Chapter 1

Feature: Building a "New, Japan-Inspired IT Society"

Introduction

The theme of this white paper is "Building a 'New, Japan-Inspired IT Society'." The objective is to study the direction of the new IT society that Japan should aim for by analyzing the current status of information and communications in Japan based on data. The new image of an IT society will not only be a goal for Japan, but the image of an IT society that Japan will introduce to the world.

Japan presently faces major problems both in economic and social aspects. In terms of the economy, Japan is suffering from a prolonged economic slump and marks the lowest-level economic growth rate among major developed countries. Japan's international competitiveness ranking also dropped to 11th place in 2003 despite holding the top position for five consecutive years from 1989 in the ranking released by the International Institute for Management Development (IMD). In terms of society, the population is rapidly aging, and Japan is expected to become the country with the most aged population in the world by 2005.

On the other hand, Japan maintains high potential in educational standards and technological capabilities, and has fine culture and art. According to the OECD's Program for International Student Assessment (PISA), Japanese students' performance for mathematical and scientific literacy belongs to the highest-ranking group. Furthermore, over 80% of citizens hold the recognition that Japan has excellent culture and art ("Public Opinion Poll on Social Awareness 2000," Cabinet Office).

In order for Japan to resolve the present problems by making use of these potentials, it is indispensable to reform the conventional social and economic structures, and information and communications can play a significant role in bringing about such structural reform.

In the past, the world of the Internet and other information and communications had been lead by the United States. However, some areas of the conventional IT industry and the PC-centered IT infrastructure are showing their limits and presenting problems as represented by the collapse of the IT bubble economy and the digital divide issue.

In the meantime, Japan set up a goal to "become the world's most advanced IT nation" by 2005 in the e-Japan Strategy formulated in January 2001, and strategic efforts have been made both by the public and private sectors. As a result, Japan has not only caught up with other IT-advanced countries in terms of developing the broadband user environment, but it has achieved providing low broadband rates and optical fiber services, while it has succeeded in leading the world in the mobile communications field, such as the mobile Internet. In this manner, Japan is in the process of shifting from a catch-up phase to a frontrunner phase.

In light of these circumstances, it would be necessary for Japan to realize a "New, Japan-Inspired IT Society" under the joint effort of the public and private sectors by making the most of Japan's strengths, and overcome the economic and social problems the country faces.

Based on the above problem consciousness, this year's white paper features analyses of the direction of a "New, Japan-Inspired IT Society" from the following aspects: the infrastructure aspect in Section 1; the economic/business aspects in Section 2; the lifestyle/social/administrative aspects in Section 3; the cultural/Internet content aspects in Section 4; and the information security aspect in Section 5. In particular, selective analysis is conducted through international comparison and quantitative analysis with regard to the characteristics of the information and communications field in Japan (advantages and problems), the role information and communications could play in developing the Japanese economy and society, and the problems impeding the actual use while the information and communications infrastructure is being developed.

Section 1

Development of the World's Highest-Level Network Infrastructure

1. Growth of Information and Communications

(1) The world's top-level broadband

(i) Increase in the broadband user population

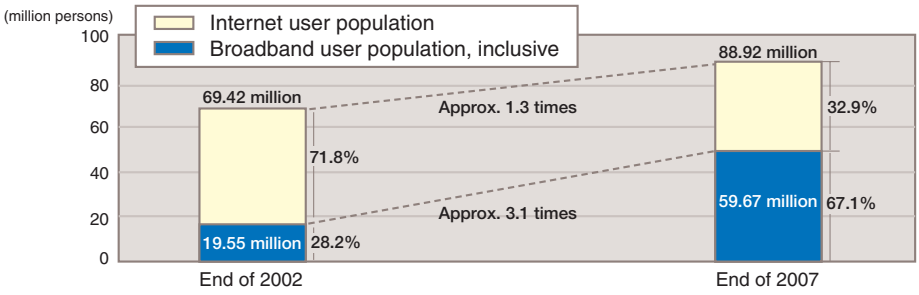
The development and use of broadband has rapidly grown in Japan, almost reaching the world's highest level. The user population for broadband services (Fiber to the Home (FTTH), digital subscriber line (DSL), cable Internet, and wireless (fixed wireless access (FWA), etc.)) was estimated to be 19.55 million as of the end of 2002. Broadband users account for 28.2% of the 69.42 million Internet users, indicating that already one or more out of four Internet users are using broadband (Figure 1-1).

