

Japan's National IT Strategy and the Ubiquitous Network

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The term *ubiquitous* has thoroughly penetrated into Japanese society, and most IT (information technology) companies have been promoting ubiquitous-related projects. These activities have begun since the beginning of the 21st century. While the term “ubiquitous” was first used in the United States, the concept of the ubiquitous network was created in Japan. Through independent development, the ubiquitous network is now being established as an independent IT paradigm.

Since 2004, the global evolution of the ubiquitous paradigm outside Japan has become eminent. The most active moves are taking place in Korea, which is evolving the u-Korea promotion strategy. Recently, China and other Asian countries have also started similar activities. The Japanese government made full use of the venue of the World Summit on the Information Society (WSIS) of the United Nations in announcing the prospect of the ubiquitous network society and the “u-Japan Policy.” (u-Japan stands for ubiquitous network Japan.)

In Japan, the ubiquitous network paradigm has been successively adopted as the basic concept of the mid- and long-term vision since 2004: “u-Japan Strategy” as the information and communications policy, “Vision for Information-based Economy and Industries” as the industrial structure policy, “principles for formulating the Basic Policy for Science and Technology” as the science and technology policy and “UNS Strategy Program” as the research and development strategy in the ICT field (UNS stands for ubiquitous network society.)

In view of the actual situation, such as the dissemination of the ubiquitous network paradigm, its global evolution, and its political evolution, the following three points should constitute the core factors of the next-phase national IT strategy to be formulated around the end of 2005: (1) changing the name “e-Japan” to “u-Japan,” (2) shifting the strategy focus from “utilization strategy” to “value creation strategy,” and (3) focusing attention on “measures related to security, privacy and network crime.”

I Penetration of the Ubiquitous Paradigm in Japan

More than five years have elapsed since Nomura Research Institute (NRI) started to address the theme of the ubiquitous network. Various moves have occurred during these five years. The most important among these moves related to the ubiquitous network after the publication of my previous paper, "Ubiquitous Networking: Business Opportunities and Strategic Issues" (*NRI Papers* No. 79, August 2004), included the global evolution of the ubiquitous network paradigm and the contribution to the nation's mid- and long-term information and communications policy, industrial structure policy, science and technology policy, etc.

This paper introduces these two aspects in detail and examines the role that should be played by the ubiquitous network paradigm in the nation's IT¹ strategy, which is now being prepared.

Before discussing these details, this chapter first outlines how deeply the ubiquitous paradigm has penetrated into the society and corporate activities of Japan.

1 Ubiquitous Paradigm Taking Root in Japanese Society

Professor Masahiko Sato of Keio University conducted an interesting survey called "Japanese Switch."² This project used the mobile Internet to ask forced-choice questions, i.e., Yes or No, or A or B, of more than 30,000 ordinary Japanese citizens, and attempted to identify the direction of the concepts of the Japanese people on an almost real-time basis. To the question of "Where do you run if you feel scared while walking at night?" 29 percent of the respondents selected "koban (police station)" and about 70 percent chose "convenience store." To the question of "Do you want to live in Japan in your next life?" 60 percent answered "yes" and about 40 percent selected "no."

As part of the Japanese Switch project, an interesting question of "Do you know what 'ubiquitous' means?" was asked on March 25, 2004. To this question, 24 percent of the respondents answered "yes, I know what it means," and the remaining 76 percent answered "no, what does it mean." These findings indicate that about one-fourth of average Japanese people know the meaning of "ubiquitous."

This question has not been asked of IT specialists or employees of IT companies, such as Sony or Hitachi, but was asked of ordinary Japanese people. Besides, there is a possibility that the respondents who "have heard the term *ubiquitous*, but do not know its meaning" might be included in the 76 percent who selected "no, what does it mean." While this might also happen in Korea, such a situation cannot even be imagined in

other countries. To this extent, the term *ubiquitous* has penetrated into Japanese society.

In my previous papers³ since 2003, the focus remained on the concept of the ubiquitous network. However, the replies of the above 24 percent do not necessarily refer to the ubiquitous network alone, but are based on a comprehensive picture involving a variety of concepts related to ubiquity including "ubiquitous computing" and "the ubiquitous information society."

Accordingly, separate from the ubiquitous network paradigm, this paper refers to overall ubiquitous-related concepts covering extensive fields, such as the ubiquitous network, ubiquitous computing and ubiquitous information society and more than thirty other ubiquitous-related concepts, as the ubiquitous paradigm.

In this sense, that 24 percent of Japanese respondents know the term *ubiquitous* does not necessarily mean that they know of the ubiquitous network paradigm nor does it mean that they have a full understanding of the ubiquitous paradigm. However, these findings clearly reveal that, while almost no Japanese people were familiar with the term *ubiquitous* in 2000, an extremely large number of people now know its meaning.

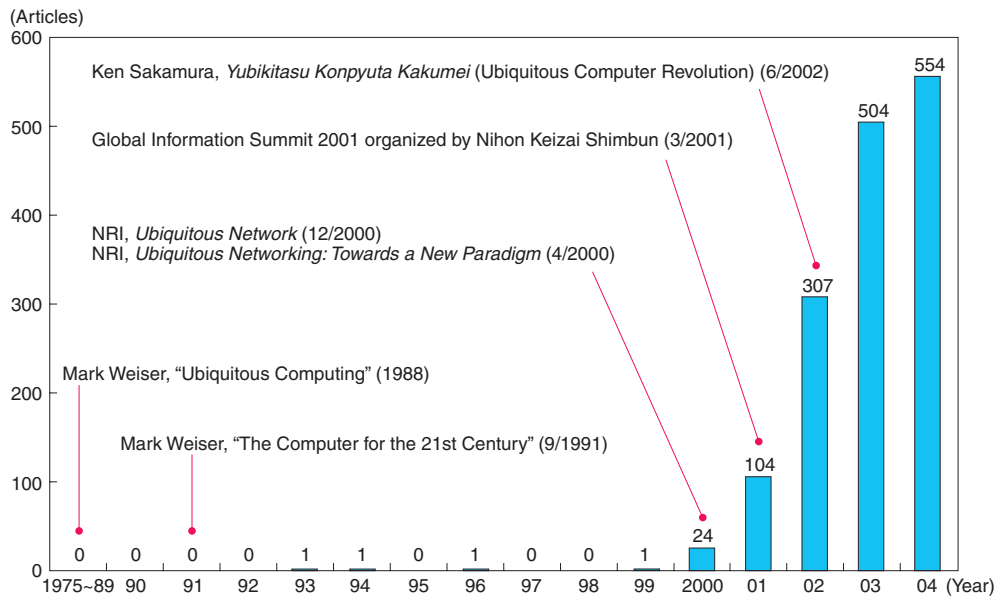
Figure 1 shows the frequency of the appearance of ubiquitous-related articles in three economic newspapers (*Nihon Keizai Shimbun*, *Nikkei Sangyo Shimbun*, *Nikkan Kogyo Shimbun*) and reveals increasing interest in the ubiquitous paradigm in the industrial sector.

In 1988, the term *ubiquitous* was first used in the IT field as a new paradigm. Mark Weiser, a chief technologist at Xerox's Palo Alto Research Center (PARC), first articulated this concept. It was not until 1991 that this term first appeared in a Japanese publication. Weiser's paper published in *Scientific American* was translated and published in *Nikkei Science* (translated by Sho-ichiro Asano).⁴

However, this topic quickly disappeared without being publicized by newspapers and, with few exceptions, it was not until 1999 that any special attention was paid to the term *ubiquitous computing* as advocated by Weiser. While a small number of related articles did appear, most of these were used to explain the concept of a product when Fuji Xerox introduced a new type of photocopier. No signs for the expanded usage of this term were evident.

In contrast, NRI created a new concept that was different from that of Weiser and, in 1999, started research on the ubiquitous network that focuses on the ubiquity of access to networks (especially, the Internet). This concept was first introduced in the form of the paper jointly written by Akihisa Fujinuma and myself and titled "Ubiquitous Networking: Towards a New Paradigm" (*NRI Papers* No. 2, April 2000).

