the utilization rate of mobile phone e-mail is 87.7%, and 80% of the users send less than five e-mail messages per day. While the utilization rate of PC e-mail in the United States is high at 96.1%, the utilization rate of mobile phone e-mail is extremely low at 12.4%. In the Republic of Korea, the mobile phone Internet is widely used similarly to Japan, but the utilization rate of mobile phone e-mail is 43.1%, which is far lower than the rate in Japan. In this manner, the high utilization rate of mobile phone e-mail is characteristic to Japan **(Figures 1-2-6 and 1-2-7)**.

The communication tool other than e-mail that is most used by Internet users is "Internet BBS" at 45.1%, followed by "a personal Website" (27.1%). At the same time, the percentage of users who have "a personal blog" is 14.9%. When comparing Japan, the United States, and the Republic of Korea, the utilization rate of such tools is generally high in the Republic of Korea where 37.3% of Internet users have a personal blog **(Figure 1-2-8)**.

4 Diffusion of online shopping, etc.

Among PC Internet users, those who have experi-

ence in online shopping accounted for 89.1% in Japan, 89.7% in the United States, and 86.1% in the Republic of Korea. In this manner, online shopping is widely used in all three countries. On the other hand, among mobile phone Internet users, those who have experience in online shopping account for 18.1% in Japan, 14.7% in the United States, and 31.4% in the Republic of Korea. In other words, online shopping through mobile phones is more popular in the Republic of Korea than in Japan or the United States **(Figure 1-2-9)**.

The annual amount of purchases (throughout 2004) through PCs was 95,062 yen in Japan, 1,202 dollars (about 129,500 yen) in the United States, and 824,187 won (about 78,100 yen) in the Republic of Korea. That of purchases through mobile phones was 34,694 yen in Japan, 697 dollars (about 75,100 yen) in the United States, and 163,813 won (about 15,500 yen) in the Republic of Korea.

The degree of satisfaction with PC online shopping is high in Japan, the United States, and the Republic of Korea, but in terms of mobile phone online shopping it is relatively low **(Figure 1-2-10)**.

Internet users' intent to use PC online shopping in the future is high at 92.3% in Japan, 88.1% in the United States, and 88.5% in the Republic of Korea, while the intent to use mobile phone online shopping is 21.5% in Japan, 8.9% in the United States, and 23.6% in the Republic of Korea, showing that the intent of use in the United States is lower than that in Japan and the Republic of Korea.

Figure 1-2-5 Social influences of the Internet
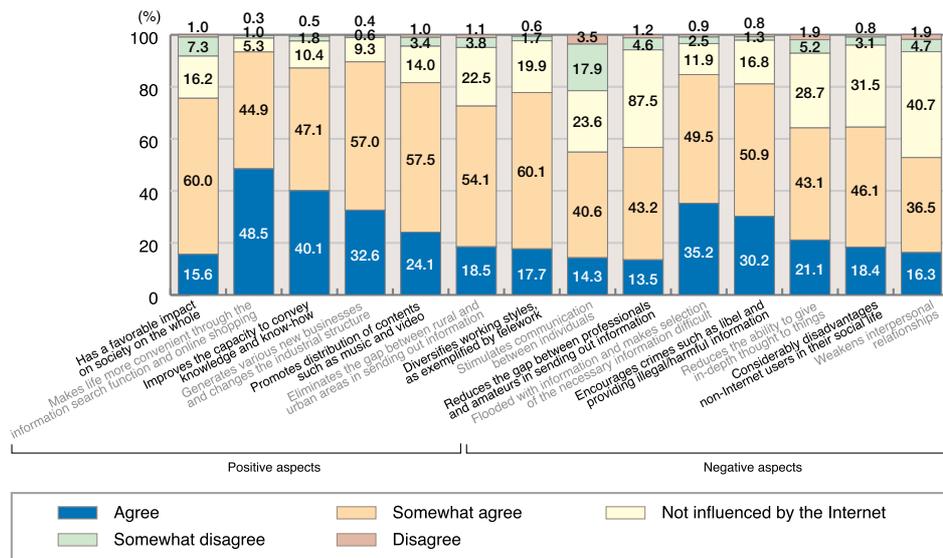
Source: Survey on Networks and People's Lives (Web Survey)

Figure 1-2-6 Utilization rate of e-mail

(%)

	PCs	Mobile phones
Japan	94.2	87.7
USA	96.1	12.4
ROK	84.8	43.1

■ PCs □ Mobile phones
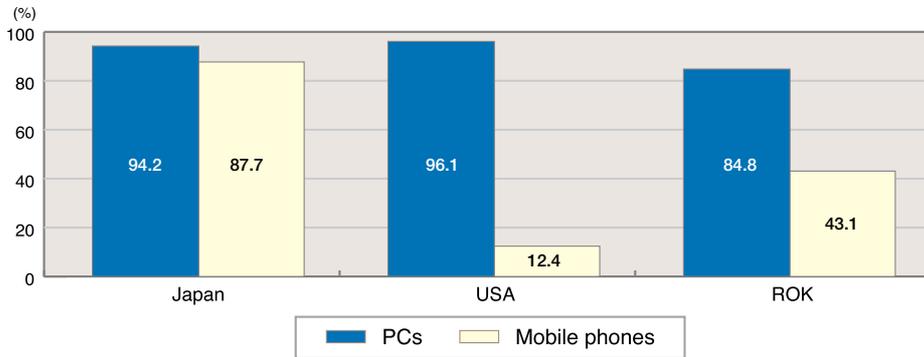
Figure 1-2-7 Frequency of sending e-mail messages

(%)

	None	1 message or less	2 to 5 messages	6 to 10 messages	11 to 20 messages	21 to 30 messages	31 messages or more
PCs	5.8	46.3	37.2	6.1	1.8	0.7	2.0
Mobile phones	12.3	30.3	39.1	11.5	3.2	1.5	2.1

■ None ■ 1 message or less □ 2 to 5 messages ■ 6 to 10 messages ■ 11 to 20 messages
■ 21 to 30 messages ■ 31 messages or more
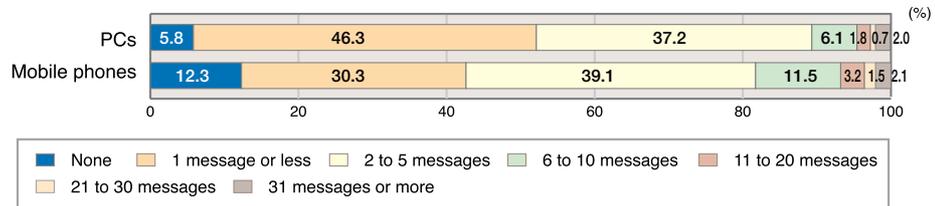
Note: The percentages in brackets indicate changes over the previous year.

Figure 1-2-8 Utilization rate of communication tools (multiple responses possible)

(%)

■ Japan □ USA ■ ROK

	Japan	USA	ROK
Using Internet BBS	45.1	13.5	
Creating a personal Website	27.1	15.4	33.3
Participating in an e-mailing list	26.2	34.7	54.8
Reading other people's blogs	25.9	10.8	36.7
Chatting or sending instant messages	22.7	47.6	58.4
Creating a personal blog	14.9	6.8	37.3
Using social networking services	2.5	3.3	3.0
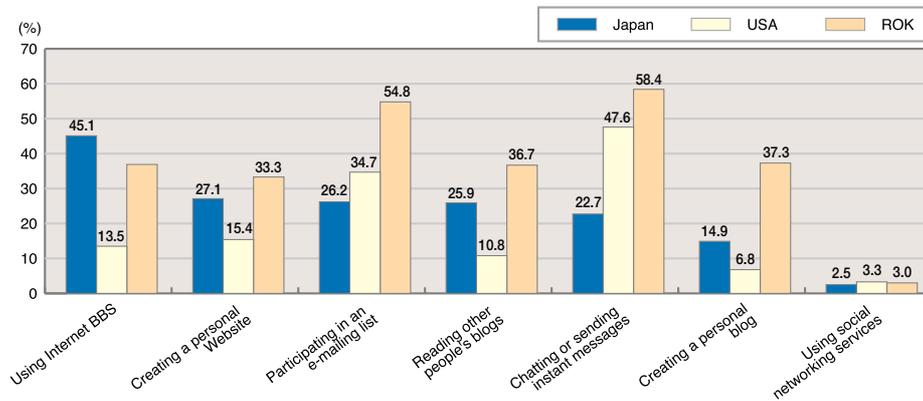
Figure 1-2-9 Utilization rate of online shopping

(%)

■ Japan □ USA ■ ROK

	Japan	USA	ROK
	89.1	89.7	86.1
	18.1	14.7	31.4
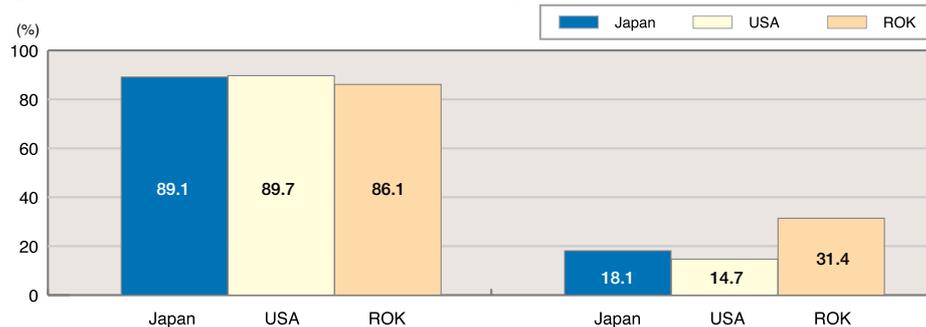
Source for Figures1-2-6 to 1-2-9: Survey on Networks and People's Lives (Web Survey)

5 Increasing use of media contents

(1) Overall trend of media contents market

The overall media contents market has hit the ceiling at about 11 trillion yen during the period from 2000 to 2003. Broken down by content type, the market for audio contents (music, radio programs, etc.) and the text contents market (newspaper articles, literary contents, etc.) are shrinking, while the market for visual contents (movies, TV programs, etc.) is expanding. Each of these content types could be put to secondary use in other media after being used in a specific medium. It was found that the market for distribution in the first medium in which produced content is assumed to be distributed (primary distribution market) is shrinking, and the market for secondary distribution through other media (multi-use market) is expanding.

In recent years, the market for media contents, which includes music, games and newspaper articles that are distributed to PCs and mobile phones through the Internet and mobile network (network-based distribution market), has been growing. The market expanded to about 500 billion yen in 2003, increasing by about 200 billion yen in three years **(Figure 1-2-11)**.

(2) Internet contents

An overwhelmingly high percentage of PC Internet users use free contents. The most frequently used paid contents are "music" (7.2%) followed by "games" (6.7%) and "moving images" (4.8%). Free contents are also frequently used among mobile phone Internet users,

Figure 1-2-10 Degree of satisfaction of online shoppers
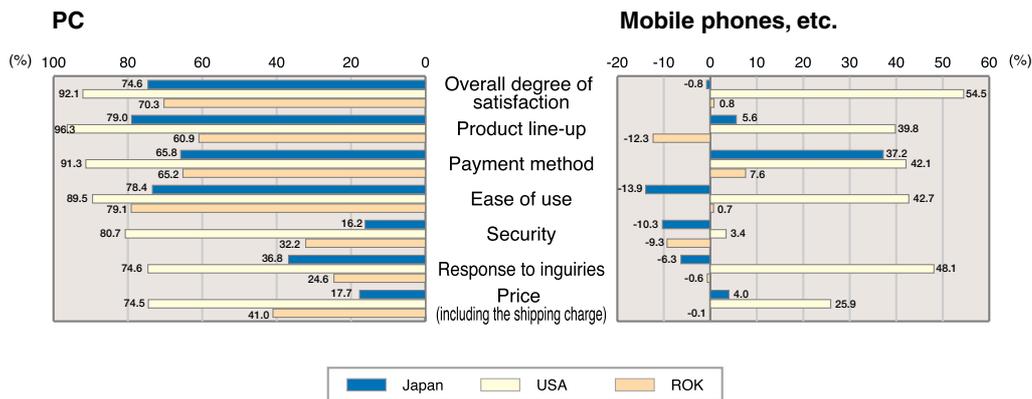
* The figure indicates the percentage of users who answered "satisfied" by deducting the percentage of users who answered "dissatisfied" for each item.