According to a prediction of the future broadband user population based on the transitions in the number of broadband subscribers and other data, the Internet user population is expected to become 88.92 million (penetration rate: 69.6%), among which 59.67 million (penetration rate: 46.7%) will be broadband users, in the next five years (by 2007). This would mean that 67.1% of the entire Internet user population will be using broadband, and the mainstream of Internet use will switch from narrowband to broadband (**Figure 1-1**).

(ii) Economic effect of broadband

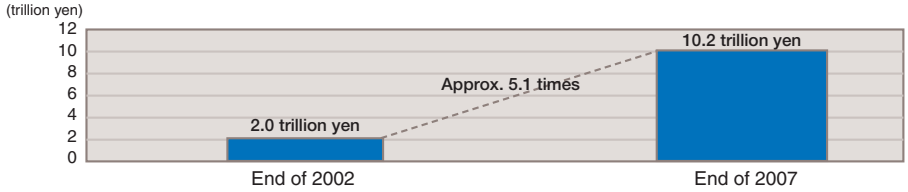
The diffusion of broadband has a large impact on the Japanese economy. As the broadband user population increases, the demand for broadband equipment and terminals will increase. In addition, due to an increase in the opportunity to conduct online shopping, broadband is expected to boost e-commerce transactions by individuals. Business operators will establish new systems and networks to deal with the increase in the broadband user population. Furthermore, broadband is expected to bring about new businesses that utilize the broadband quality that allows high-speed data communications.

Figure 1-1: Current Status and Prediction of the Broadband User Population



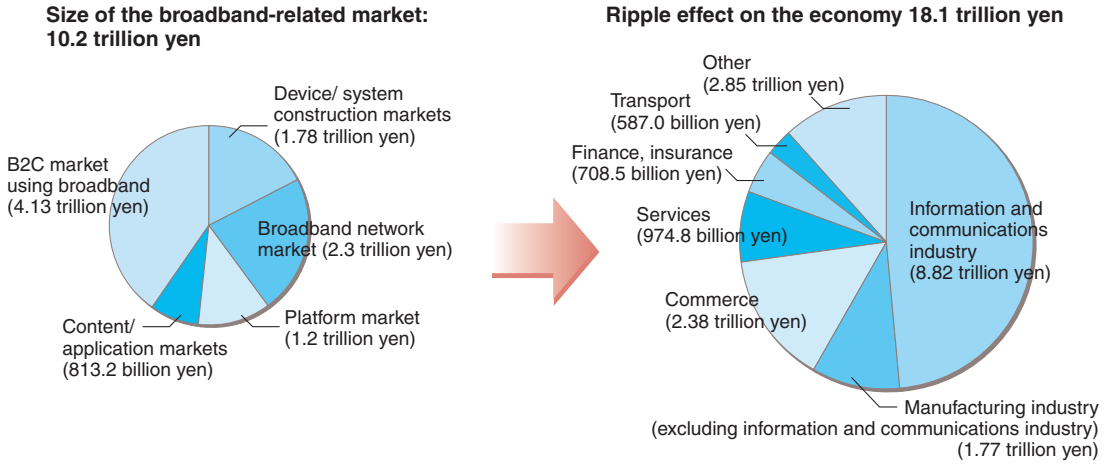
Source: "Communications Usage Trend Survey in 2002," MPHPT.

Figure 1-2: Current Status and Prediction of the Broadband Market Size



Source: "Survey on Utilization of IT in Business Management."

Figure 1-3: Ripple Effect of Broadband on the Economy (Value of production induced in the respective industries in 2007)



Source: "Survey on Utilization of IT in Business Management."