As shown in Figure 1, it was in 2000 that attention started to be given to the ubiquitous theme at least in Japan's industrial sector (as well as the rest of the world). An explanation has frequently been made that

Figure 1. Frequency of Appearance of Ubiquitous-Related Articles in Three Financial Newspapers

Note: The three financial newspapers are *Nihon Keizai Shimbun*, *Nikkei Business Daily* and *Nikkan Kogyo Shimbun*.

this theme has its origin in the concept developed by Weiser and that the concept was exported to Japan. However, Weiser's idea is different from that now being advanced by NRI and is also different from the concept adopted in the government's "u-Japan policy," which is explained in subsequent sections of this paper.

NRI's ubiquitous network theory emerged with the basic aim of improving the international competitiveness of the Japanese IT industry. The background consisted of the extensive penetration of the Internet, the spread of mobile Internet service offered by NTT DoCoMo, which was started in February 1999, and indications that video game machines, TVs, kiosk terminals, etc., could be connected to a network.

The term *ubiquitous* started to take root in Japan at around the same time that NRI commenced research in 1999, began to publicize this concept in 2000 and *Nihon Keizai Shimbun* adopted "Launching the Era of the Ubiquitous Network" as the theme of its forum, "Global Information Summit 2001." As is clear from Figure 1, the term *ubiquitous* started to appear often in publications from around this time.

Another clear fact is that this term began taking root on an accelerating and accumulating basis in Japan's industrial sector in 2000. It is a well-known fact that Professor Ken Sakamura of The University of Tokyo advocated a similar concept by using the phrase "computer anywhere" before Weiser's announcement. Starting around 2002, Sakamura began talking actively about ubiquitous computing, and significantly contributed to the spread of the ubiquitous paradigm.

The frequency of 554 appearances in 2004, as indicated in Figure 1, suggests that executives and businesspersons who read the three newspapers saw more than three ubiquitous-related articles every two days.

Because this figure comes from only newspaper articles, it is thought that people saw this term more often if ubiquitous-related advertisements, which have been rapidly increasing these days, were included.

2 Ubiquitous Paradigm Taking Root in Japanese Companies

Under these circumstances, it was around 2001 that corporate activities dealing with the ubiquitous paradigm began to show vitality. These accelerated activities were first reflected in such occasions as announcements of new products, exhibitions and presentations of related products and solutions at forums targeted at customers and exhibitions at trade shows. Behind these special events, it is assumed that efforts were actively underway at each company including activities to promote research and development and to organize project teams.

In April 2002, such corporate activities were made public. Three companies, i.e., Hitachi, Sony and *Nihon Unisys*, simultaneously announced that they had established new organizations prefixed by the term *ubiquitous*. There must be a specific idea or management strategy behind the creation of an organization prefixed by a term that is not familiar among most people. In the case of exhibiting products at trade shows to test the reaction of people or inaugurating a research and development project within a company, the strategy can be immediately changed if the results were not promising. However, a relatively long-term approach is assumed for the establishment of a new organization, and a justifying explanation is required of management if such a newly established organization is to be closed down.

In fact, it was Uchida Yoko Co., a company offering office and education solutions, that first established an

organization with the ubiquitous prefix in Japan. Uchida Yoko created a “ubiquitous sales department” two years before the three companies mentioned above established new organizations and conducted sales activities for office solutions using ubiquitous as a catchword. The company is continuing its activities to achieve the concept similar to Weiser’s.

Nevertheless, the inauguration of new organizations by the three companies in April 2002 has had symbolic implications. Hitachi established the Ubiquitous Solutions Headquarters and Ubiquitous Platform Systems, Sony established Ubiquitous Technology Laboratories and Nihon Unisys established the Ubiquitous Business Center. With these moves as the start, Japan’s IT-related companies successively inaugurated ubiquitous-related organizations. These include Ricoh Co., Fujitsu and NRI Data Services in October 2002, Mitsubishi Electric Corp., Fuji Xerox Co., NTT DoCoMo and Yokogawa Electric Corp. in 2003 and

NEC Corp. in 2004. As such, almost all of Japan’s IT-related companies have had ubiquitous-related organizations. Because the details of the establishment of ubiquitous-related organizations up through April 2004 were indicated in my previous paper,⁵ Table 1 lists organizations established since then. As indicated in Table 1, moves to establish new organizations are continuing and companies operating varying types of businesses are establishing such organizations. Of course, many companies are conducting similar activities without using the term *ubiquitous*. At present, IT-related companies in Japan that are not conducting ubiquitous-related activities clearly belong to the minority.

Table 2 lists the keywords used by Japan’s IT-related companies based on the materials contained on the website of each company. These keywords represent activities that each company intends to advance with respect to the ubiquitous paradigm. Subtle differences are seen in the fields to which the ubiquitous paradigm is applied

Table 1. Major Companies Establishing Ubiquitous-Related Organizations (Since May 2004)

Date established	Company name (ubiquitous-related organization name)
2004 June	NTT DoCoMo (Products & Services Division, Ubiquitous Services Department)
July	Fujitsu Access Limited (Access Network Business Group, Ubiquitous Access Division)
October	Hitachi Transport System, Ltd. (Automotive & Ubiquitous Systems Development Department)
October	Yokogawa Electric Corporation (Business Development Center I, Ubiquitous Security PJT)
October	Kyowa Exeo Corp. (IT Solutions, Ubiquitous Computing)
October	NEC Corp. (Ubiquitous Software Division)
December	Japan Telecom Co. (Product Unit, Ubiquitous Transformation Service Department)
2005 April	Japan Telecom Co. (Ubiquitous Business Unit)
April	NEC Soft, Ltd. (Ubiquitous Systems Division)
April	Fujitsu (Ubiquitous Products Business Group, IPMT Technology Development Office)
April	T. D. I Co. (Embedded Ubiquitous LSI)
April	NRI Data Services (Business Promotion Division, Ubiquitous Project Department)
April	Hitachi Transport System, Ltd. (Hitachi Logistics Business Development Headquarters, Automotive & Ubiquitous Systems Development Department)
June	Japan Telecom Co. (Ubiquitous Business Unit, Ubiquitous Engineering Department)

Note: Cases in which existing organizations were reorganized and/or their names were changed are included. (Some organizational names were translated by the author to English from the original Japanese.)

Source: Compiled based on the materials released by each company.

Table 2. Keywords Used by Japanese Companies for Activities Related to the Ubiquitous Paradigm

Company	Ubiquitous-related keywords
Fuji Xerox	Ubiquitous Computing
Fujitsu	Ubiquitous Near Future Corner
Hitachi	“uVALUE” supporting the creation of value of the ubiquitous information society
KDDI	Ubiquitous Solution Company
Matsushita Electric Industrial Co.	“Leap 21 Plan” consisting of two major business visions, one of which is “Realization of Ubiquitous Network Society”
Mitsubishi Electric Corp.	Ubiquitous Secure Solution
NEC	“U can change”: what can be done by ubiquitous; what can be done by group
NTT	Vision for the Ubiquitous Era: Envisioning a new-generation optical network technology as a gateway to the world of broadband-based resonant communication
Nihon Unisys	System Architecture for the Ubiquitous Era
Ricoh Co.	Ubiquitous Solution Research
Sharp Corp.	“Connecting and Expanding,” Sharp’s basic idea in the ubiquitous age
Sony Corp.	Ubiquitous Value Network
Toshiba Corp.	Toshiba Ubiquitous World

Source: Compiled based on the materials released by each company. Some were translated by the author to English from the original Japanese.

by each company, and the stance of activities also varies. Of course, the messages directed at the public do not necessarily conform to actual business evolutions, and there may be time differences between the use of keywords and actual business operations. However, here again, this survey suggests that almost all major IT-related companies are involved with the theme of “ubiquitous” in a specific manner.