Source: Survey on Networks and People's Lives (Web Survey)

Figure 1-2-11 Proportion of the network-distributed media contents market in the overall contents market
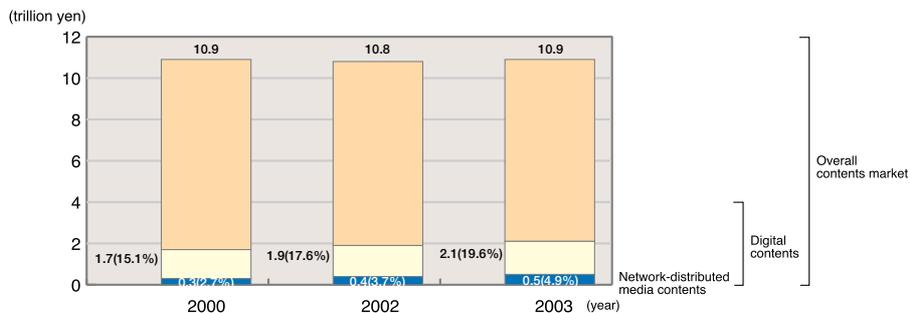
Notes:
Digital contents are CDs, DVDs, games, digital satellite broadcasting programs, off-line databases and network-distributed media contents.
Network-distributed media contents are contents distributed via the Internet, mobile network, online karaoke and online databases.

Source: Institute for Information and Communications Policy, MIC, Research Concerning the Current State of Production and Distribution of Media Contents

but while the utilization rate of free contents is lower compared to that for PC Internet use, the utilization rate of paid contents is higher **(Figure 1-2-12)**.

With regard to the intent for future use of paid contents, PC Internet users have a high intent for using "music" (16.5%), followed by "moving images" (13.9%) and "games" (9.0%), while mobile phone Internet users have a high intent for using "ring-tone melodies, etc." (37.1%), followed by "games" (16.9%) and "music" (11.8%) **(Figure 1-2-13)**. Music, moving images, and games are expected to remain as the core Internet contents in the future.

When comparing the use of core paid contents (moving images, still images, music, ring-tone melodies, games, and books/cartoons) among Japan, the United States, and the Republic of Korea, the rate of use is overwhelmingly high in the Republic of Korea, both through

PCs and mobile phones. The use through PCs is the next highest in the United States, and then in Japan, and the use through mobile phones is the next highest in Japan, and then in the United States **(Figure 1-2-14)**. One of the reasons for such active use of paid contents in the Republic of Korea is that settlement of small amounts is simple and easy due to the diffusion of the system to have the fees charged by the mobile phone carriers.

The average annual amount of paid contents used in 2004 through PCs was 9,464 yen in Japan, 180 dollars (about 19,400 yen) in the United States, and 129,059 won (about 12,200 yen) in the Republic of Korea, while that used through mobile phones was 4,036 yen in Japan, 233 dollars (about 25,100 yen) in the United States, and 93,899 won (about 8,900 yen) in the Republic of Korea.

Figure 1-2-12 Status of use of contents (multiple responses possible)
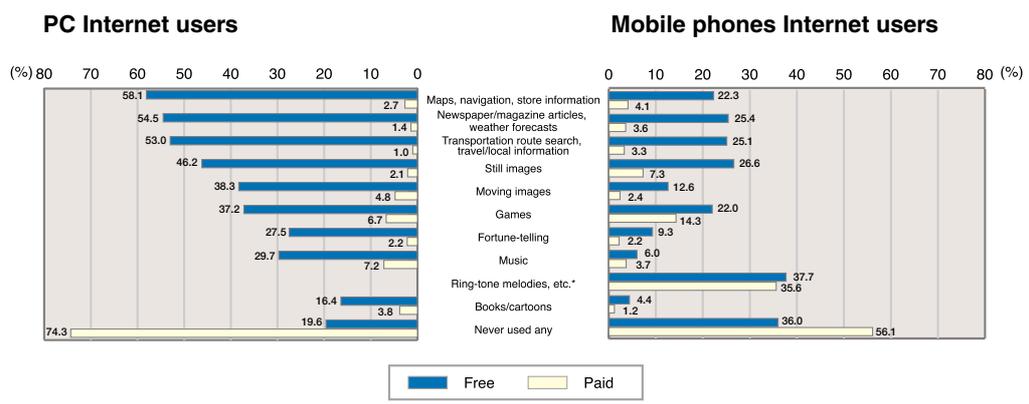
PC Internet users — **Mobile phones Internet users**

* Only mobile phone Internet users were questioned about the status of use of "ring-tone melodies, etc.".

Source: Survey on Networks and People's Lives (Web Survey)

Figure 1-2-13 Intent for future use of paid Internet contents (multiple responses possible)
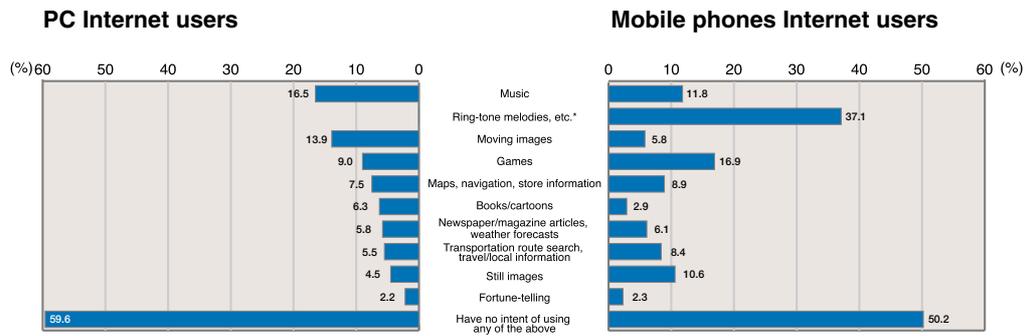
PC Internet users — **Mobile phones Internet users**

* Only mobile phone Internet users were questioned about the status of use of "ring-tone melodies, etc.".

Source: Survey on Networks and People's Lives (Web Survey)

With regard to copyright awareness in using contents, users who are "always aware/sometimes aware" account for 46.4% in Japan, 71.8% in the United States, and 49.8% in the Republic of Korea, and those who are "often not aware/never aware" account for 53.6% in Japan, 28.2% in the United States, and 50.2% in the Republic of Korea. Copyright awareness is higher in the United States than in the other two countries, and the awareness level is about the same in Japan and the Republic of Korea **(Figure 1-2-15)**.

The percentage of users of P2P file sharing software is tremendously large in the Republic of Korea compared to the other two countries, with the utilization rate being

3.7% in Japan, 11.6% in the United States, and 44.2% in the Republic of Korea **(Figure 1-2-16)**.

(3) Music distribution

The music distribution service started by a U.S. company, A, in April 2003 (launched in April 2003 in the United States and in June 2004 in Europe) was an explosive hit due to the large collection of music available, the low price, and loose copyright restrictions. The cumulative total of the number of tunes sold exceeded 300 million in March 2005, and currently the daily sales exceed one million tunes. While purchases of music via the Internet surged from April 2003 in the United States, the

Figure 1-2-14 Status of use of paid contents (multiple responses possible)

* Only mobile phone Internet users were questioned about the status of use of "ring-tone melodies, etc.".
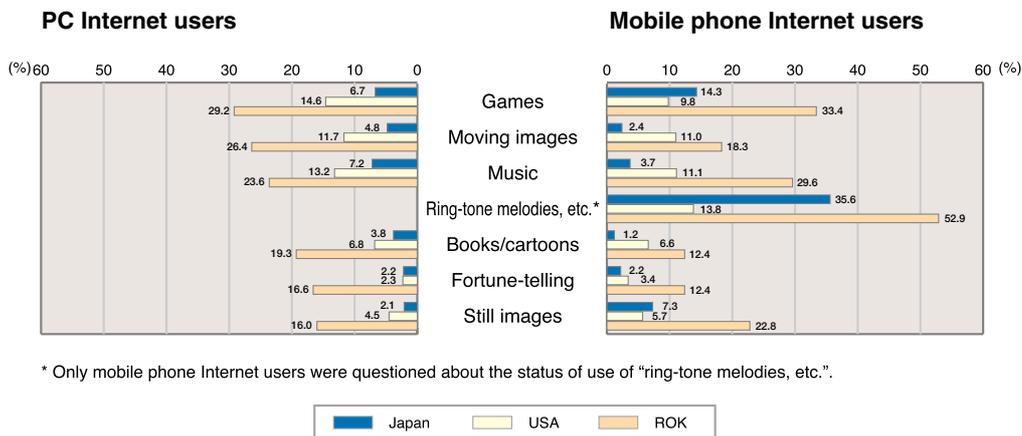
Source: Survey on Networks and People's Lives (Web Survey)

Figure 1-2-15 Copyright awareness upon using contents
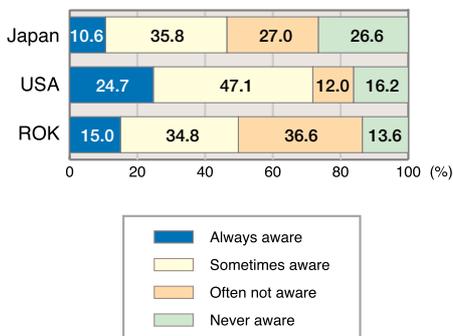
Figure 1-2-16 Status of use of P2P file sharing software
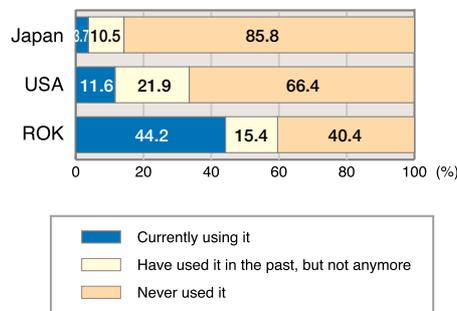
Source for Figures 1-2-15 and 1-2-16 Source: Survey on Networks and People's Lives (Web Survey)

shipment volume of musical CDs in 2004 also increased by 2.8% over the previous year **(Figure 1-2-17)**.

Many Japanese companies have also entered the music distribution market since 2004 **(Figure 1-2-18)**. The Japanese music distribution market is still small compared to the United States with two major companies' monthly music sales in January 2005 being about 510,000 tunes. This is considered to be because the Japanese music distribution services are not sufficiently attractive for users at present.

Among Internet users, those who use music distribution services through PCs account for 8.9%, which is still small in number **(Figure 1-2-19)**.

The most commonly mentioned dissatisfaction with music distribution services through PCs was "the price of music is high" (26.3%), followed by "the restrictions on copying and transfer are tight" (17.1%), "it takes a lot of effort to find the desired tune" (15.9%), and "the desired tune is not available/the music collection is

small" (15.2%) **(Figure 1-2-20)**. This indicates that there is a high degree of dissatisfaction with the price, copyright control, and the number of available tunes. As for the intent for using the service in the future, those who "want to use it" accounted for 42.9%.

6 Comparison of ICT use in Japan, the United States, and the Republic of Korea

(1) Internet use through mobile phones

The Internet utilization rate of mobile phone users is the highest in Japan at 78.8%, followed by the Republic of Korea at 66.9%. In the United States the rate is 32.2%, a considerably low percentage compared to Japan and the Republic of Korea, indicating that Internet use through mobile phones is not in wide use in U.S. society.