When such growth of demand pertaining to broadband diffusion is estimated by categorizing the broadband-related markets into (1) device/system construction markets, (2) network market, (3) platform market, (4) content/application markets, and (5) B2C e-commerce market, the size of the broadband-related markets is expected to increase from 2.0 trillion yen in 2002 to 10.2 trillion yen, which is about 5.1 times, in 2007. As for the production inducement effect of broadband diffusion on various industries, the ripple effect of broadband on overall industries is estimated to become 18.1 trillion yen in 2007 (**Figures 1-2 and 1-3**).

(iii) Trends in broadband rates

The continuing fall of broadband rates is one of the causes for the rapid broadband diffusion. When rates for DSL and cable Internet services in various countries are compared by converting them into rates per 100 kbps, the rates in Japan are found to be the lowest in the world (**Figure 1-4**).

(iv) International comparison of the status of broadband diffusion

In an international comparison of the status of broadband diffusion, Japan ranks third in terms of the number of subscribers, following 18.7 million subscribers in the United States and 9.86 million subscribers in the Republic of Korea, indicating the soaring number of subscribers in Japan (**Figure 1-5**).

(2) Full-fledged diffusion of IP telephones

Use of IP telephones has suddenly increased with the diffusion of broadband. Following the launch of IP telephone services using dedicated IP networks as the relay networks in April 2001, IP telephone services that use broadband circuits as the access circuits began to be provided in full fledge in 2002 and 2003.

According to an intention survey of broadband users, the number of subscribers to IP telephones using broadband circuits was estimated to be approximately 2.27 million as of the end of 2002. The number of subscribers may exceed 20 million by 2007, growing by about 10 times to approximately 22.73 million persons (**Figure 1-6**).

(3) Steady diffusion of the Internet

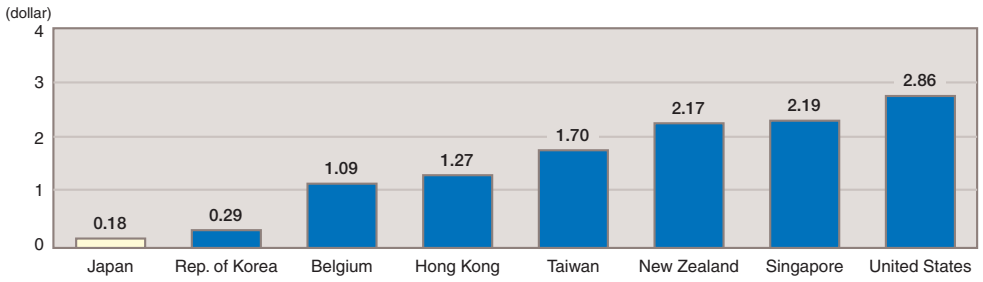
The Internet user population is constantly increasing in Japan. The Japanese Internet user population as of the end of 2002 was estimated to be 69.42 million (a 24.1% increase over the previous year), increasing by 13.49 million in one year. The Internet penetration rate exceeded half the population for the first time at 54.5%, indicating that at least one out of two persons in Japan is using the Internet (**Figure 1-7**).

(4) Development of the mobile Internet

The number of subscribers to the mobile Internet (Internet connection services using cell phones) in Japan exceeded 60 million in only four years from the start of the services in February 1999, reaching 62.46 million at the end of fiscal 2002 (Figure 1-8). The proportion of mobile Internet subscribers among the total number of cell phone subscribers was 82.6%, more than 80%, as of the end of fiscal 2002 (**Figure 1-8**).