II Global Evolution of the Ubiquitous Network

One of the noteworthy changes concerning the ubiquitous network since 2004 is the global evolution of the ubiquitous network paradigm. Progress in Asia is different from that in other countries. Even in Asia, some countries are enthusiastic about developing this theme while some countries are less so.

1 u-Korea Promotion Strategy and IT839 Strategy in Korea

Signs of the global evolution of the ubiquitous network were first seen in Korea.

Two of three books published by NRI during the period from 2000 to 2002 were translated into Korean in November 2002 and February 2003. Furthermore, the seminar held by NRI’s Seoul Branch in 2003, in which Director Won-Gyu Ha of Korea’s Electronics and Telecommunications Research Institute (ETRI) who translated these books also participated, was attended by most major IT-related companies in Korea, indicating that country’s growing interest in this theme.

Subsequently, the Ubiquitous IT Korea Forum was organized in 2004 in Korea, and ETRI President Chu-Hwan Yim became chairperson of the forum. The forum consists of more than 50 member organizations including companies, universities and research institutes, and is engaged in the dissemination and promotion of ubiquitous IT.

Measures related to the ubiquitous network are also being taken at the government level. The Ministry of Information and Communication, which is the competent authority for information and communications in Korea, has sponsored the “digital home plan.” This plan calls for the installation of digital home appliances with communications capabilities in apartment houses as an overall, integrated system. Similarly, the Ministry of Commerce, Industry and Energy is promoting the “smart home plan.”⁷

The “u-Korea Promotion Strategy” announced in 2004 represents the national information and communications policy of Korea that encompasses these moves. This strategy considers the period from 1995 to 2002 as that for pursuing the cyber Korea vision, the period from 2003 to 2007 as that for implementing broadband IT Korea and the period after 2007 as that for realizing a ubiquitous Korea (u-Korea) intelligent infrastructure society. Through the “IT839 Strategy,” the government is aimed at establishing a u-Korea society.

The highest priority goal of the national economy in Korea is to achieve a per-capita GDP of 20,000 dollars. Accordingly, the “u-Korea Promotion Strategy” is expected to contribute to this achievement. The “Ubiquitous IT839 Strategy” defines specific measures to achieve this goal with the aim of creating a favorable cycle for the development of the IT industry by linking and developing eight IT services, three IT infrastructures and nine new growth engines (Table 3).

First, the eight IT services include (1) 2.3-GHz WiBro mobile Internet, (2) satellite and terrestrial wave digital multimedia broadcasting, (3) home network service, (4) telematics (vehicle-mounted information systems), (5) RFID (radio frequency identification), (6) W-CDMA (next-generation mobile phones), (7) terrestrial digital TV and (8) Internet telephony (VoIP). Specific goals have been set for each service. In addition to detailed plans for 2004, there are goals from the mid- and long-term perspective, such as home network service in 10 million households, 5 percent share of RFID in the world market and 4 million VoIP users.

Table 3. Korea’s IT839 Strategy

Eight services	Three infrastructures	Nine new growth engines
<ul style="list-style-type: none"> • 2.3 GHz portable internet service • Digital multimedia broadcasting (DMB) service (satellite and terrestrial) • Home network service • Telematics service • RFID-based service • W-CDMA • Terrestrial digital TV • Internet telephony 	<ul style="list-style-type: none"> • Broadband convergence network • Ubiquitous sensor network • IPv6 	<ul style="list-style-type: none"> • Fourth generation (next-generation) mobile communications devices • Digital TV • Home network • IT SoC (system-on-chip) • Next-generation PC • Embedded software • Digital content • Telematics • Intelligent Service Robot

Notes: GHz = gigahertz, IPv6 = Internet Protocol Version 6, RFID = radio frequency identification, W-CDMA = a communications system used in the third-generation mobile system.
Source: Ministry of Information and Communication of Korea.

Plans also call for the nationwide dissemination of terrestrial digital TV by the end of 2005 (2011 in Japan), 4.2 million satellite digital multimedia broadcasting subscribers by 2007 and the nationwide development of terrestrial wave multimedia broadcasting by the latter half of 2006. Through the achievement of these goals, Korea expects to develop a digital broadcasting market at a single stroke, and intends to develop related equipment ahead of all other countries for sale in the world market.

The three IT infrastructures cited in the strategy include (1) the broadband convergence network, (2) the ubiquitous sensor network and (3) IPv6 (Internet protocol version 6). The specific goal of the broadband network by 2010 is 20 million subscribers at the speed class of 100 megabits per second. The target for the ubiquitous sensor network is to disseminate chips priced at 10 cents or less by 2007. The aim for IPv6 is to achieve a total shift to this new version by 2010.

The nine new growth engines indicated in the strategy include (1) fourth-generation mobile communications, (2) digital TV, (3) home network, (4) IT system-on-chip (SoC), (5) next-generation PC, (6) embedded software, (7) digital content, (8) telematics and (9) intelligent service robots. Specific goals are also set for each item. These include developing fourth-generation mobile phone products by 2007, becoming one of the world's three leading countries for system-on-chip in which all components of a computer system including a central processor and memory are integrated into a single chip, increasing the domestic production rate for embedded software to more than 50 percent, and acquiring a 20-percent share of the world's market for intelligent service robots.

To achieve these goals, the strategy calls for government initiatives in actively implementing industrial policies, such as model projects, supporting technological development and providing subsidies. While these goals and targets simply represent the country's vision and it is not certain whether these goals and targets will actually be implemented, it is certain that efforts to achieve these goals and targets are well under way with government organizations playing central roles. It appears that limiting the strategy to achieve the ubiquitous network society to 20 (8+3+9) policies might entail risks. However, these 20 measures cover most of the fields of technology that are now considered important. If appropriate, flexible responses could be made in the future depending on the actual situation, this 839 implementation plan can be regarded as realistic and strategically appropriate.

Under these circumstances, the Second International Ubiquitous Computing Symposium was held in Seoul in November 2004.⁸ At this symposium, participants from not only Korea and Japan but also China, Singapore and Australia were requested to make known the policies of their own countries in relation to the ubiquitous paradigm.

At the TV conference held concurrently with the symposium, Minister Chin Dae-je of the Ministry of Information and Communication expressed his strong intention to create an environment where Korea could serve as a test bed and showcase for the world's ubiquitous technology. While Minister Chin announced the "Ubiquitous IT839 Strategy" at this time, the basic policy of the strategy in terms of concentration and selection was clear, and it was impressive that he presented the extremely strategic message in his own words. His message also symbolized the efforts of Korea to continuously pursue the ubiquitous paradigm in a global framework without being limited to the domestic market.

2 Europe and the United States Yet to Start

In the United States and Europe, a tone of ridicule regarding the ubiquitous paradigm is no longer evident. However, it cannot be denied that the focus of technological development in the IT field in the United States leans towards security after the terrorist attacks of September 11, 2001, and there is no evidence of seriously dealing with the ubiquitous paradigm.