Figure 1-2-17 Status of music distribution services and CD shipment in the United States

(million tunes) ... (%)

- Total number of tunes sold by A (estimate)
- CD shipment volume (compared to the previous year)
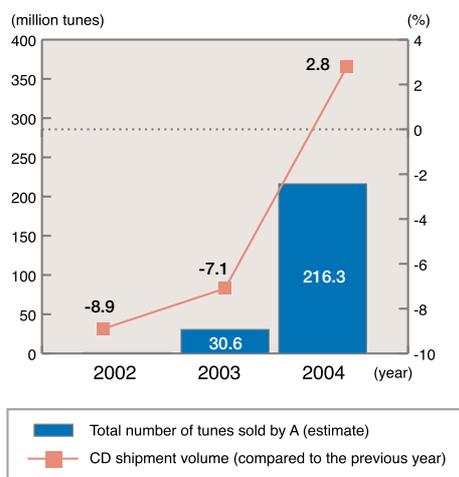
Figure 1-2-18 Status of major Japanese music distributors (15 companies) (as of March 2005)

Time of launch	1999 or earlier: 2 companies 2000-2003: 3 companies 2004 or after: 10 companies
Compression format	Only WMA: 9 companies Only ATRAC3: 3 companies Both WMA and ATRAC3: 2 companies Both WMA and MP3: 1 company
Price per tune	About 150 to 350 yen
Tune available	About 10,000 to 30,000 tunes: 3 companies About 40,000 to 70,000 tunes: 2 companies About 80,000 to 100,000 tunes: 7 companies About 150,000 tunes: 1 company
Writing on a CD-R	Prohibited: 5 companies Prohibited except for certain labels/tunes: 10 companies

Source for Figures 1-2-17 and 1-2-18 Source: Survey on Networks and People's Lives

Figure 1-2-19 Utilization rate of online music distribution

Currently using it
8.9%

Never even considered using it
54.4%

Have considered using it, but did not use it
36.8%
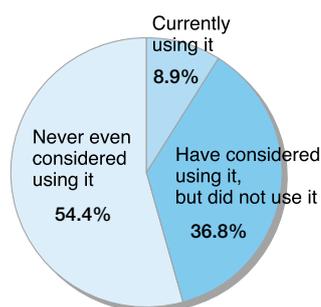
Figure 1-2-20 Dissatisfying aspects of online music distribution services

The price of music is high.	26.3
The restrictions on copying and transfer are tight.	17.1
It takes a lot of effort to find the desired tune.	15.9
The desired tune is not available./The music collection is small.	15.2
The downloading takes time.	13.8
The recording formats are not unified.	9.8
The price of the player is high.	9.7
The operation of the equipment is troublesome.	8.2
There are no dissatisfying aspects.	4.8

Source for Figures 1-2-19 and 1-2-20 Source: Survey on Networks and People's Lives (Web Survey)

(2) Changes in activity patterns in line with the use of the Internet

With respect to changes in daily activity patterns in line with the use of the Internet, many users mentioned that the time in contact with other media (books, magazines, newspaper, and TV), the time for sleep, and the frequency of going out decreased in Japan, the United States, and the Republic of Korea. In Japan and the United States, the number of users who said the frequency of communicating with family members or friends and the frequency of traveling increased exceeded the number who said the frequency decreased.

The number of users who said their daily activity pattern has "not changed" was the highest in the United States for all of the items, while in the Republic of Korea, the number of such users was the lowest and the number of users who said the frequency or length of time "decreased" was the highest for all of the items. This shows that Internet use has had the largest influence on people's daily activity patterns in the Republic of Korea **(Figure 1-2-21)**.

Figure 1-2-21 Changes in activity patterns in line with the use of the Internet
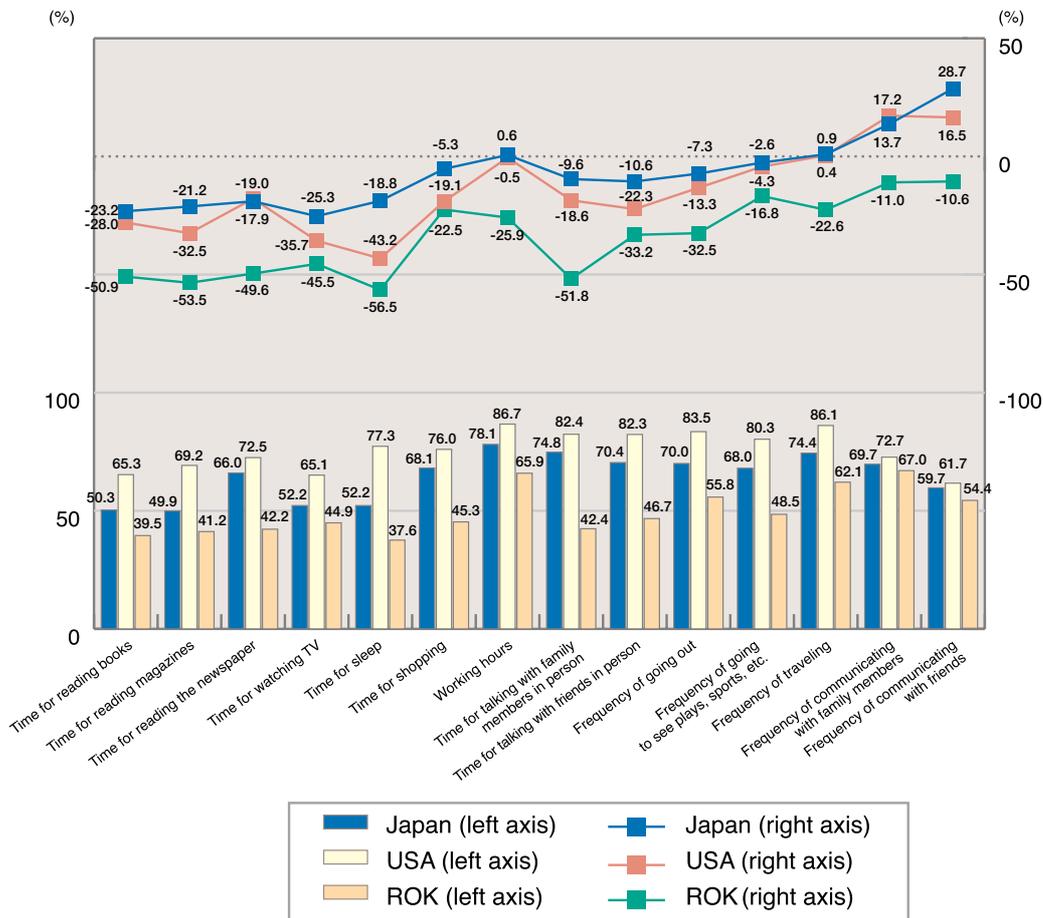
* The line chart indicates the percentage of users who answered "increased" by deducting the percentage of users who answered "decreased" for each item. The bar chart indicates the percentage of users who answered "not changed."

Source: Survey on Networks and People's Lives (Web Survey)

Section 3

ICT Use by Companies

1 Enhanced use of ICT by companies

(1) Progress in use of the Internet

Companies' Internet utilization rate increased by 8.8 points from 89.3% at the end of 2000 to 98.1% at the end of 2004, which indicates that most companies are using the Internet. Meanwhile, the Internet utilization rate at business establishments increased by 37.0 points from 44.8% at the end of 2000 to 81.8% at the end of 2004 **(Figure 1-3-1)**.

(2) Introduction of ICT systems

The introduction of ICT systems has made progress in almost all operations compared to FY 2002. The introduction is particularly noticeable in areas of development/design and customer services **(Figure 1-3-2)**.

ICT systems are generally introduced for two main purposes: "reducing costs/improving operational efficiency" and "expanding sales/increasing added value." When the purposes were compared with those in FY 2002, the number of companies that introduced ICT systems for "reducing costs/improving operational efficien-

Figure 1-3-1 Transition in the Internet utilization rate (left: enterprises; right: establishments)
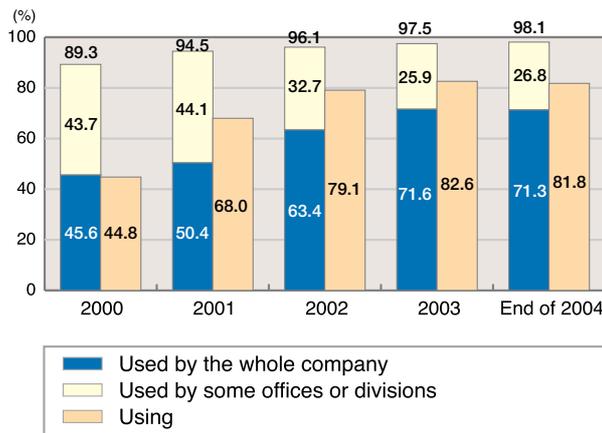
Produced from MIC, Communications Usage Trend Survey

Figure 1-3-2 Transition in the introduction of ICT systems by type of operations
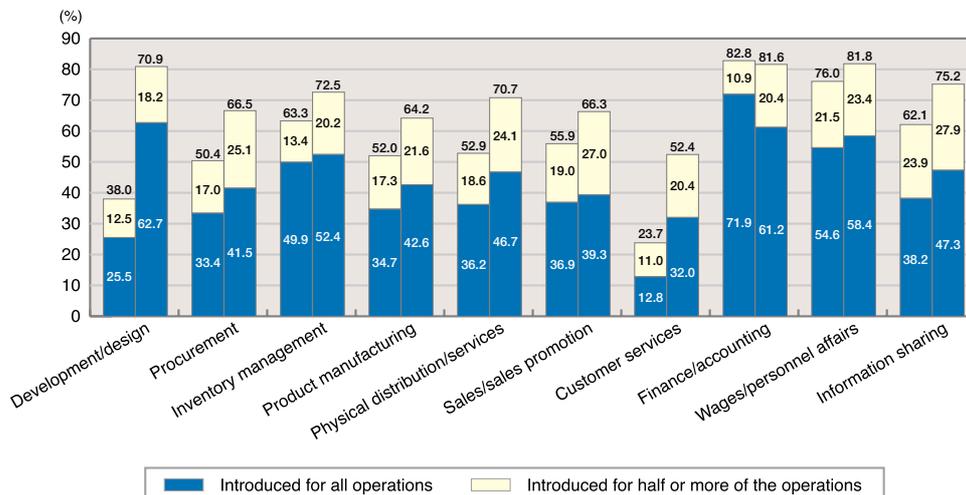
Source: Survey on the Current Status of ICT Use by Companies (Web Survey)

cy" decreased, while those that introduced the systems for "expanding sales/increasing added value" increased **(Figures 1-3-3 and 1-3-4)**. This shows that the conventional tendency of Japanese companies to link introduction of ICT with improvement of operational efficiency has been undergoing changes over the past two years.

In order to increase the effectiveness of ICT system investment, the mere introduction of ICT systems would not be enough, but efforts such as reviewing the existing operational processes and verification of the effectiveness would be essential. When such corporate efforts toward increasing the effectiveness were compared with those in FY 2002, larger efforts were being made in respect to "verifying cost-effectiveness," "organizational/institutional reform for management of ICT systems,"

and "selection and concentration" **(Figure 1-3-5)**.

When the actual effects of introducing ICT systems were compared with those in FY 2002, more companies were found to recognize effectiveness both in terms of reducing costs/improving operational efficiency and expanding sales/increasing added value **(Figure 1-3-6)**. The assumable factors behind such increase are the progress in the connection of ICT systems between companies, changes in the purpose for introducing ICT systems, and advancement in the efforts toward increasing the effectiveness of ICT system investment.