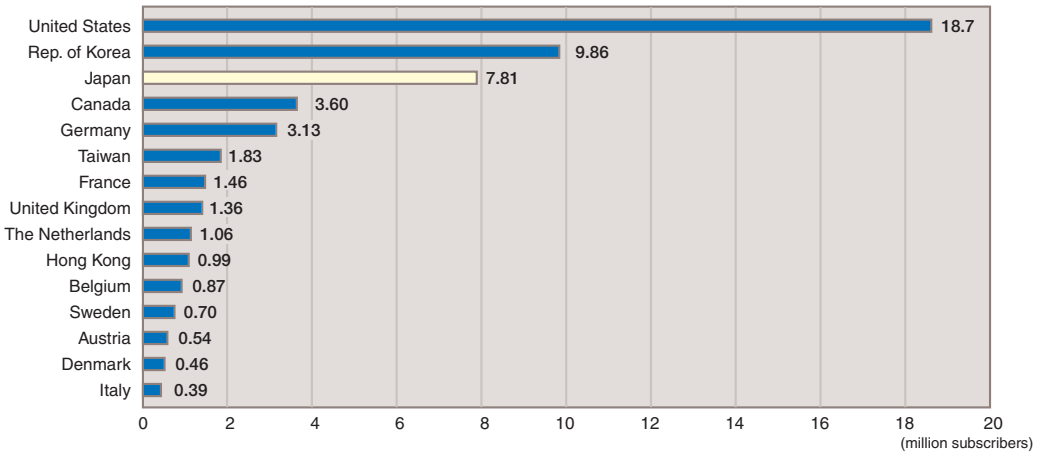
Looking at the status of mobile Internet diffusion in

Figure 1-4: International Comparison of Broadband Rates (rates per 100 kbps; end of fiscal 2002)



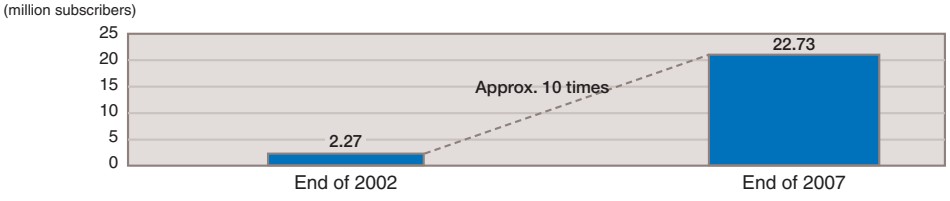
Note: Comparison was made by deriving the rates for 100 kbps based on the speeds and rates of DSL and cable Internet services provided in the respective countries.
Source: Based on "Strategic Planning Workshop on Promoting Broadband Background Paper," ITU.

Figure 1-5: International Comparison of the Number of Broadband Subscribers (top 15 countries/regions; end of 2002)



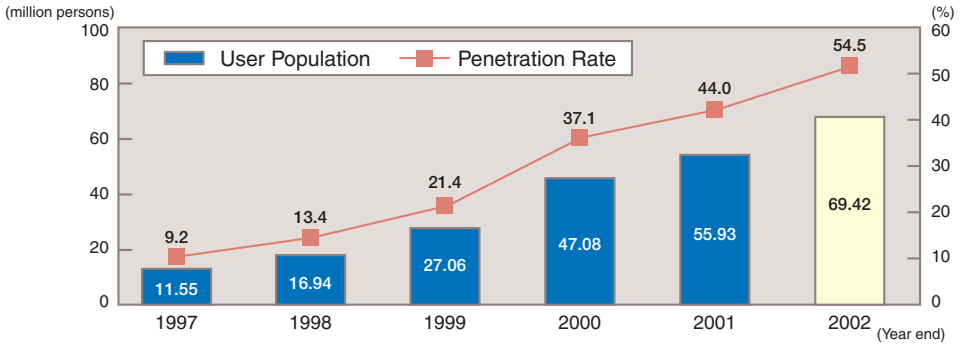
Source: Based on "Strategic Planning Workshop on Promoting Broadband Background Paper," ITU.