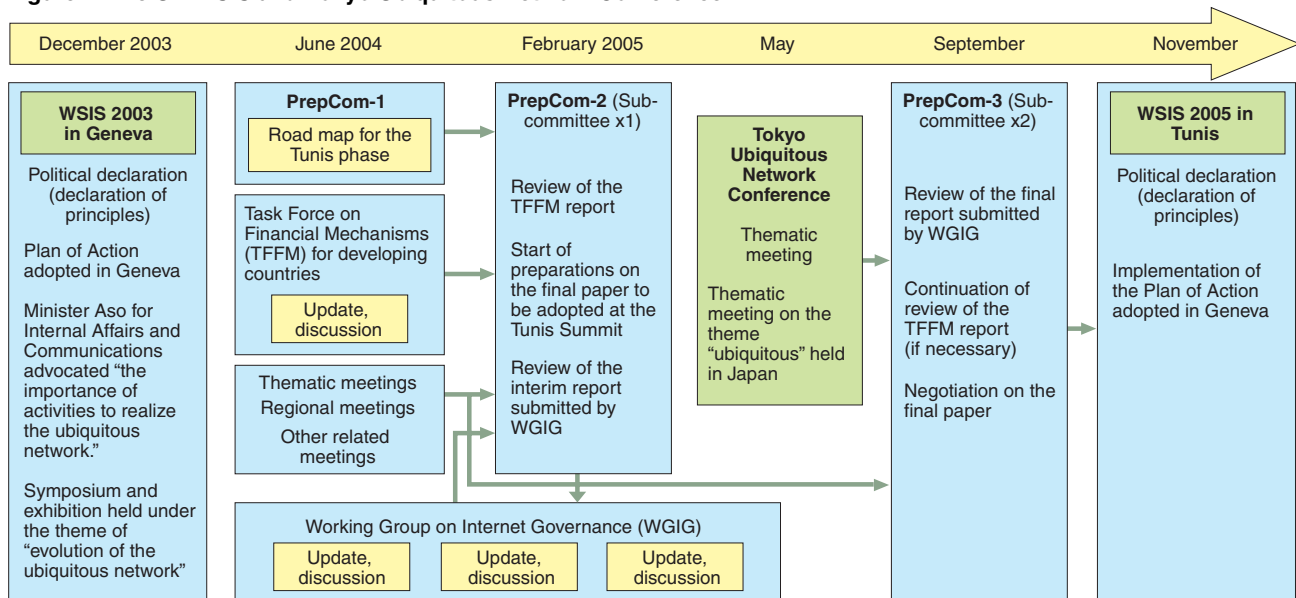
What is different in the United States and Europe from the situation in 2004 is an accelerated pace in the shift to broadband service, which suggests that interest in this field has finally started to increase. However, moves are yet to be seen in terms of the application of broadband technology to mobile phones and the provision of a menu with a wide variety of services. Wal-Mart Stores was quick to adopt RFID technology, and plans to use such technology on a large scale. However, the basic trend is that individual companies have been introducing IT as a means of reducing costs. No moves are evident in which overall activities are planned under the new paradigm.

In Europe, the use of the term *ubiquitous* is still limited. The European Union is promoting research and development activities under the theme of ambient intelligence. Services being developed under this theme include context-aware service, services using location information and technology to link and combine digital home appliances with communications capabilities. Accordingly, in many ways, the direction pursued under these activities is similar to that of the ubiquitous network. In the future, overlapping portions will become clearer as progress is made in achieving results. However, at present, it is unlikely that EU would replace the theme of ambient intelligence with that of the ubiquitous network.

3 WSIS 2005

The World Summit on the Information Society (WSIS) of the United Nations held in December 2003 in Geneva provided the first opportunity for a full-scale

Figure 2. The UN WSIS and Tokyo Ubiquitous Network Conference



Source: Ministry of Internal Affairs and Communications. Subject to change.

discussion of the ubiquitous network in an international venue other than in Japan and Korea (Figure 2). During this summit, the Japanese government was active in helping to develop symposiums, exhibitions and related events under the unified theme of "Perspective for a Ubiquitous Network Society." The Minister for Internal Affairs and Communications, Taro Aso, who attended the conference, called for the fulfillment of the ubiquitous network society as an important issue for a global information society by noting, "the realization of the ubiquitous society will bring about sustainable economic growth and a safe and secure society."⁹

At the WSIS in Geneva in 2003, it was decided to hold the same conference again in 2005 in Tunis. To date, active discussions have been held on Internet governance, network security and bridging the digital divide.

Encouraged by the success of the symposium held in Geneva, the Japanese government held the Tokyo Ubiquitous Network Conference in May 2005 in Tokyo with the theme of a ubiquitous society.¹⁰ After opening addresses by Minister for Internal Affairs and Communications Taro Aso, Secretary-General of the ITU (International Telecommunication Union) Yoshio Utsumi and high-ranking officials of each participating country, opening presentations were made by Professor Ken Sakamura of the University of Tokyo and Professor Nicholas Negroponte of the Massachusetts Institute of Technology. These presentations were followed by my keynote speech. Following the opening session, active discussions were held in five sessions, which included "technologies leading a ubiquitous network society," "knowledge sharing—capacity building," "bridging the digital divide," "ubiquitous network for civil society" and "ubiquitous network society." About 600 people

from 85 countries participated in this conference, which provided a good opportunity to present the ubiquitous paradigm to the world.

During the conference, a common understanding was established in the summary of the chairman that "the ubiquitous network society will make it possible to connect on a seamless basis 'anytime, anywhere, by anything and anyone' to exchange and share extensive information easily and at low cost by user-friendly equipment and services." It was also confirmed that the new paradigms that are now emerging all over the world, such as ambient intelligence, pervasive computing, ubiquitous computing, etc. are generally pursuing the same goals as that of the ubiquitous network.

Furthermore, that we discussed the possibility that these new technologies might also benefit developing countries by adopting the IT leapfrog strategy was considered as the important first step for the ubiquitous network's IT paradigm.

For the conference in Tunis in November 2005, the Japanese government also plans to organize a forum under the theme of the ubiquitous network. It is expected that the success of the Tokyo Ubiquitous Network will be reflected in this conference.

Even though only a short preparatory period was available, people from more than 15 countries participated in the ITU Workshop on Ubiquitous Network Societies held in April 2005 in Geneva. More than 20 papers discussing the ubiquitous network society from diverse perspectives were presented, and ideas were actively exchanged during the workshops. In addition to Japan, Korea, Hong Kong and Singapore participated in this workshop from Asia. The ubiquitous network has already become a theme about which ideas can be exchanged naturally on a global basis rather than being limited to only a few countries.

4 Gradual Penetration Also Seen in China

While accelerated moves pursuing the ubiquitous paradigm are prominent in Japan and Korea among Asian nations, what is noticeable is the stance of China, which has recently been drawing increased attention by its extremely active moves in the IT field as well as by the progress resulting from such activities.

At the Tokyo Ubiquitous Network Conference, Liu Jiren, Chairman and CEO of Neusoft Group, a leading software and solution provider, reported that, as of 2004, China already had 87 million Internet users, exceeding the number of Internet users in Japan. As of 2003, China had 300 million mobile phone users, surpassing the number of users of fixed telephones, indicating that China has partially outpaced the United States in terms of scale.¹¹ In terms of quality as well, it has been reported that interesting applications have appeared in the medical, public security and entertainment fields. These reports suggest that China is deeply committed to the development of information and communications infrastructure.

After the Tokyo conference, the Forum on the Construction of Ubiquitous Digital Society was held in Shanghai in May 2005. Experts and government officials in China and Japan participated in this forum and engaged in active discussions.¹² Although this conference was held as part of the 5th Annual Forum on City Informatization in the Asia-Pacific Region, especially high interest was shown in this session from among the ten sessions that were concurrently held. During this session, *ubiquitous* was commonly discussed among the Chinese members responsible for information and communications by using the equivalent Chinese term, suggesting that the ubiquitous paradigm has gradually started to penetrate into China as well.

III Evolution of the Ubiquitous Network in IT Policy

The national IT strategy, “e-Japan Strategy II,” that is currently under way covers the period up to the end of 2005. “e-Japan Strategy,” which started in January 2001, is the national IT strategy that is aimed at making Japan one of the world’s most advanced IT countries by 2005. Accordingly, no national IT strategy covering the period after 2006 is prepared in Japan at present. As we move near the end of 2005, it is apparent that discussions concerning the next phase of the national IT strategy will be animated.

Moves have already been seen here and there such as those involving information and communications policy and industrial structure policy. This chapter presents an overview of the studies being made in the field of mid- and long-term policies that may affect the formulation of the next phase of the national IT strategy.

A vast amount of intellectual and human resources are being used for these studies with a great amount of input from specialists in a variety of areas.

This section outlines the important points of these individual studies.