There are no major differences among Japan, the United States, and the Republic of Korea as to the ICT system introduction rate by type of operations, except that the introduction in customer services is advanced in

Figure 1-3-3 Purpose for introducing ICT systems (reducing costs/improving operational efficiency)
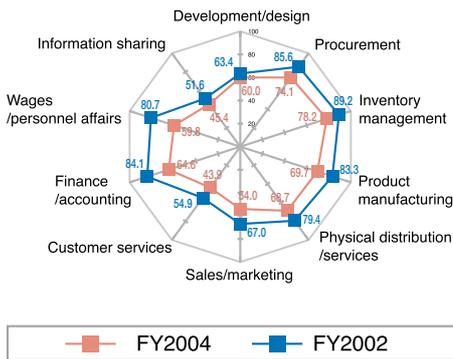
Figure 1-3-4 Purpose for introducing ICT systems (expanding sales/increasing added value)
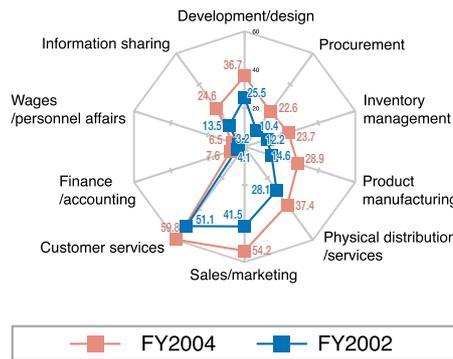
Figure 1-3-5 Efforts toward increasing effectiveness of ICT system investment

* The percentage of companies that answered "sufficient efforts are made" or "some efforts are made."
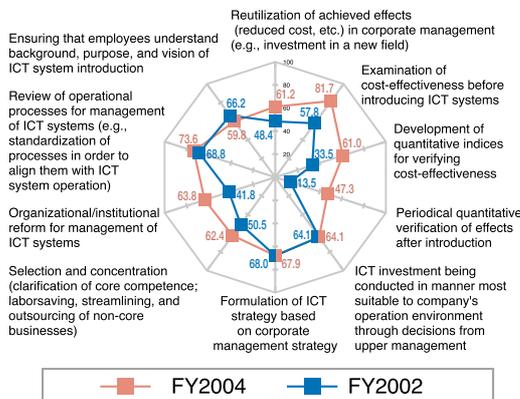
Figure 1-3-6 Effects of introducing ICT system
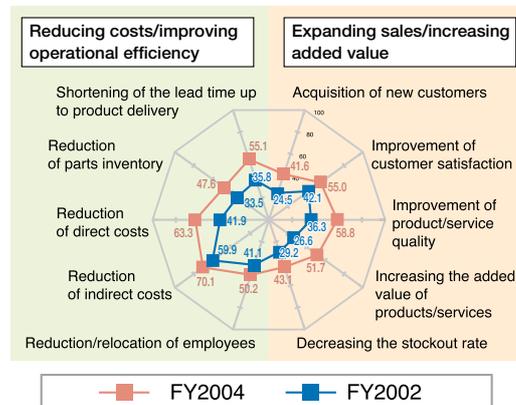
* The percentage of companies that answered "sufficient effect was observed" or "some effect was observed."

Source for Figures 1-3-3 and 1-3-6 Source: Survey on the Current Status of ICT Use by Companies (Web Survey)

the United States **(Figure 1-3-7)**.

The percentages of companies that introduced ICT systems for "reducing costs/improving operational efficiency" and "expanding sales/increasing added value" were the highest in the United States, followed by Japan and the Republic of Korea **(Figures 1-3-8 and 1-3-9)**.

The efforts toward increasing the effectiveness of ICT system investment were the most advanced in the United States, followed by the Republic of Korea and Japan **(Figure 1-3-10)**.

The actual effects of introducing ICT systems were the highest in the Republic of Korea, both in terms of "reducing costs/improving operational efficiency" and "expanding sales/increasing added value" **(Figure 1-3-11)**.

2 Expansion of E-Commerce

With respect to B2B e-commerce, 42.8% of companies "procure goods/services from companies via the Internet (procurement)" and 27.0% of companies "sell goods/services to companies via the Internet (sales)." In the United States, procurement is implemented by 68.6% of companies and sales by 34.4%, while in the Republic of Korea, procurement is implemented by 44.5% of companies and sales by 22.2%. The implementation rates for procurement and sales are both high in the United States.

As for B2C transactions via PC Internet in Japan, 28.9% of companies are "currently implementing" and 18.3% are "scheduled to implement or considering implementation." With regard to e-commerce via mobile

phones, 9.1% of companies are "currently implementing" and 25.6% are "scheduled to implement or considering implementation." The implementation rate of e-commerce via mobile phones is one-third of that via PCs, but since many companies are "scheduled to implement or considering implementation," e-commerce via mobile phones is expected to come into wider use in the future. Most of the companies that answered "currently implementing" or "scheduled to implement or considering implementation" for e-commerce via mobile phones also answered "currently implementing" or "scheduled to implement or considering implementation" for e-commerce via PCs, so companies that implement both e-commerce via PCs and mobile phones are likely to increase in the future. In the United States, the implementation rate of e-commerce via PCs is higher than in Japan and the Republic of Korea, and the situation in the Republic of Korea is similar to that in Japan **(Figure 1-3-12)**.

3 Comparison of ICT use among Japan, the United States, and the Republic of Korea

The rate of introducing video conference systems is the highest in the United States at 76.4%, followed by Japan (50.8%) and the Republic of Korea (32.6%). The utilization rate of mobile phones is around the same in Japan and the United States at a little less than 70%, and it is 29.6% in the Republic of Korea.

The rate of introducing telework is the highest in the

Figure 1-3-7 Comparison among Japan, the United States, and the Republic of Korea as to the introduction of ICT systems by type of operations
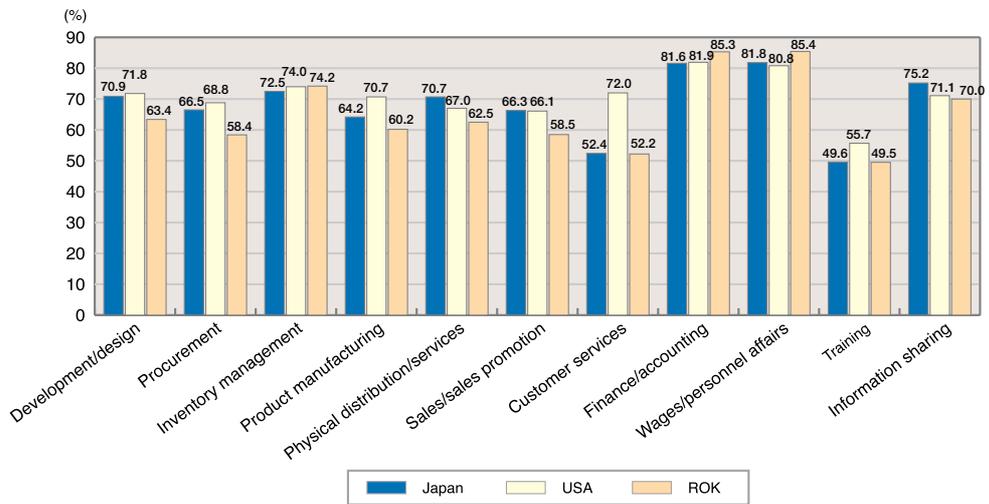
Source: "Survey on the Current Status of ICT Use by Companies" (Web Survey)

### Figure 1-3-8 Purpose for introducing ICT systems (reducing costs/improving operational efficiency)

Japan　USA　ROK
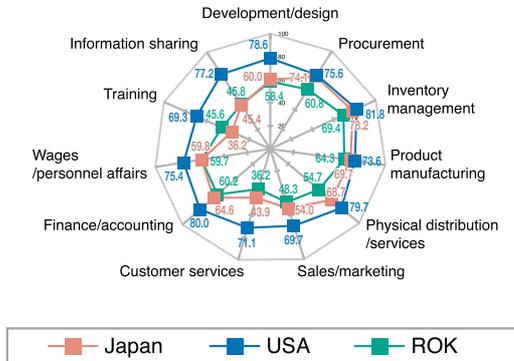
Figure 1-3-9 Purpose for introducing ICT systems (expanding sales/increasing added value)

Japan　USA　ROK
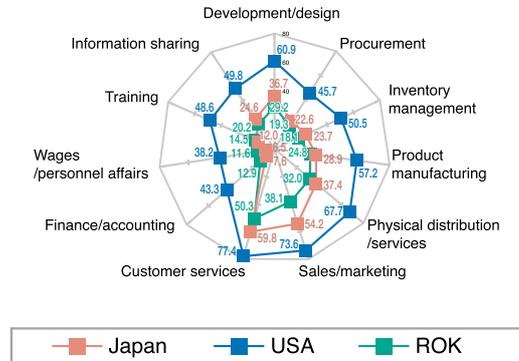
Figure 1-3-10 Efforts toward increasing effectiveness of ICT system investment

Japan　USA　ROK

* The percentage of companies that answered "sufficient efforts are made" or "some efforts are made."
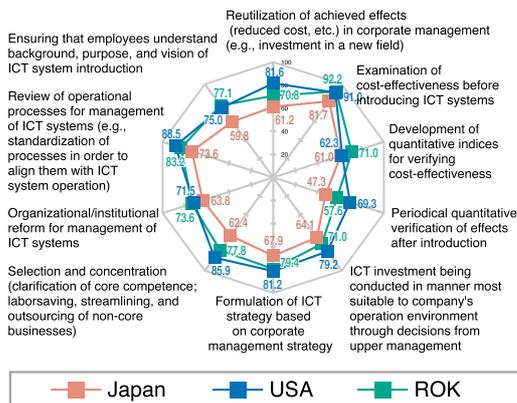
Figure 1-3-11 Effects of introducing ICT system
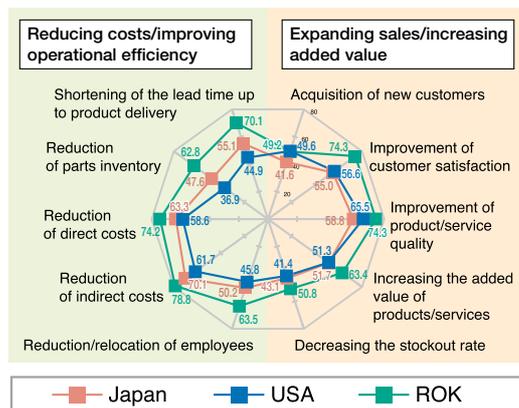
Japan　USA　ROK

* The percentage of companies that answered "sufficient effect was observed" or "some effect was observed."

Source for Figures 1-3-8 and 1-3-11: Survey on the Current Status of ICT Use by Companies (Web Survey)

Figure 1-3-12 Implementation of e-commerce via PCs/mobile phones

	Currently implementing	Scheduled to implement	Considering implementation	Will not implement
E-commerce via PCs				
Japan	28.9	3.9	14.4	52.9
USA	40.2	4.9	6.3	48.6
ROK	24.9	8.3	12.4	54.5
E-commerce via mobile phones				
Japan	9.1	5.1	20.5	65.3
USA	12.7	2.2	13.7	71.4
ROK	8.4	8.2	14.8	68.6
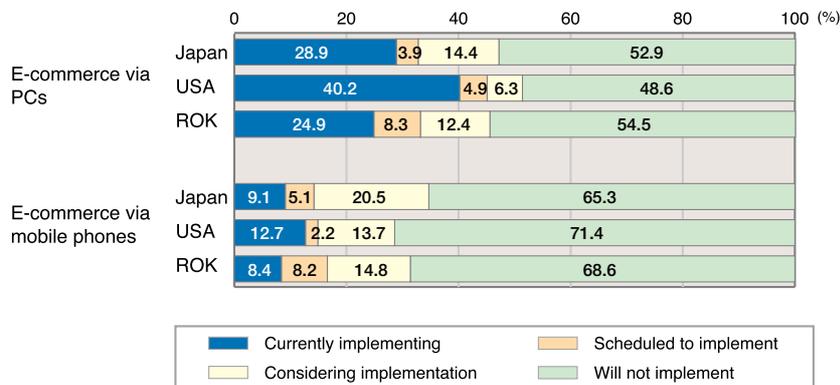
Source: Survey on the Current Status of ICT Use by Companies (Web Survey)

United States at 68.9%, followed by the Republic of Korea (21.2%) and Japan (14.7%) **(Figure 1-3-13)**. The rate of introducing open source software (OSS) as the server OS is the highest in the United States at 33.0%, while the rate was 21.0% in Japan and the Republic of Korea **(Figure 1-3-14)**.

With respect to the shift from mainframe systems to open systems, companies that "already conducted full replacement/[are] considering full replacement" account for 21.9% in the Republic of Korea, 20.1% in the United States, and 17.7% in Japan. Companies that "already conducted partial replacement/[are] considering partial replacement" account for 45.6% in Japan, 43.6% in the Republic of Korea, and 36.4% in the United States. Companies "continuing to use mainframes" account for 34.7% in the United States, 31.8% in Japan, and 26.0% in the Republic of Korea **(Figure 1-3-15)**.

The utilization rate of ASP services is the highest in the Republic of Korea at 24.4%, followed by the United States (20.5%) and Japan (12.6%), while that of iDC services is the highest in the Republic of Korea at 27.9%, followed by Japan (12.5%) and the United States (10.8%) **(Figure 1-3-16)**.