Figure 1-6: Current Status and Prediction of the Number of Subscribers to IP Telephones Using Broadband Circuits



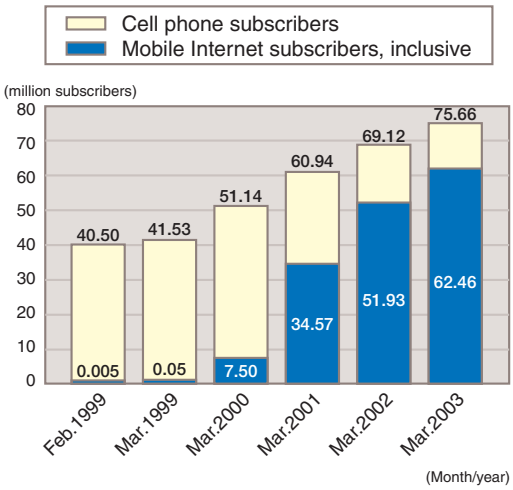
Source: "Survey on Information and Communications Infrastructure."

Figure 1-7: Transitions in the Internet User Population and Penetration Rate



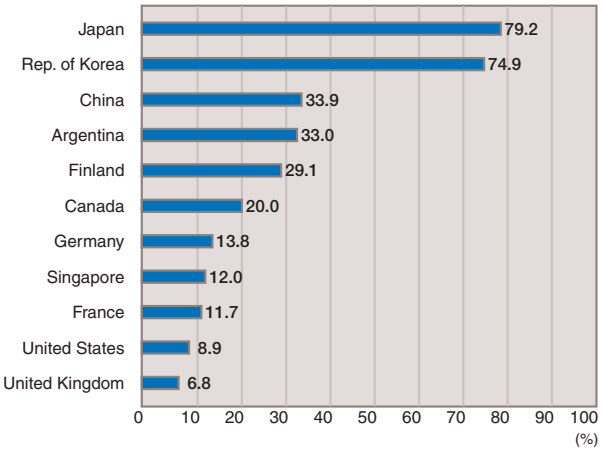
Source: "Communications Usage Trend Survey," MPHPT.

Figure 1-8: Transitions in the Number of Subscribers to Cell Phones and Mobile Internet



* The number of mobile Internet subscribers is the total number of subscribers to I-mode, EZweb (including former Ezaccess), and J-Sky services provided by cell phone carriers.

Figure 1-9: Cell Phone Internet Compatibility Rate in Major Countries (Proportion of mobile Internet subscribers among the total number of cell phone subscribers) (end of Sep. 2002)



* The figures show the proportion of mobile Internet subscribers among the total number of cell phone subscribers for major carriers in the respective countries.

Source: Based on "3G Mobile" materials.

various countries, the proportion of mobile Internet subscribers among the total number of cell phone subscribers for major carriers in the county is the highest for Japan with 79.2%, followed by the Republic of Korea and China. Thus, Asian nations are leading the diffusion of the mobile Internet (**Figure 1-9**).

(5) Spread of third-generation cell phones

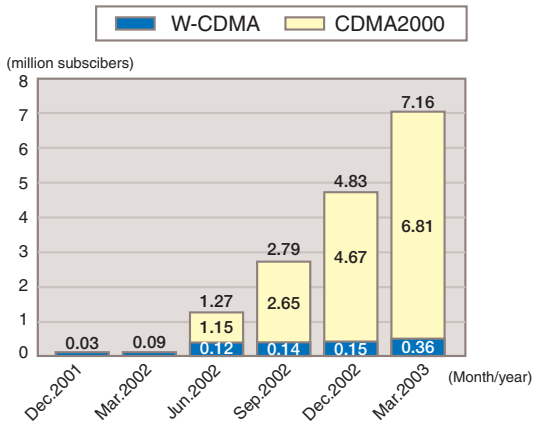
The number of subscribers to third-generation telephones was 7.16 million at the end of fiscal 2002, showing a steady increase. The majority of these, specifically, 6.81 million subscribers are those for phones using the CDMA2000 technology adopted by the KDDI group (**Figure 1-10**).

In terms of the number of subscribers, Japan, which provides services in both W-CDMA and CDMA2000 centering on the world's common spectrum, the 2GHz band, and the Republic of Korea, which provides services only in CDMA2000 in the 800 MHz band, command about a 60% share of the world's total subscribers of approximately 44 million (**Figure 1-11**).