1 u-Japan Policy

It was the Ministry of Internal Affairs and Communications (MIC) that took the first steps for the next-phase national IT strategy. MIC inaugurated the u-Japan Policy Roundtable (committee for the realization of a ubiquitous network society) in March 2004. The meetings consisted of three working groups concerned with basic policy, the IT industry and the usage environment. Participants in the working groups included company executives and university professors who are well versed in technology, organization structure, strategy, etc., and engaged in lively discussions for ten months up until December 2004.

(1) Basic concept of u-Japan policy

u-Japan stands for ubiquitous network Japan. The social status in which the numerous issues Japanese society and industry must face in the future are resolved by IT of the ubiquitous network by 2010 is called u-Japan. This means that the opportunity of being positioned as the basic concept of Japan’s long-term vision for information and communications policy was assigned to the ubiquitous network paradigm.

Initially, e-Japan Strategy was the network infrastructure development strategy that focused on the shift from narrowband (low speed, small capacity) to broadband (high speed, large capacity) infrastructure. “u-Japan Strategy” further advances this strategy and aims at promoting the development of a ubiquitous network infrastructure that enables “easy access to the network at anytime, by anything and anyone.”

In terms of the promotion of utilization, e-Japan Strategy gave priority to the development of an environment for electronic commerce and e-governments. e-Japan Strategy II advanced this strategy a step ahead and shifted its focus from the development of infrastructure to the promotion of effective IT utilization. e-Japan Strategy II selected seven important areas where IT utilization must first be promoted. They are medical service, food, lifestyle, small and medium enterprise financing, knowledge, employment and labor, and public service. However, these measures were basically aimed at the promotion of IT utilization. In contrast, the targets under the u-Japan Policy are the resolution of social and economic issues and the realization of the expectations to be achieved by ICT (information and communications technology).

Furthermore, in the course of promoting the development of such infrastructure and the resolution of problems, the negative aspects of IT must also be addressed.

Accordingly, the establishment of a utilization environment was set as a new goal. Consequently, the u-Japan policy adopted “emergent value creation” as its basic concept for policy evolution, as compared to the development of broadband infrastructure in the case of e-Japan Strategy and the promotion of effective IT utilization in the case of e-Japan Strategy II. This concept pursues the establishment of a utilization environment where ICT penetrates into every corner of life like grass roots and creative ICT uses are generated, giving rise to new values. New and unexpected values are generated by synergies through the linkage of these creative uses.

Through these activities, u-Japan policy follows e-Japan Strategy, which aimed at making Japan one of the world’s most advanced IT nations by 2005, and continues to pursue that goal after 2006 as well. Its aim continues at making Japan the world’s front-runner in ICT utilization as we move towards 2010 (Figure 3).

(2) Basic targets of u-Japan policy

The implementation of u-Japan policy will be promoted in three ways: (1) the development of the ubiquitous network, (2) the advancement of ICT utilization and (3) the development of a usage environment (Figure 4).

The first target of developing the ubiquitous network relates specifically to the development of infrastructure. While e-Japan Strategy pursued the development of wired networks such as ADSL (asymmetric digital subscriber line), cable Internet and optical fiber, u-Japan

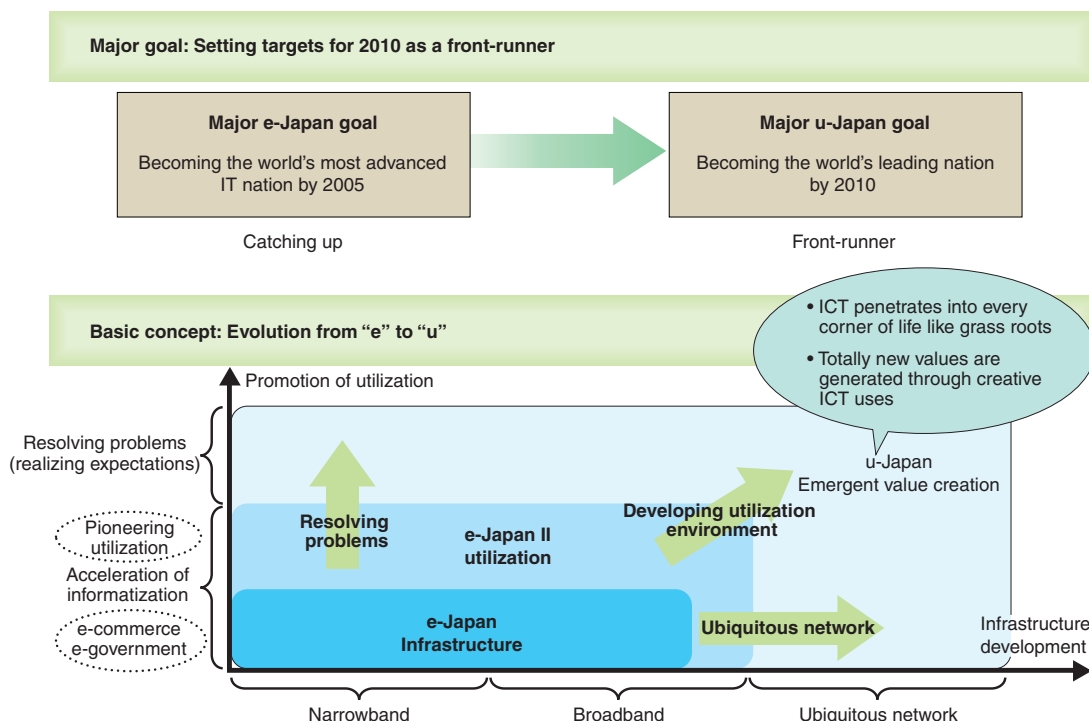
policy must promote the development of infrastructure by maintaining consistency among not only wired networks but also among wireless networks such as mobile networks and wireless LANs (local area networks), broadcasting systems where the digitization of terrestrial waves is promoted, and transportation networks that increase the safety and ease of use of transportation by ITS (intelligent transport systems). The target of developing real object networks is also added.

A real object network connects things to the network one after another that so far have had no relationship with a network such as beef, refrigerators and curtain rods, and makes them a part of the network by means of new ICT devices such as electronic tags, sensor networks and network robots.

The measures required to develop the ubiquitous network are not limited to those mentioned above. In order to achieve an environment truly enabling access anywhere, broadband infrastructure must be developed on a nationwide basis. Furthermore, different platforms must also be developed to enable the use of the ubiquitous network as a business venue.

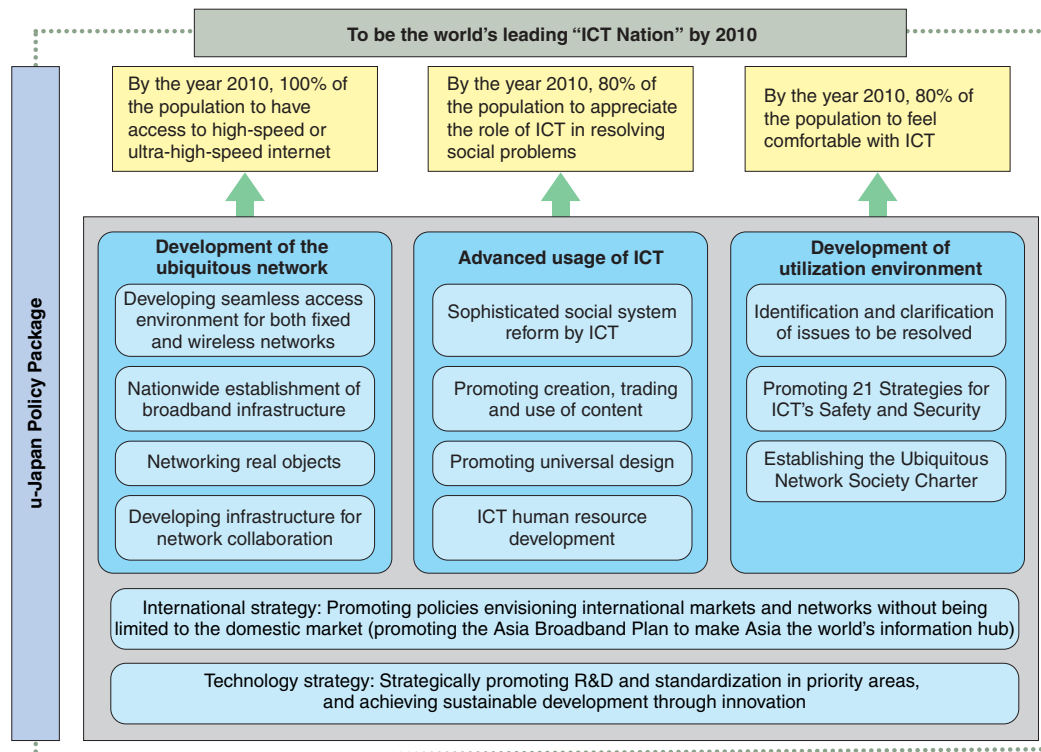
The second target of advancing ICT utilization refers to the establishment of a foundation where various social and economic issues can be resolved by industry by using ICT flexibly. Specific issues to be addressed include regulatory reform, management reform and physical distribution reform, the establishment of a content utilization environment, the promotion of the introduction of universal design and human resource development.