Figure 1-3-13 Introduction of telework

Japan: Already introduced 14.7 | Not introduced, but have a concrete plan to introduce 19.6 | Neither introduced nor have a concrete plan to introduce 65.8
USA: 68.9 | 10.5 | 20.5
ROK: 21.2 | 17.7 | 61.1

(0 20 40 60 80 100 %)

- Already introduced
- Not introduced, but have a concrete plan to introduce
- Neither introduced nor have a concrete plan to introduce
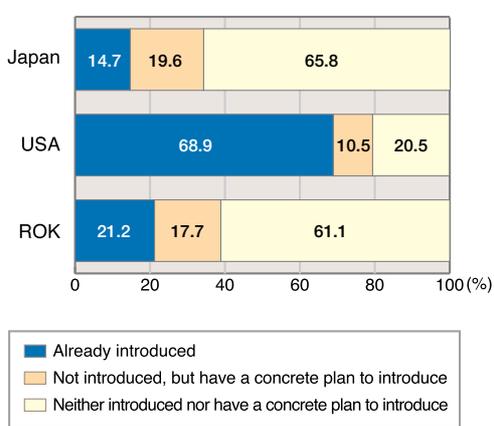
Figure 1-3-14 Introduction of OSS (Linux, FreeBSD, etc.) as the server OS

Japan: 21.0 | 7.6 | 14.6 | 22.1 | 20.2 | 14.5
USA: 33.0 | 5.7 | 10.6 | 9.8 | 25.8 | 15.2
ROK: 21.0 | 4.7 | 12.9 | 16.8 | 33.1 | 11.5

(0 20 40 60 80 100 %)

- Already introduced
- Scheduled to introduce
- Considering introduction
- Not considering introduction, but interested
- Not going to introduce
- Don't know
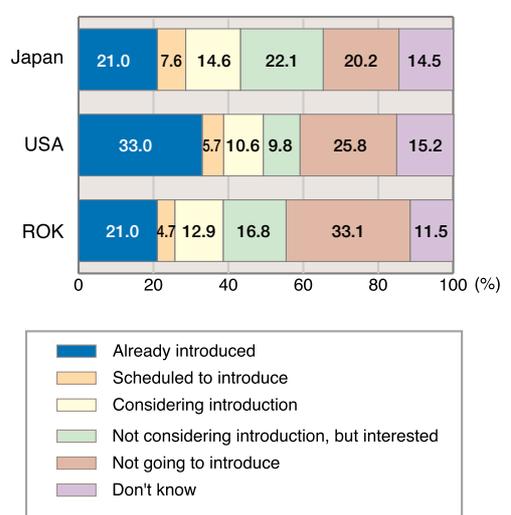
Source for Figures 1-3-13 and 1-3-14: Survey on the Current Status of ICT Use by Companies (Web Survey)

### Figure 1-3-15 Status of the shift from mainframes to open systems

Japan: 4.9 | 5.3 | 12.4 | 22.6 | 23.0 | 31.8
USA: 8.8 | 6.6 | 13.5 | 17.0 | 19.4 | 34.7
ROK: 8.5 | 10.2 | 11.7 | 31.1 | 12.5 | 26.0

(0 20 40 60 80 100 %)

- Adopted open systems from the start
- Already conducted full replacement
- Considering full replacement
- Using both mainframes and open systems
- Considering using both mainframes and open systems
- Continuing to use mainframes
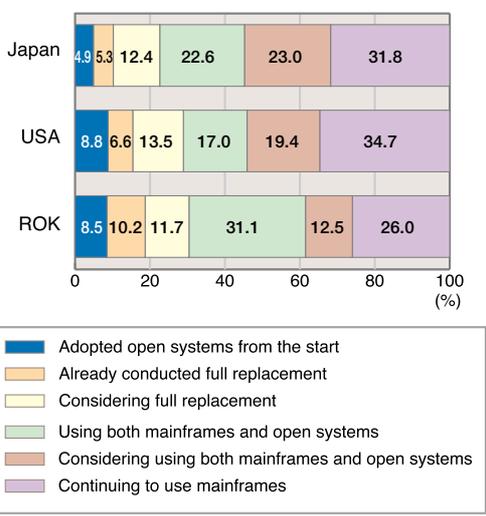
Figure 1-3-16 Status of use of ASP and iDC services

ASP
Japan: 12.6 | 5.8 | 10.2 | 16.1 | 35.0 | 20.2
USA: 20.5 | 4.0 | 5.6 | 6.8 | 35.6 | 27.5
ROK: 24.4 | 3.9 | 9.3 | 14.0 | 38.8 | 9.7

iDC
Japan: 12.5 | 4.1 | 9.2 | 12.7 | 40.6 | 20.9
USA: 10.8 | 4.8 | 4.7 | 4.6 | 50.2 | 24.9
ROK: 27.9 | 3.4 | 9.2 | 13.9 | 38.6 | 6.9

(0 20 40 60 80 100 %)

- Already introduced
- Scheduled to introduce
- Considering introduction
- Not considering introduction, but interested
- Not going to introduce
- Don't know
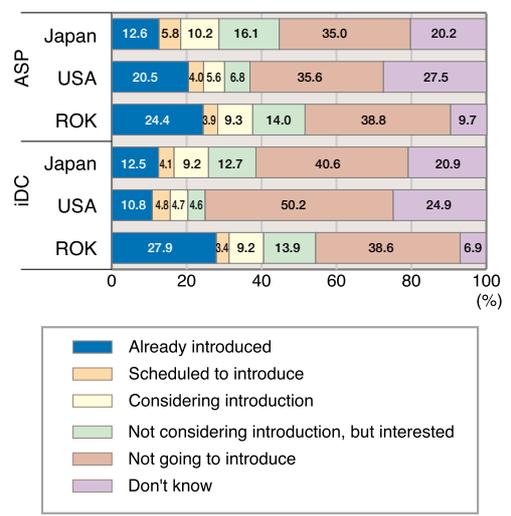
Source for Figures 1-3-15 and 1-3-16: Survey on the Current Status of ICT Use by Companies (Web Survey)

Section 4

Network Infrastructure Supporting u-Japan

1 Progress of broadband

The number of broadband subscribers reached 18.66 million at the end of December 2004, increasing by 36.5% over the previous year. In this manner, broadband is continuing to expand steadily **(Figure 1-4-1)**. Among the broadband subscribers, 13.33 million subscribe to DSL, 2.87 million to cable Internet, and 2.43 million to FTTH. Thus, DSL subscribers account for 71.4% of broadband subscribers.

Looking at the transition in the quarterly net increase of subscribers in 2003 and 2004, DSL subscribers decreased from 1.377 million in the January-March 2003 term to 522 thousand in the October-December 2004

term, while FTTH subscribers increased from 99 thousand to 401 thousand during the same period. Therefore, FTTH is expected to further spread in the future **(Figure 1-4-2)**.

When making international comparison of broadband diffusion, the number of broadband subscribers in 2003 was the highest in the United States with 27.15 million subscribers, followed by Japan (14.92 million subscribers), the Republic of Korea (11.18 million subscribers), and China (10.52 million subscribers). Meanwhile, the broadband penetration rate in 2003 was the highest in the Republic of Korea at 23.3%, followed by Hong Kong (18.0%) and Canada (14.7%). The penetration rate in Japan was 11.7%, raising its rank to sev-

Figure 1-4-1 Transition in the number of broadband subscribers

(thousand subscribers)
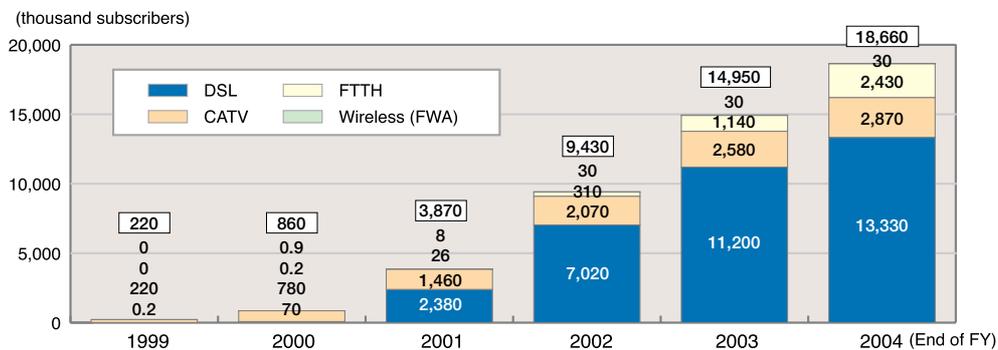
Notes:
The values for 2004 are those as of the end of December.
Broadband: Total for FTTH, DSL, cable Internet, and wireless (FWA)

Figure 1-4-2 Net increase in the number of DSL/FTTH subscribers

(thousand subscribers)
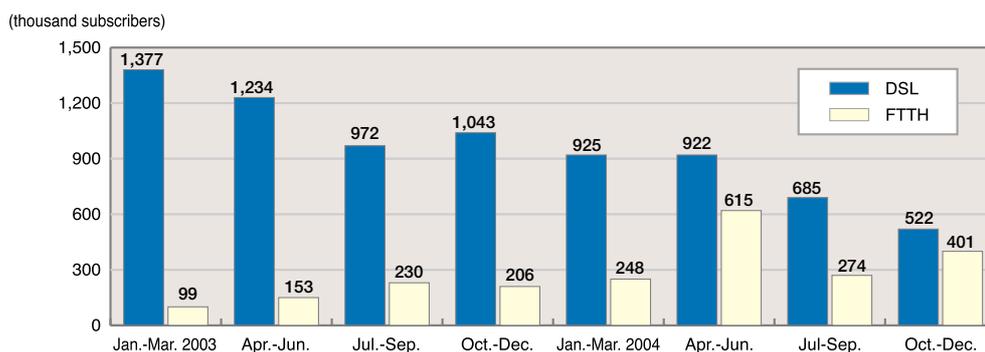
enth place from ninth place in 2002 **(Figure 1-4-3)**.

When the DSL and cable Internet fees in various countries are compared by converting them into fees per 100 kbps, the fees in Japan are the lowest at 0.06 dollars, followed by the Republic of Korea (0.24 dollars), Sweden (0.24 dollars), and Taiwan (0.44 dollars) **(Figure 1-4-4)**.

2 Progress of mobile communications

The number of mobile phone subscribers at the end of FY 2004 was 87 million (increasing by 6.7% over the previous year), continuing to increase but slowing down. The number of mobile phone Internet (Internet access services using mobile phones) subscribers was 75.15 million (increasing by 7.8% over the previous year), accounting for 86.4% of mobile phone subscribers **(Figure 1-4-5)**.

With regard to third-generation mobile phones, the NTT DoCoMo group started W-CDMA services in October 2001 for the first time in the world, then the KDDI group started CDMA2000 services in April 2002

and J-Phone (currently Vodafone) started W-CDMA services in December of the same year. The number of third-generation mobile phone subscribers at the end of FY 2004 reached 30.35 million (increasing by 81.8% over the previous year), accounting for 34.9% of mobile phone subscribers **(Figure 1-4-6)**.

The rate of Internet users using wireless LAN is 17.1%, exceeding the 15.1% in the United States and the 7.3% in the Republic of Korea.

3 Progress of IP networks

The utilization rate of IP phones in households increased by 5.4 points from 7.3% in 2003 to 12.7% in 2004. In addition, up to 69.1% of households plan the introduction, so IP phones are expected to spread further in the future **(Figure 1-4-7)**. As for the toll-cutting effect of IP phones, 46.0% of the users recognized a toll-cutting effect, while 16.6% recognized no changes in tolls **(Figure 1-4-8)**.