(6) Digitization of broadcasting

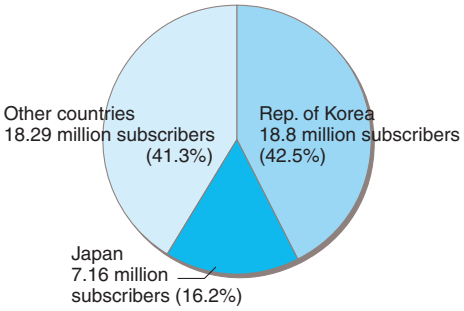
On December 1, 2003, terrestrial digital television broadcasting will be launched in the Kanto, Chukyo, and Kinki regions from Tokyo, Nagoya, and Osaka. With this,

Figure 1-10: Transitions in the Number of Subscribers to Third-Generation Cell Phones



Source: Based on materials of the Telecommunications Carriers Association (TCA)

Figure 1-11: Number of Subscribers to Third-Generation Cell Phones in the World (end of FY 2002)



Sources: Based on a survey by CDG, a survey by QUALCOMM, and materials of TCA.

digital broadcasting will be realized for all broadcasting media—terrestrial, satellite, and cable television broadcasting. Since television is diffused to almost all households in Japan, by promoting digitization of terrestrial television broadcasting, it will be possible to establish a "home infrastructure for supporting the IT Revolution" allowing all people to use advanced services easily through the widely penetrated television.

The first digital broadcasting in Japan started with the launch of CS digital broadcasting using a communication satellite (CS) in June 1996. In July 1998, digital broadcasting became available also on cable television in some areas. In December 2000, BS digital broadcasting using a broadcasting satellite (BS) commenced, and 110ºE CS digital broadcasting started in March 2002. In fall of 2003, test broadcasting of terrestrial digital sound broadcasting is scheduled to start in Tokyo and Osaka for the purpose of understanding the demands and developing broadcasting services. In December 2003, terrestrial digital television broadcasting is planned to be launched in the three major regions.

The shift from analog broadcasting to digital broadcasting is also planned to be completed by 2011 except for terrestrial radio broadcasting. CS broadcasting has already mostly completed the shift to digital broadcasting. Of BS analog broadcasting, the shift will complete for analog Hi-Vision broadcasting by 2007 and for other broadcasting (NHK-1, 2, WOWOW) by 2011. Terrestrial analog television broadcasting is planned to be terminated in 2011. It is aimed that almost all cable televisions be also digitized by 2010.

2. Prospects and Problems of Next-Generation Information and Communications Networks

(1) Next-Generation Ubiquitous Networks

(i) Significance of ubiquitous networks

The information and communications networks that are anticipated to become the mainstream in the next generation are "networks that are usable anytime, anywhere, by anybody" (ubiquitous networks), which are the further developed form of the rapidly disseminating broadband, cellular phones, and digital broadcasting. Ubiquitous networks allow anybody to distribute any kind of information and content from any part of the globe at any time without any restrictions in terms of transmission speed, etc.

Conventional information and communications networks had various limitations, such as spatial/geographical restrictions, restrictions in the receiving devices, restrictions in the selectable networks/terminals/services/contents, restrictions in communication performance, and network risks. However, ubiquitous networks are able to overcome these limitations. The basic concept of ubiquitous networks can be summarized into the five points in **Figure 1-12**.

Moreover, ubiquitous networks will also be able to solve or reduce the economic and social problems Japan is currently facing. Ubiquitous networks will not only [1] make people's daily lives richer in quality and more convenient, but also contribute to innovating social systems by [2] realizing secure societal life, [3] promoting social participation by the disabled and the elderly, and [4] responding to environmental problems. Furthermore, they will contribute to revitalizing the Japanese economy by [5] generat-

Figure 1-12: Basic Concept of Ubiquitous Networks

1. A network environment adaptable to any situation and circumstances (network accessible anywhere)
2. A highly convenient and diverse terminal environment (network accessible from any terminal)
3. An environment that enables the use of all kinds of services and applications (network for universal use)
4. An ultra high-speed network environment allowing concurrent access by a large number of users (network for stress-free access)
5. A secure information access environment (network with high level of security)

Source: "Report by the Study Group on Future Prospects of Ubiquitous Network Technology," MPHPT (June 2002).

ing industries that create new values.