Figure 3. Framework of “u-Japan Policy” as a Vision for 2010



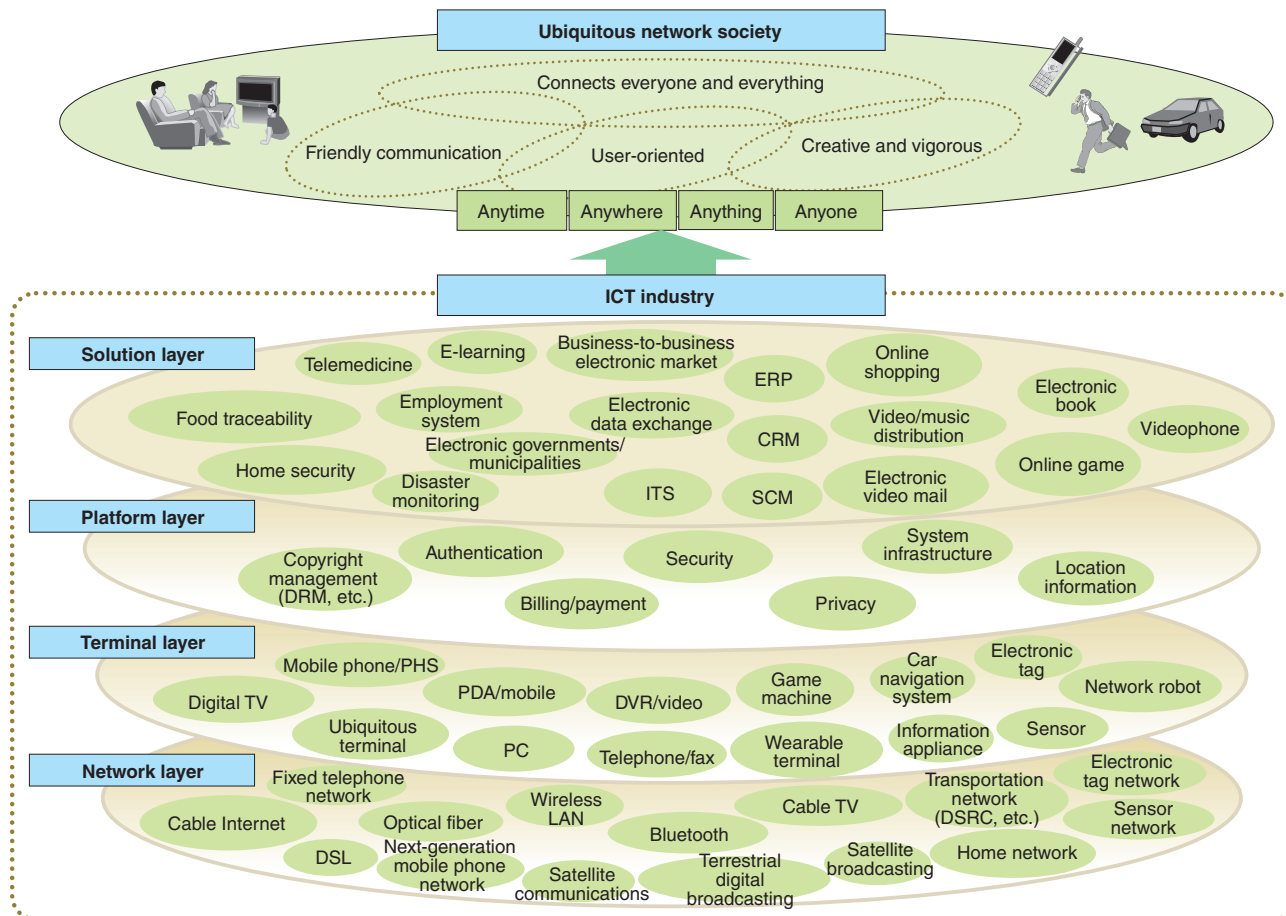
Note: ICT = information and communication technology.
Source: Ministry of Internal Affairs and Communications.

Figure 4. Overview of “u-Japan Policy Package”



Source: Ministry of Internal Affairs and Communications, "u-Japan Policy—Working toward Realizing the Ubiquitous Network Society by 2010," December 2004.

Figure 5. Structure of Ubiquitous Network ICT Industry



Notes: CRM = customer relationship management, DRM = digital rights management, DSL = digital subscriber line, DSRC = dedicated short range communication, DVR = digital video recorder, ERP = enterprise resource planning, ITS = intelligent transport system, PDA = personal digital assistance, SCM = supply chain management.

Source: Ministry of Internal Affairs and Communications, "u-Japan Policy—Working toward Realizing the Ubiquitous Network Society by 2010," December 2004.

Consequently, the ICT industry of the ubiquitous network will consist of four layers, i.e., the network layer, terminal layer, platform layer and application layer (Figure 5). This configuration corresponds closely to the six-layer model presented in my previous paper, i.e., the ubiquitous network infrastructure layer, ubiquitous terminal layer, ubiquitous platform layer, ubiquitous content layer, ubiquitous electronics layer and ubiquitous service layer.

The third target for the development of a usage environment is set to principally deal with the issue of how to anticipate the negative aspects of the ubiquitous network and how to prepare effective response measures. While the ubiquitous network environment offers the ultimate network convenience to users, it may also bring ultimate network vulnerability to users.

The Internet has already been the source of an assortment of problems, such as viruses, worms, spam e-mail, unauthorized access and phishing. With the progress in the development of an environment and increased usage, the ubiquitous network may cause new problems. Accordingly, in studying the development of a usage environment, efforts were first made to thoroughly identify any negative aspects that might arise in the future. Specifically, existing as well as probable problems were identified and ten issues were listed for each of ten fields such as security, privacy and mali-

cious content. In total, 100 issues of negative aspects were identified.