The communications services that are most widely used as trunk systems for corporate communications networks are "IP-VPNs" at 24.7%, followed by "Internet

Figure 1-4-3 International comparison of the number of broadband subscribers and the penetration rate (2003)
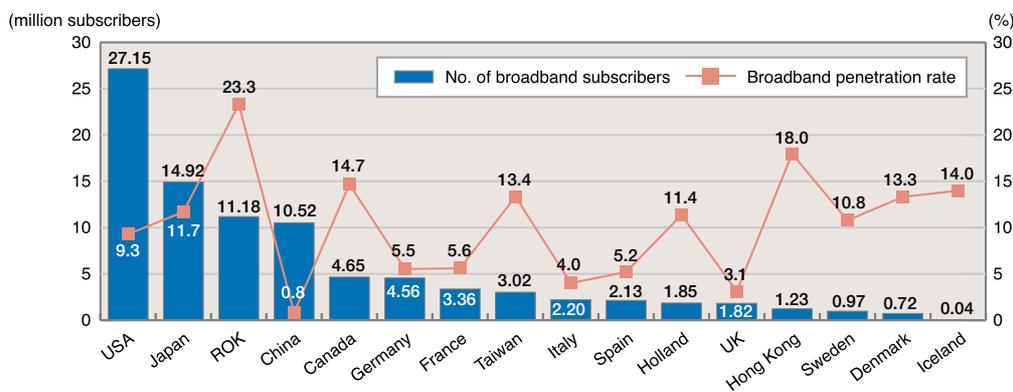
Figure 1-4-4 International comparison of broadband fees (fees per 100 kbps; 2003)
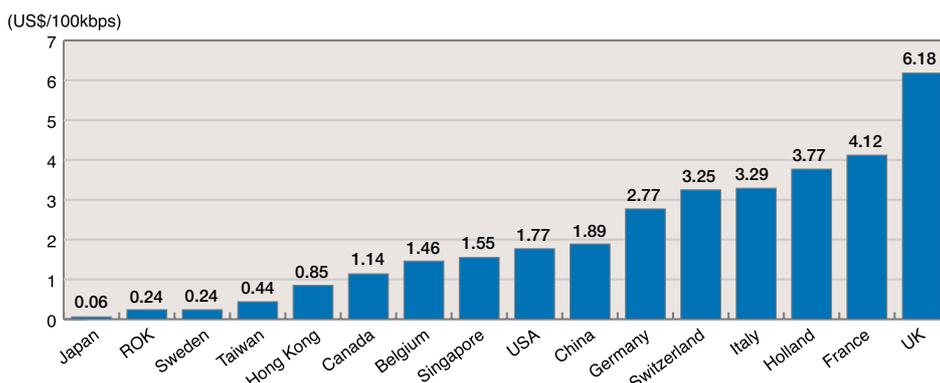
Source for Figures 1-4-3 and 1-4-4: Produced from on ITU, The Portable Internet (September 2004)

Figure 1-4-5 Transition in the number of mobile phone subscribers

(million subscribers)
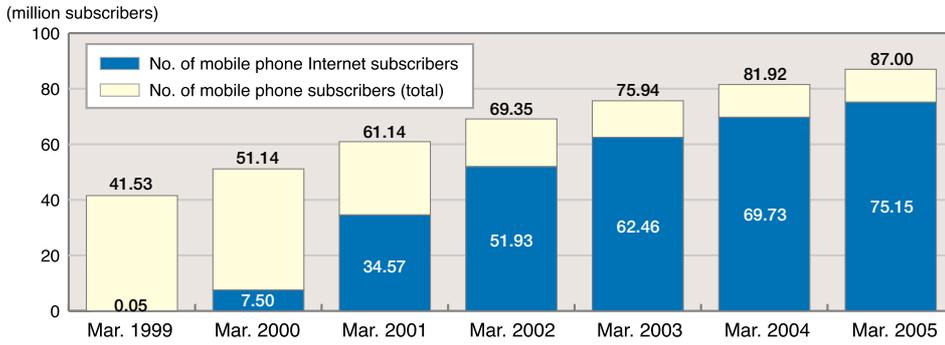
* The number of mobile phone Internet subscribers indicates the number of subscribers to i-mode,
EZweb (including former EZaccess), and Vodafone Live! (including former J-Sky) services provided by mobile phone carriers.

Produced from materials from the Telecommunications Carriers Association

Figure 1-4-6 Transition in the number of third-generation mobile phone subscribers

(million subscribers)
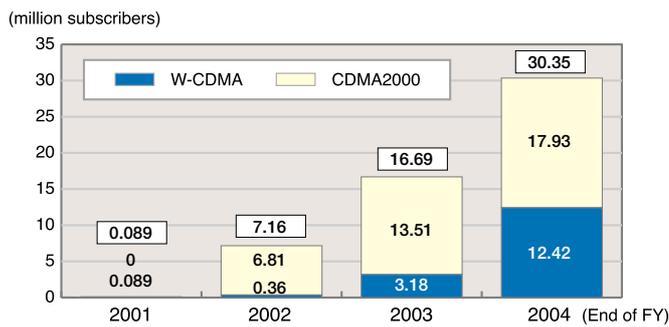
Produced from materials from the Telecommunications Carriers Association

Figure 1-4-7 IP phone utilization rate for households

Already introduced　Plan to introduce
Not introduced　Unknown
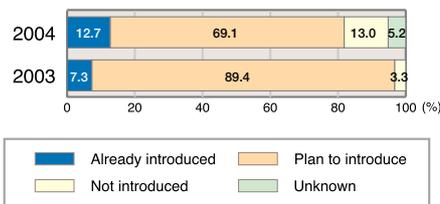
* The option "plan to introduce" was added
in the 2004 survey.

Figure 1-4-8 Toll-cutting effect of IP phones

About 10%　About 20%
About 30%　More than 30%
No change　Don't know
Un known
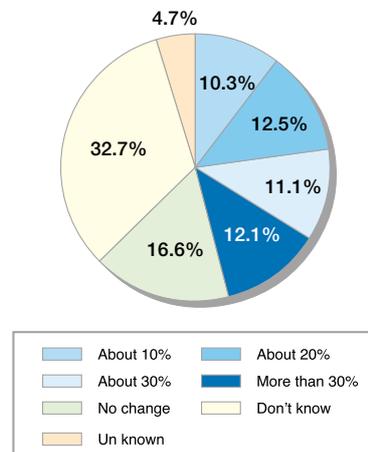
Source for Figures 1-4-7 and 1-4-8: MIC, Communications Usage Trend Survey

VPNs" (18.3%) and "dedicated lines" (15.1%). Compared to 2003, the use of "IP-VPNs" and "Internet VPNs" increased, while the use of "dedicated lines" and other services decreased. This suggests that IP networks are being increasingly used as trunk systems **(Figure 1-4-9)**.

4 Diffusion of terrestrial digital broadcasting

Terrestrial digital broadcasting, which was launched in three metropolitan areas (Kanto, Chukyo, and Kinki) in December 2003, has been steadily expanding its service areas. The shipment volume of receivers supporting terrestrial digital broadcasting also increased rapidly. The cumulative shipment volume at the end of April 2005 reached 4,335,000 units **(Figure 1-4-10)**.

5. Japan's advantage in information and communications equipment and technology

The areas of ICT R&D that should be particularly emphasized in promoting construction of a ubiquitous network society in the future are: (i) new-generation network technology; (ii) universal communications technology; and (iii) ICT for safety and security.

A survey was conducted on Japanese ICT engineers concerning the advantages of Japan, North America, Europe, and Asia in major core technology in these three areas. As a result, many responded that Japan had an advantage in FTTH, next-generation mobile phones, real-world networked robots, high-definition imaging technology, home networks, and mobile equipment technology, while many responded that North America had an advantage in the area of ICT for safety and security, such as IP traceback technology, automated management of network building/operation, and adhoc sensor networks **(Figure 1-4-11)**.

Figure 1-4-9 Services used for trunk systems of corporate communications networks

Year	Wide area Ethernet	IP-VPN	Internet VPN	Dedicated line	Frame relay	Cell relay	Dial-up	Other	Unknown (don't know)	No answer
2004	13.8	24.7	18.3	15.1	3.2	4.1	0.5	1.8	2.1	16.4
2003	12.4	22.6	13.8	21.8	6.5	1.3	7.2	2.4	3.7	8.4
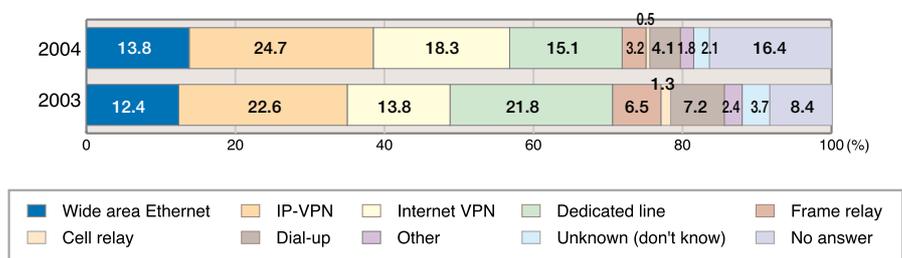
Source MIC, Communications Usage Trend Survey

Figure 1-4-10 Shipment volume of receivers supporting terrestrial digital broadcasting

(million units)

	Up to Dec. 2003	Jan.-Mar. 2004	Apr.-Jun. 2004	Jul.-Sep. 2004	Oct.-Dec. 2004	Jan.-Mar. 2005	Apr. 2005
Shipment volume	0.736	0.336	0.516	0.689	0.885	0.683	
Cumulative shipment volume	0.736	1.072	1.588	2.277	3.162	3.845	4.335
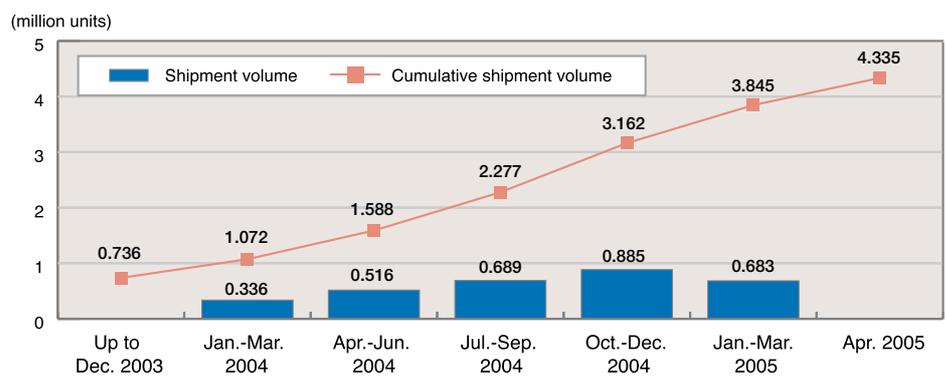
Produced from materials from the Japan Electronics and Information Technology Industries Association

Figure 1-4-11 International comparison of the advantages in ubiquitous network related technology

		Japan	North America	Europe	Asia	Other	Don't know
New-generation network technology	Next-generation mobile phones	62.3	15.2	8.7	0.7		13.0
	FTTH	54.3	23.8	1.9			20.0
	Optical switching/routing technology	33.3	42.3	0.9			23.4
	XoIP technology	27.5	54.2	2.3	0.8		15.3
	Technology of common core networks for fixed-line and mobile communications	27.5	35.3	9.8	1.0		26.5
	Next-generation wireless IP networks	24.8	52.1	1.7	4.3		17.1
	Ultrahigh-speed (1 Gbps) wireless LAN/PAN technology	22.1	57.5	0.9			19.5
	Content/ semantic routing technology	21.4	47.3	3.6			27.7
	Quantum communications and cryptography	20.0	40.0	11.3			28.7
Universal communications technology	Real-world networked robots	73.7	8.5	1.7			16.1
	Home networks	69.2	19.5	0.8			10.5
	High-definition imaging technology	67.3	13.3				19.5
	Mobile equipment technology	63.2	14.9	5.3	0.9		15.3
	CDN technology for high-definition images	60.7	22.4				16.8
	Speech recognition/understanding technology	42.3	35.8	1.6			20.3
	RFID tag data management systems	41.5	41.5	1.5	0.8		14.6
	Content development technology	19.8	55.4	0.8			24.0
	Digital rights management infrastructure	17.0	58.5	1.9			22.6
ICT for safety and security	Infrastructure for biometric authentication	27.4	52.2	0.9			19.5
	Data mining for sensor networks	23.3	48.3	0.8			27.5
	Automated management of network building/operation	15.8	62.4	1.0	1.0		19.8
	Adhoc sensor networks	14.2	62.5	4.2	0.8		18.3
	IP traceback technology	8.1	71.7	1.0			19.2

Source: Survey on Trends Concerning a Ubiquitous Network Society

Section 5

Challenges Toward Achieving u-Japan

1 Safe and secure ICT use

(1) ICT security incidents experienced by individuals and companies

Among PC Internet users, 86.5% experienced ICT security incidents during 2004. The most frequently occurring incident was "spam" at 72.4%, followed by "discovery of a virus" (43.1%) and "virus infection" (20.3%).