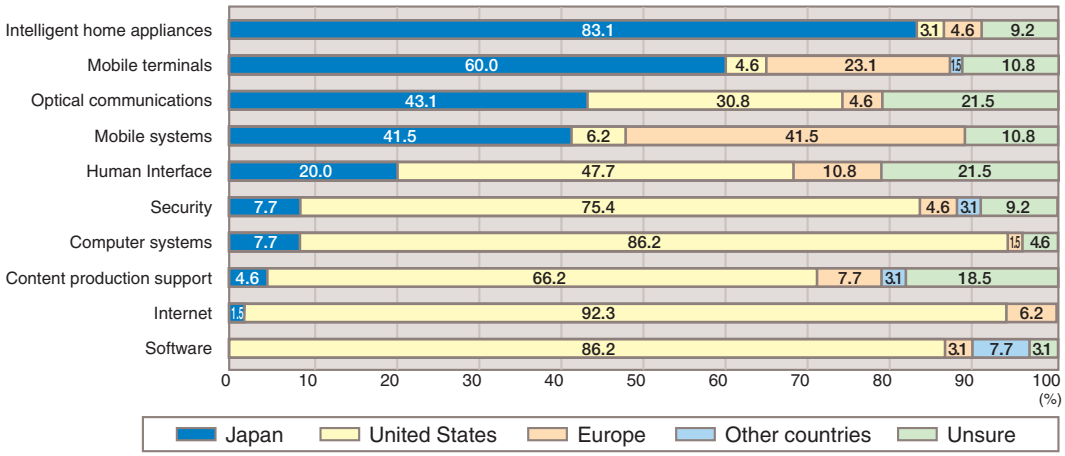
(ii) Securing international competitiveness utilizing Japan's strong fields

In order to realize ubiquitous networks, it is necessary to develop small, easily operable terminals that can be used for long hours, to change the modes of network services according to users, and to develop information and communications technologies for the networks.

When Japanese and overseas information communications researchers were surveyed on the superiority of Japan, the United States, and Europe in terms of information and communications technologies, an outstanding number of respondents answered that the United States was more advanced than the others in terms of software technology, Internet technology, content production support technology, computer system technology and security technology. On the other hand, many answered that Japan was more advanced than others in terms of intelligent home appliances technology, mobile terminal technology, optical communications technology, and mobile system technology (**Figure 1-13**).

In this manner, the United States is superior both in market share and technological development in the area of the conventional PC-centered Internet and technologies of content production and security that are in extension to it. However, the central technologies for ubiquitous networks will be the mobile communications technology for overcoming the spatial and geographical restrictions, the terminal technology for overcoming the restrictions of the receiving devices and of terminals, and the optical technology for overcoming the communication performance. Japan has been promoting farsighted R&D of these technologies under the joint cooperation of the public and private sectors, so Japan has the edge in these fields. If Japan realizes ubiquitous networks ahead of other countries by utilizing these strong aspects, and introduces the model to the world, it would also have the effect of securing international com-

Figure 1-13: International Comparison of Superiority in Information and Communications Technologies



* Japanese and overseas researchers were asked to state which country/region was superior in the respective information and communications technologies.

Source: "Survey on Information and Communications Infrastructure."

petitiveness and making international contribution.

While ubiquitous networks hold enormous possibilities, expansion of networks may also present new problems such as privacy infringement. According to a survey on the intention of using the services and systems realized by ubiquitous networks, the top concern held against ubiquitous networks was "leakage of personal information," indicated by an outstanding proportion, 81.5%, followed by "credibility of the networks" indicated by 52.2%. This indicates that concerns about privacy and information security need to be wiped out in order for ubiquitous networks to be accepted by society.

(2) Burgeoning of next-generation networks

Ubiquitous networks are expected to make dramatic progress until 2005 or 2010, but some burgeoning examples, such as home networks, high-speed wireless access services at "hot spots," and navigational services have already started to penetrate in society.