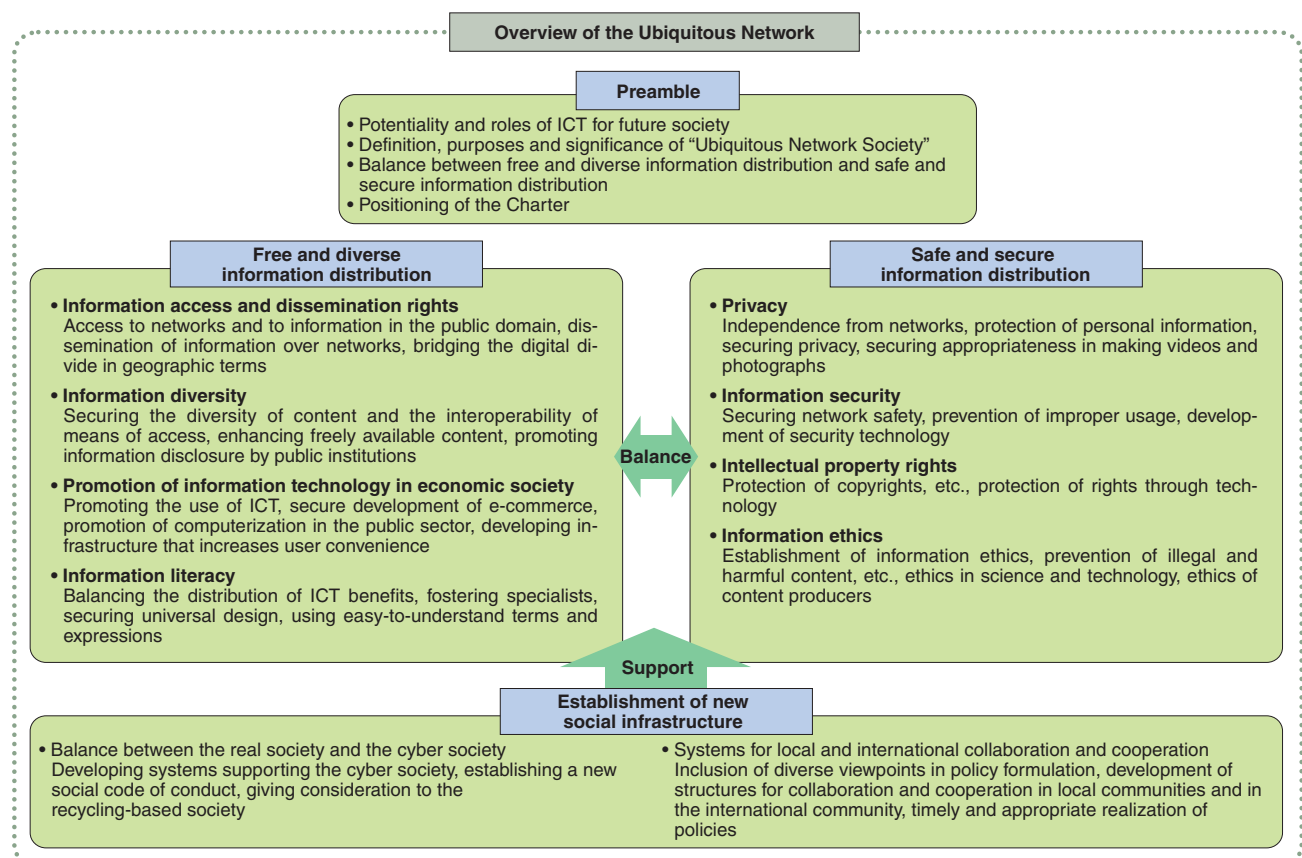
In the u-Japan policy, these 100 issues were assessed according to priority, and 21 issues were selected as those requiring immediate response. Although institutional or technical measures are to be applied for these 21 issues, it is not possible to provide 100-percent perfect solutions to these issues. Accordingly, the u-Japan policy also adopts measures to appeal to the value judgment of users, in addition to these institutional and technical measures. For this purpose, the “Ubiquitous Network Social Charter” was proposed that stipulates the basic stance of users living in the ubiquitous network society (Figure 6).

(3) Scheduling and PDCA cycle

After preparing a policy package for achieving u-Japan through these studies, the u-Japan Policy Roundtable asked MIC to create a schedule for measures covering the period until 2010 based on this policy package and to establish and observe the PDCA cycle (plan→do→check→act) based on the prepared schedule when the final report was submitted.

In response, MIC divided the necessary measures into 13 groups and redefined the achievement goals for each group. MIC then prepared and announced a schedule for measures until 2010 to achieve these goals. While this

Figure 6. Overview of the Ubiquitous Network Society Charter



Source: Ministry of Internal Affairs and Communications, “u-Japan Policy—Working toward Realizing the Ubiquitous Network Society by 2010,” December 2004.

schedule tends to include many short-term measures lasting only three years, it nevertheless gives the impression that the two IT policy evaluation concepts of “achievement-oriented evaluation from the user perspective” and “full observance of a PDCA cycle for policies” that were advocated by the Evaluation Committee of the IT Strategic Headquarters have gradually started to take root.

Through the formulation of this u-Japan policy, the ubiquitous network paradigm that emerged in conformity with Japan’s IT environment at the turn of the century has come to survive as a major IT paradigm while competing with many other ubiquitous paradigms and at least has become the underlying concept of Japan’s long-term information and communications policy.

2 Vision for Information-based Economy and Industries

In December 2004, when the u-Japan policy was announced by METI, the Ministry of Economy, Trade and Industry, which is the other competent authority of the IT Strategic Headquarters, convened a session of the Information Economy Subcommittee of the Industrial Structure Council to establish the “Vision for Information-based Economy and Industries,”¹⁵ which is the long-term IT policy vision. This subcommittee consisted of members in a wide range of fields including not only management executives on the IT supplier side but also those on the IT user side including university professors, lawyers, representatives of consumer organizations and labor unions.

(1) Moving toward the second stage of IT utilization
e-Japan Strategy II has substantially shifted the strategic goal from the development of IT infrastructure to the promotion of IT utilization. However, if the situation of IT utilization in each sector is examined in detail, there are still many issues to be resolved and the situation regarding IT utilization is not yet fully satisfactory.

When we see the situation in companies that have continuously served as a driving force of IT utilization, IT utilization is still limited, because it is principally for domestic operations and for partial optimization, as seen in the efforts to improve work efficiency within individual departments and/or factories that use PCs and narrowband networks. It can hardly be said that IT is contributing to a company’s abilities to improve competitiveness, promote innovations and resolve problems. In the meantime, concerns about the negative aspects of a network society such as security and privacy issues have been increasing.

With respect to the development of IT infrastructure, moves are being seen to develop the ubiquitous network, a next-generation IT utilization environment, which is beyond the broadband infrastructure, ahead of other

countries. This new environment enables access to the network anywhere, anytime and by anyone, and allows connections between persons, between persons and objects, and between objects.

This situation means that although IT utilization by companies and government organizations is yet to start, IT infrastructure has already started to move toward the next stage. As Japan’s information economy has certainly started to make a major change to the second stage, time has come for the government and the private sector to share a new industrial vision under a new IT paradigm regarding the direction of such change (Figure 7). The Vision for the Information Economy and Industry was formulated under such circumstances.

The basic purpose of this vision is to innovate an information-based economy and shift the focus of the information industry in four directions: (1) from PC-based equipment to ubiquitous IT equipment (mobile phones, digital home appliances with communications capabilities, electronic tags, digital TVs, car navigation devices, etc.), (2) from industrial clusters in Silicon Valley to industrial clusters in East Asia, (3) from the development of IT infrastructure and its spread (convenience) to innovations and solutions (realization of strength) by IT, and (4) from IT utilization focused on partial optimization to IT utilization focused on overall optimization on an industry-wide basis and for social systems overall.