A similar trend was observed in the United States and the Republic of Korea as well. About 90% of PC Internet users experienced some ICT security incidents, and the most frequently occurring incidents were in the order of "spam," "discovery of a virus," and "virus infection." Looking at the individual types of incidents, "virus infection" was most frequently observed in the

Republic of Korea at 44.8%, followed by the United States at 35.8% and Japan at 20.3%. In the United States, where phishing has grown into a social problem recently, "phishing mail" was experienced by 36.7% of users, which is higher than the 9.7% in Japan and the 11.6% in the Republic of Korea **(Figure 1-5-1)**.

(2) Virus and unauthorized access

According to two companies aggregating and publishing virus incident reports, the number of virus incidents reported during 2004 was 121,404, which is about three times higher than the 43,384 incidents observed during 2001 **(Figure 1-5-2)**. In 2004, new viruses including "Netsky" and "Bagle" spread widely.

Figure 1-5-1 ICT security incidents experienced by PC Internet users
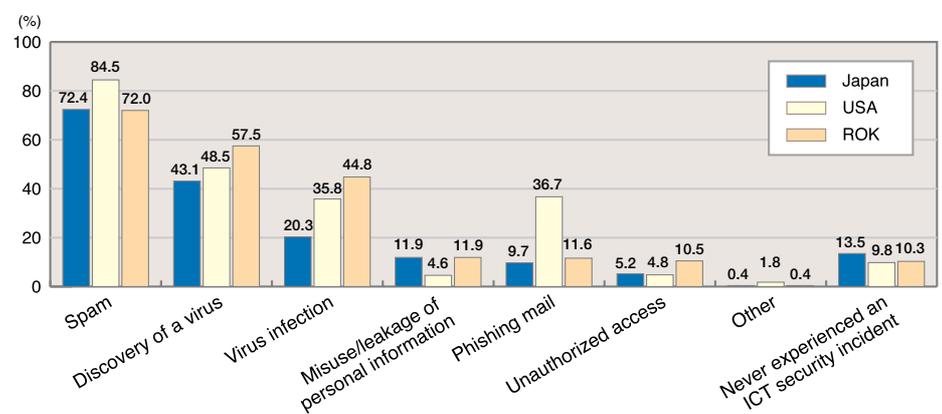
Source: Survey on Networks and People's Lives (Web Survey)

**Figure 1-5-2 Transition in the number of virus incidents reported**
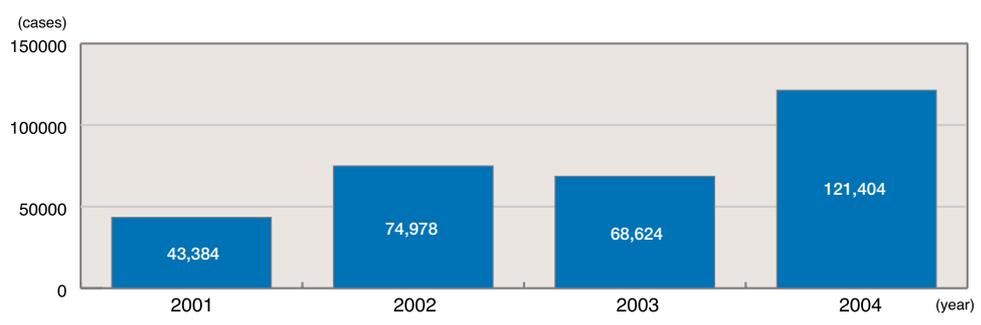
Source: Survey on Networks and People's Lives

Among Internet users, 93.0% take some measure against viruses and unauthorized accesses. The measure most frequently taken is "using anti-virus software" at 63.1%, followed by "using caution when opening attached files and HTML e-mail messages" (57.4%).

A similar trend is observed in the United States and the Republic of Korea as well. More than 90% of Internet users take some measure, and the most frequently taken measures include "using anti-virus software" and "using caution when opening attached files and HTML e-mail messages." Overall, Internet users in the United States are taking the strongest measures, followed by users in Japan and users in the Republic of Korea **(Figure 1-5-3)**.

Figure 1-5-3 Anti-virus measures and measures against unauthorized access taken by Internet users
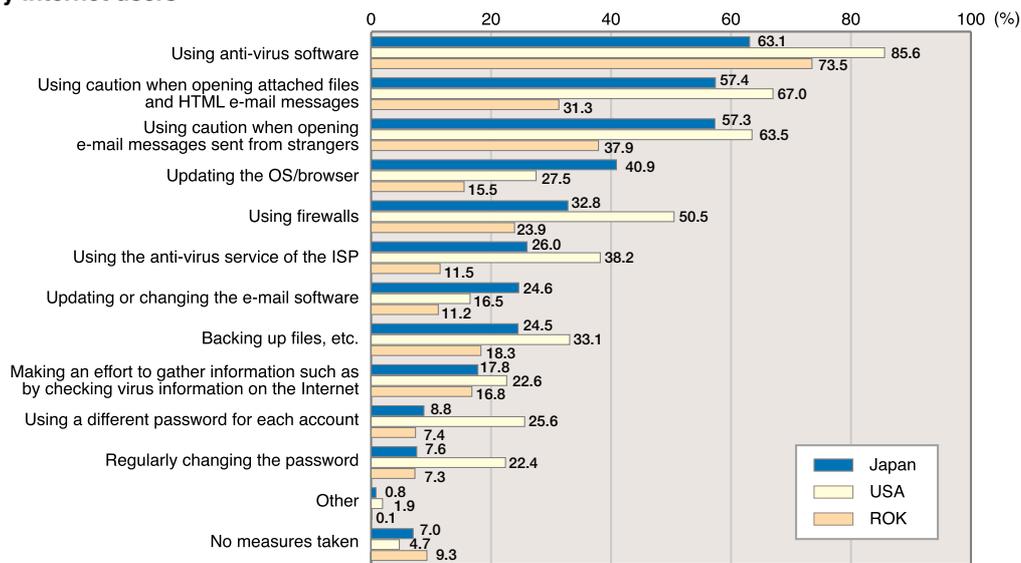
Source: Survey on Networks and People's Lives (Web Survey)

Figure 1-5-4 IT security measures taken by companies

Source: Survey on the Current Status of ICT Use by Companies (Web Survey)

Companies taking some measure against ICT security incidents account for 99.1%. The most frequently taken measure is "installing a virus-checking program on the PC or other terminals" at 75.3%, followed by "installing a virus-checking program on the server" (70.2%), "educating employees on the matter" (59.1%), and "setting up firewalls" (58.3%).

Most companies in the United States and the Republic of Korea also take some measures. When comparing the status of implementation of concrete measures, the implementation rate is high for U.S. companies in most of the measures. In particular, U.S. companies are advanced in operational and institutional measures such as "educating employees on the matter," "formulating a security policy," and "conducting security audits" **(Figure 1-5-4)**.

(3) Spam

Indeed, 86.6% of PC users and 72.6% of mobile phone users have received spam in the past. While more than 70% of PC and mobile phone spam recipients receive five or less spam messages per day, more than 10% of PC spam recipients receive 11 messages or more per day.

In the United States, only 8.2% of mobile phone users have received spam because mobile phone e-mail is not in wide use, but 97.6% of PC Internet users have received spam, and nearly half of them receive 11 spam messages or more per day. In the Republic of Korea, 94.6% of PC Internet users and 79.0% of mobile phone users have received spam, and the situation is generally the same as in Japan **(Figure 1-5-5)**.

(4) Protection of personal information

Among Internet users, 51.5% take some measures for protecting personal information. Specifically, the most frequently taken measure is "avoid disclosing personal information on the Internet" at 33.9%, followed by "avoid careless downloading of programs" (25.1%) and "refrain from entering credit card numbers" (23.7%) **(Figure 1-5-6)**.

The Law Concerning the Protection of Personal Information came into force in April 2005, and business operators handling personal information became obligated to use personal information only for the specified purposes of use, acquire such information through appropriate means, and take measures for safely managing such

Figure 1-5-5 Number of spam messages received per day
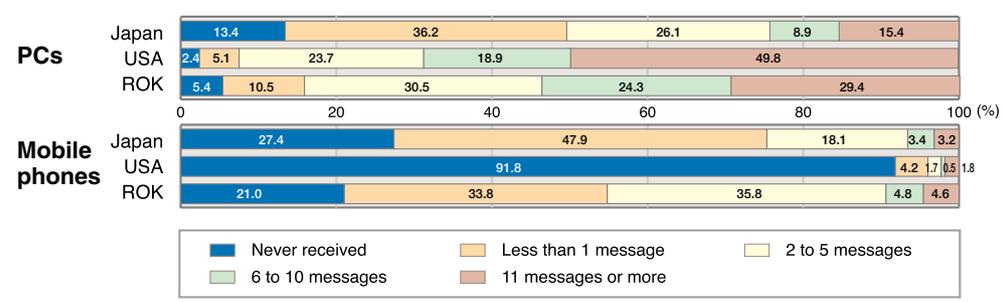
Source: Survey on Networks and People's Lives (Web Survey)

Figure 1-5-6 Internet users' measures for protecting personal information (multiple responses possible)
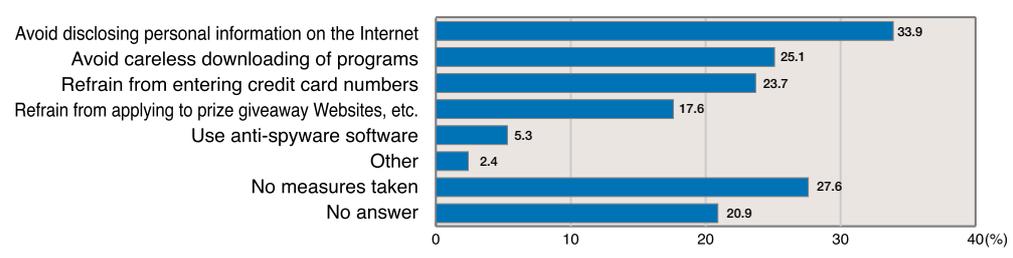
Source: MIC, 2004 Communications Usage Trend Survey

information.

In these circumstances, companies' efforts for protecting personal information have made progress. When comparing companies' methods of managing personal information in FY 2003 and FY 2004, greater efforts are observed for all items. In particular, a considerably larger number of companies have come to "formulate personal information management rules and notify them to persons concerned" (49.7%) and "limit use and viewing of customers' personal information" (40.5%) **(Figure 1-5-7)**.

On the whole, measures against information leakage by insiders have also made progress. The most frequently taken measures are to "limit entrance into the server room" (74.7%) and "limit the removal of laptop PCs and OA equipment from premises" (49.7%) **(Figure 1-5-8)**.

(5) Challenges toward a ubiquitous network society
The "Policy Roundtable for Realizing a Ubiquitous Network Society" divided the challenges in the shadow of a ubiquitous network society into ten major divisions such as privacy protection and security, and listed ten individual challenges for each division, presenting a total

of 100 challenges. Then, in order to clarify the priority challenges among these 100, it conducted a questionnaire survey on experts and extracted priority challenges based on two perspectives: the degree of impact on society and the degree of insufficiency of measures. As a result, 21 priority challenges were extracted including "vulnerability of ICT networks," "regional gaps in advanced services," and "illegal business practices using networks" **(Figure 1-5-9)**.