Due to the trend of owning multiple PCs at home and the diffusion of broadband, more people have come to establish home networks (home LANs) that join the PCs at home either by wire or wireless connection. At the end of 2002, 25.7% of all households owned multiple PCs, and 35.5% of them had home networks. The installation rate of such home networks was 53.1% for broadband user households while it was 33.2% for narrowband user households, suggesting that many users established home networks when they subscribed to broadband services.

In addition, provision of high-speed Internet connection services using wireless LANs is making progress in facilities such as hotels and restaurants and public spaces such as airports and railway stations (these are called "hot spots") to enable out-of-home, high-speed Internet access. In 2002, 8.8% of Internet users used wireless access services at hot spots.

Furthermore, the diffusion of out-of-home Internet access means and global positioning systems (GPS) have given rise to navigational services, which are services accessible anywhere that provide positional information and information on the neighborhood of the current position to give geographical directions for people and cars. Representative navigational services are the positional information services on cell phones as well as the telematics services. "Telematics," which is a term that combines telecommunications and infomatics, is a next-generation information service for cars. Car navigation systems have already become widely diffused, used by 23.8%—nearly a quarter—of all households as of the end of 2002.

(3) Outlook for intelligent home appliances

Provision of intelligent home appliances is now shifting from an experimental phase to a phase of practical application. When intelligent home appliances become available, the individually used home appliances will be connected to each other by networks, and by further connecting them to the Internet though gateways, it will be possible to operate the home appliances from outside and provide network services linked with hardware. For example, it will be possible to provide maintenance services, such as upgrading the software or failure diagnosis of intelligent home appliances, and to provide such data as cooking recipes and television program information for automatic video recording.

As of the end of 2002, households owning Internet-supported television sets were only 3.0% and those that owned other home appliances that could be connected to the Internet were 3.2%, indicating that the full-fledged diffusion of intelligent home appliances has yet to start ("Communications Usage Trend Survey in 2002," MPHPT).

According to a survey on conditions for using intelligent home appliances, most respondents answered that they would "want to purchase if the intelligent home appliances were sold at the same prices as general home appliances" or "want to purchase if the price difference was within an additional 10%."

In addition, questions on the priority conditions for using intelligent home appliances showed the result that it is necessary to eliminate people's concerns about being linked with networks and to secure easy operations in order to diffuse intelligent home appliances.

(4) Wide utilization of wireless tags

A wireless tag is a tag consisting of an IC chip and an antenna, which allows the reading and writing of the identification data stored in the IC chip without touching by use of radio technology. Tags that do not have their own power source are processed by using the electric power of radio waves emitted from the network device, and the process results are transmitted by radio.

One example of widely used wireless tags is "Suica" issued by East Japan Railway Company as a traffic card for automatic ticket gates. The Suica service was launched in November 2001, and the number of users exceeded 6 million persons by April 2003. Wireless tags are also used in ID cards for managing entrance/exit to and from offices and at production sites, and the shipment values of wireless tags are increasing.

Wireless tags are expected to be applied to more extensive fields in the future, but attachment/management of numbers on wireless tags, lowering of unit costs, and the ensuring of privacy and information security have been pointed out as problems to be tackled.

(5) Shift to IPv6

As ubiquitous networks make progress, access termi-

nals, such as intelligent home appliances and wireless tags, are expected to dramatically increase both in number and type. The Internet Protocol version 6 (IPv6) responds to such increase in the number of access terminals and greatly improves convenience for users, so early shift to IPv6 is anticipated.

Japan has conducted various demonstrative experiments toward practical application of IPv6 under the cooperation of industry, universities, and the government. While the number of Japanese Internet service providers (ISPs) and other organizations allocated IPv6 addresses were only five at the end of 1999, the number reached 53 as of the end of fiscal 2002, boasting the largest number of organizations allocated IPv6 addresses in the world. Japan also continues to be a frontrunner in the area of practical application of IPv6 (**Figure 1-14**).

Figure 1-14: International Comparison of the Organizations Allocated IPv6 Addresses