While a ubiquitous network society has positive effects such as enhancing safety, security, and convenience in people's lives, it also has negative effects such as the possibility of generating new problems related to privacy or security. Therefore, Internet users in Japan, the United States, and the Republic of Korea were asked whether or not construction of a ubiquitous network society, which has both positive effects and negative effects, should be promoted. In the three countries, the most chosen answers were those in support of promoting construction of a ubiquitous network society, but differences were observed in awareness in each country. In Japan, the percentage of respondents who answered

Figure 1-5-7 Companies' methods of managing personal information (multiple responses possible)
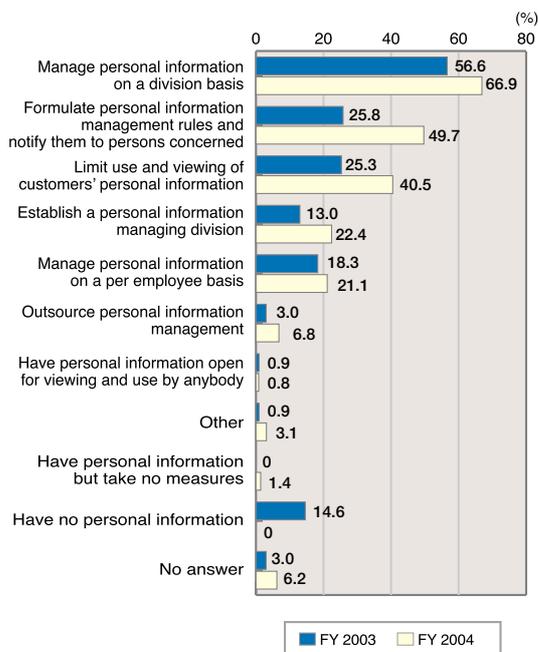
Figure 1-5-8 Measures against information leakage by insiders (multiple responses possible)
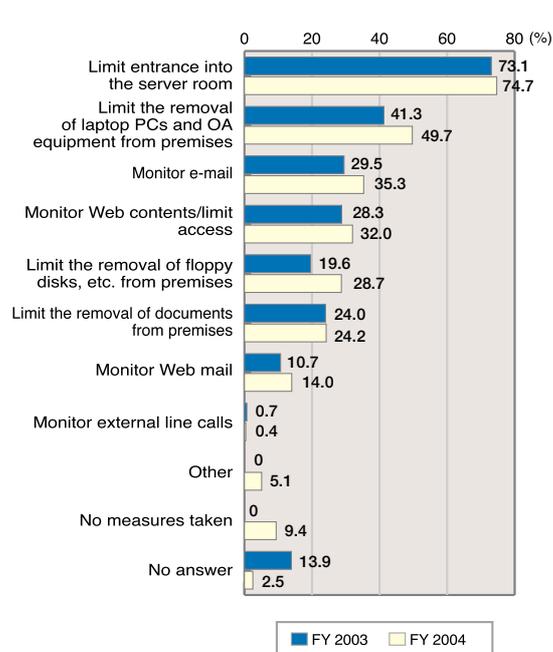
Source for Figures 1-5-7 and 1-5-8: Survey on the Status Trend of Information Security

Figure 1-5-9 Priority challenges toward a ubiquitous network society

Degree of impact on society (%)

Computer viruses
Illegal business practices using networks
Copyright protection of digital assets
Protection of personal information owned by publicinstitutions and business operators
Vulnerability of ICT networks
Safety of electronic payment
Spam
Utilization of ICT in medical care
Convenience of e-government
Regional gaps in advanced services
Privacy in medical care
Utilization of ICT in education
Impact on developmentof youth
Lack of secondary use of contents
Standardization of operations among local governments
Priority of ICT in Social capital improvement
Lack of skillful ICT human resources
Intellectual property strategy
Ethics in ICT research and development
Gaps in e-local governments
ICT security awareness among general users

Degree of insufficiency of measures

Source: MIC, Final Report of the Policy Roundtable for Realizing a Ubiquitous Network Society

Figure 1-5-10 Approval/disapproval for construction of a ubiquitous network society

Japan	8.8	75.1	3.8	12.2
USA	5.6	39.0	23.4	31.9
ROK	23.4	55.2	3.4	18.0

■ Positive effects are overwhelmingly large, so the construction should be actively promoted.

☐ Positive effects are larger, but the construction should be promoted carefully, taking the necessary time to prevent negative effects.

☐ Negative effects are larger, so the construction should not be promoted.

☐ Don't know.
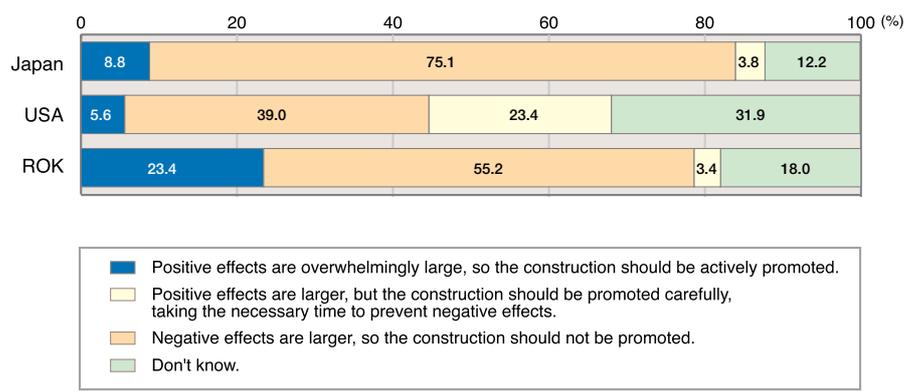
Source: Survey on Networks and People's Lives (Web Survey)

"positive effects are larger, but the construction should be promoted carefully, taking the necessary time to prevent negative effects" was 75.1%, which is higher than in the United States and the Republic of Korea. In the United States, the percentage of respondents who answered "negative effects are larger, so the construction should not be promoted" was 23.4%, which is considerably higher than in Japan and the Republic of Korea. In the Republic of Korea, the percentage of respondents who answered "positive effects are overwhelmingly large, so the construction should be actively promoted" was 23.4%, which is higher than in Japan and the United States **(Figure 1-5-10)**. This indicates that careful promotion is supported in Japan, a considerable number of people oppose the construction in the United States, and proactive promotion is supported in the Republic of Korea.

Furthermore, those who answered that construction of a ubiquitous network society should be promoted were asked about measures against the negative effects. In Japan, the United States, and the Republic of Korea, the most chosen answer was "while the government and companies need to take institutional/technical measures in advance in order to prevent negative effects, the responsibility that users take for themselves is also indispensable." Meanwhile, in Japan and the Republic of Korea, more respondents answered "the government and

companies need to take ex ante complete institutional/technical measures in order to prevent negative effects, and should avoid relying on user responsibility as much as possible" than in the United States. In the United States, more respondents answered "it will be sufficient to take ex-post measures whenever a problem arises" than in Japan and the Republic of Korea. The awareness of user responsibility tends to be stronger in the United States than in the other two countries **(Figure 1-5-11)**.

Figure 1-5-11 Opinions on measures against the negative effects of a ubiquitous network society

Japan: 3.6 | 56.0 | 36.5 | 4.0
USA: 14.4 | 58.5 | 21.3 | 5.8
ROK: 8.7 | 51.8 | 37.2 | 2.3

- ■ It will be sufficient to take ex-post measures whenever a problem arises.
- □ While the government and companies need to take institutional/technical measures in advance in order to prevent negative effects, the responsibility that users take for themselves is also indispensable.
- □ The government and companies need to take ex ante complete institutional/technical measures in order to prevent negative effects, and should avoid relying on user responsibility as much as possible.
- □ Don't know.

Source: Survey on Networks and People's Lives (Web Survey)

2 Current status of the digital divide

Looking at the diffusion of major broadband services by population of the municipality, ADSL is diffused to 100% of municipalities with a population of over 50,000, 92.3% of those with a population of over 5,000 and up to 10,000, and 54.7% of those with a population of 5,000 or less. Meanwhile, FTTH is diffused to 93.1% of municipalities with a population of over 50,000, but only to 11.6% of those with a population of over 5,000 and up to 10,000, and 3.0% of those with a population of 5,000 or less. In this manner, there are gaps in diffusion between municipalities according to their population, and the gaps are considerably wide for FTTH **(Figure 1-5-12)**.

3 Backbone circuit

(1) Surge in Internet traffic

The MIC conducted an aggregation and trial calculation of Japan's Internet traffic data with the cooperation of seven ISPs (September - November 2004) and the academic world.

The traffic of broadband subscribers has been constantly increasing. Since the difference between the downloading traffic (traffic from ISPs to subscribers) and the uploading traffic (traffic from subscribers to ISPs) is becoming smaller, ISPs can no longer construct their networks with a premise that "general users mainly use downloading services" **(Figure 1-5-13)**.

Since traffic exchanges between the seven ISPs and other ISPs are more frequently conducted through private peering, etc. than through major domestic Internet Exchanges (IXs), the traffic data for major domestic IXs

are insufficient for estimating the total amount of traffic exchanged **(Figure 1-5-14)**.

When the total amount of traffic of broadband subscribers in Japan was estimated based on the seven ISPs' 41.1% share of the total "In" traffic at the major domestic IXs (the total amount of traffic coming in from subscribers to the major domestic IXs) and the 133.0 Gbps traffic from the broadband subscribers of the seven ISPs, it was assessed that traffic exceeding 300 Gpbs (133.0 Gpbs / 41.1% = 323.6 Gpbs) is moving on the Internet.

(2) Concentration of Internet traffic exchanges in Tokyo

According to a questionnaire survey conducted by the MIC on the 14 major ISPs (February 2004), IXs' total circuit capacity for public peering was 230.4 Gpbs, out of which about 80% were concentrated in Tokyo. Meanwhile, the total circuit capacity for private peering was 278.2 Gpbs, out of which about 90% were concentrated in Tokyo.

Due to the concentration of traffic exchanges in Tokyo, various problems are being pointed out, such as deterioration of broadband services in the region and the vulnerability to cyber attacks and large-scale disasters. While many major ISPs and IXs conduct traffic exchanges not only in Tokyo, but also in Osaka, etc. for risk management, it would also be necessary to examine the technical problems in shifting to a distributed network mode in order to achieve stable operation of the whole Internet.

Figure 1-5-12 Diffusion of broadband services by population of the municipality (as of the end of March 2005)
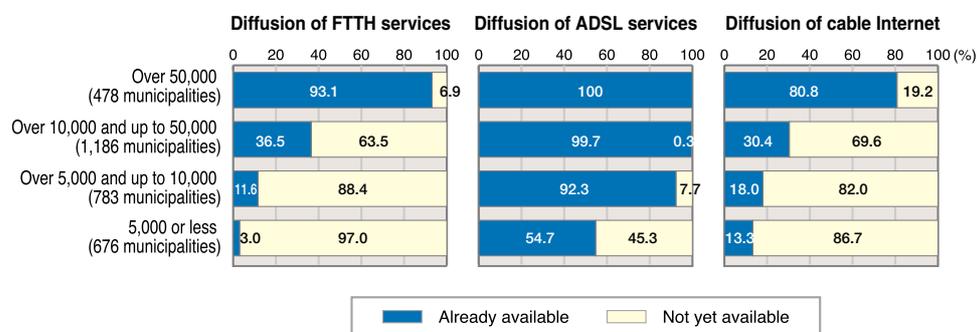
* The broadband services refer to ADSL, FTTH, cable Internet, and FWA.

**Figure 1-5-13 Traffic by type of subscribers
(transition in the average monthly traffic from September to November 2004; Gbps)**

	In*	Out*
Broadband (DSL, FTTH) subscribers of seven ISPs	98.1 → 108.3 → 116.0	118.1 → 124.9 → 133.0
Other (dial-up, dedicated line, data center) subscribers of four ISPs	14.0 → 15.0 → 16.2	13.6 → 14.9 → 15.6

* "In" indicates the traffic coming in from subscribers to the seven (or four) ISPs (uploading),
  while "Out" indicates the traffic going out from the seven (or four) ISPs to subscribers (downloading).

**Figure 1-5-14 Traffic exchanges between ISPs (transition in the average monthly
traffic from September to November 2004; Gbps)**

	In*	Out*
Seven ISPs' traffic exchanges through major domestic IXs	35.9 → 36.3 → 38.0	30.9 → 31.8 → 33.0
Seven ISPs' other modes of traffic exchanges with domestic ISPs	48.2 → 53.1 → 55.1	37.8 → 41.6 → 43.3
Seven ISPs' traffic exchanges with overseas ISPs	25.3 → 27.7 → 28.5	14.1 → 15.4 → 16.7

* "In" indicates the traffic coming in to the seven ISPs, while "Out" indicates the traffic going out from the seven ISPs.