(2) Platform strategy and solution development

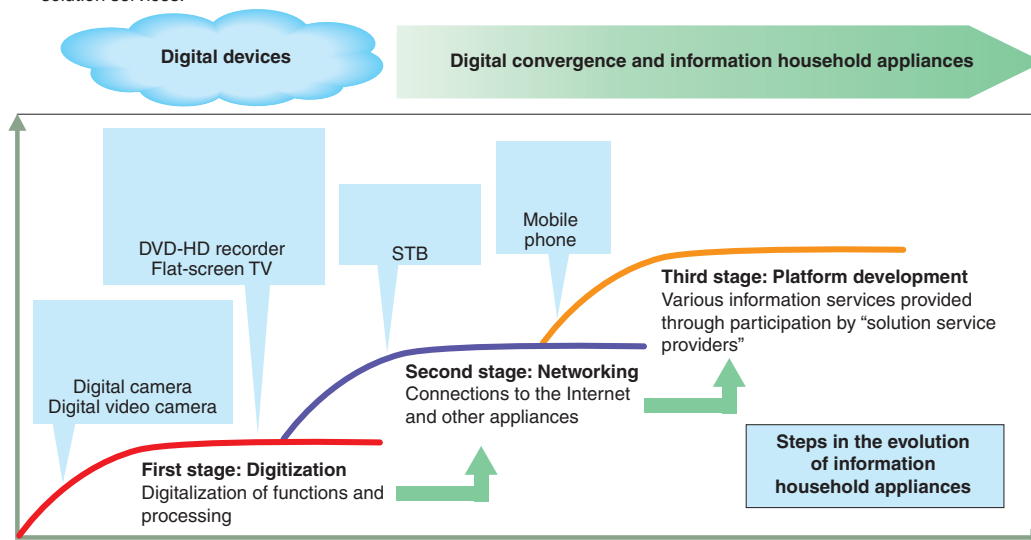
In the period envisioned under the Vision for Information-based Economy and Industries, Japanese industry must survive and grow under the situation defined by the United States, which continues to be the champion of the world’s economy, EU and European countries, which have steadily expanded their economic scale and Asian nations including China, which has an enormous economic scale, strong price competitiveness and power to promote business operations, and Korea, which has the ability to make decisions quickly and implement strategies. Accordingly, the range of options available to Japanese industry in reforming its industrial structure is not so extensive.

What is proposed by this vision is an avenue out of the difficulty by forming a wide variety of platforms as new businesses in Japan and providing attentive solutions to consumers with a high degree of effectiveness.

Industries in the future must continue to produce unique and unparalleled products and services by continually working to meet the sophisticated needs of Japanese consumers. Not only products and services but also solutions that skillfully combine products, devices, systems and services in accordance with consumer needs in providing value to customers serve as the sources of these activities. The integrated IT business infrastructure that enables the creation of business models for these solutions and enables the successive establishment of

Figure 7. Issues Regarding Shift to the Second Stage

There are still many issues that need to be resolved for information household appliances such as digital cameras, flat-screen televisions and DVD recorders. These include the securing of interconnectivity and interoperability among these appliances, Internet connections and remote operability. The situation seems to have stalled at the so-called "digitalization stage" and so there now needs to be greater development of platforms that will allow devices to function as various "solution services."



Notes: DVD = digital video disk, HD = hard disk, STB = set top box
 Source: Ministry of Economy, Trade and Industry, "Vision for Information-based Economy and Industries," April 2005.

new businesses by a number of players who rely on these business models acts as a platform.

For example, in Japan, because the mobile content platform for the mobile network arose, the mobile content solution market amounting to about 300 billion yen, including polyphonic ringtones and ring music, fortune telling, games, etc. emerged. This market was nonexistent five years ago. The role played by these solutions in expanding the mobile phone market in Japan to a scale of 7 trillion yen in such a short period can be seen as highly significant. The key to this success was a platform providing a simple mechanism for copyright processing and the authentication, charging and payment functions to collect call charges.

The core of the Vision for Information-based Economies and Industry is the posture of the industry that grows by continuously producing diverse solutions not only in the entertainment field but also in everyday living, business, public service and social systems through the construction of these platforms that connect IT and services throughout business operations.

(3) Five strategies and post-e-Japan Strategy

To achieve this vision, the following five interrelated strategies must be implemented (Figure 8).

The first strategy relates to the development of the world's most advanced IT infrastructure for the ubiquitous network at an early stage. Specifically, the broadband network infrastructure consisting of not only fixed networks but also of wireless, broadcasting and transportation networks as well as real object networks such as electronic tags and sensors must be developed. In addition, the development of a utilization environment

that assures interconnectivity and interoperability among these networks must be promoted. These measures enable the formation of a platform that gives rise to new industries such as digital home appliances, automobiles, housing and offices that are always connected to the network.

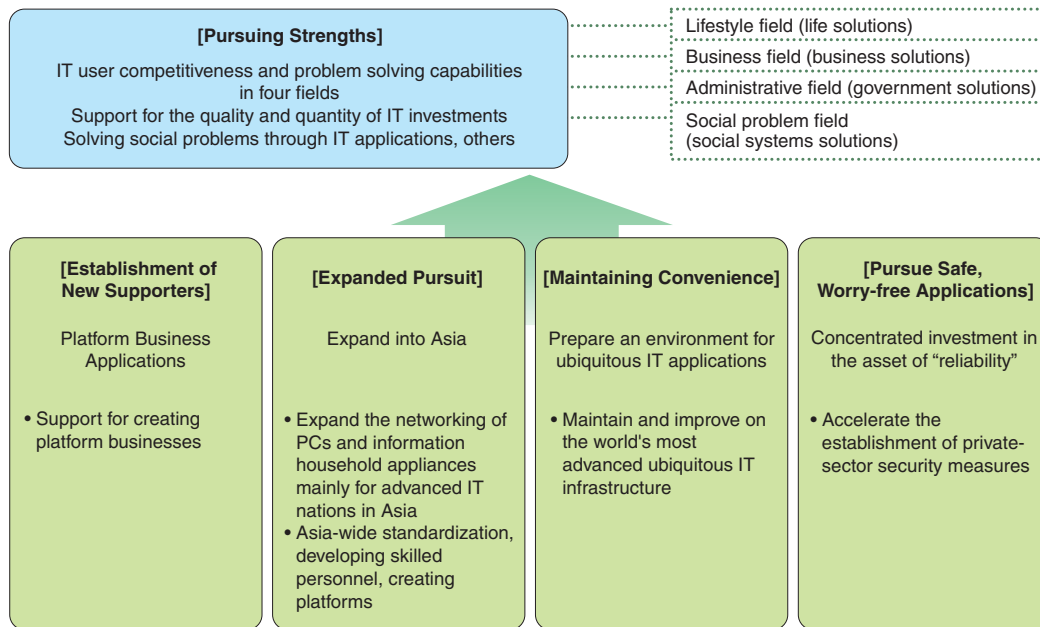
The second strategy concerns the promotion of the construction of an Asia-wide platform for electronic *kanban* (bulletin board) systems and content distribution. Specifically, efforts must be made to promote standardization and human resource development in the direction of forming a single, unified industrial cluster by always maintaining close links with Asian partner countries.

The third strategy involves concentrated investment in an asset known as trust. The prerequisite to achieving all of the platforms and solutions is the need to foster trust between industry and users. Trust can be a valuable asset in creating new businesses in the future with the aim of creating customer worth. For this purpose, concentrated investment in security and privacy should be made promptly in order to make the network space in Japan one of the safest and most secure business spaces in the world.

The fourth strategy relates to the establishment of platform business that connects IT and services as new players. The vision indicates specific examples such as digital home, mobile multi-use and digital community platforms.

The fifth strategy pursues the realization of four types of solutions, i.e., those for everyday life, business, government and social systems, and is aimed at improving the competitiveness and problem-solving capabilities of users in these four fields.

Figure 8. Problem-Solving in Four Fields and Five Strategies in “Vision for Information-based Economy and Industries”



Source: Ministry of Economy, Trade and Industry, “Vision for Information-based Economy and Industries,” April 2005.

The Vision for Information-based Economy and Industries plans to strategically integrate (1) the infrastructure, i.e., the safe and secure ubiquitous utilization environment, that will be constructed ahead of other countries under partnerships with Asian countries and (2) the establishment of platforms to promote utilization that truly contributes to increasing industry’s competitiveness and the problem-solving capabilities of individuals and society. The vision intends to pursue such measures as the basic course of the second-stage national IT strategy. While all of these five strategies require major innovation for Japanese industry, at the same time these strategies represent extremely important socioeconomic issues. It can easily be imagined that Japanese industry can acquire greater “strength” by making these strategies a reality.

What is important for the ubiquitous network paradigm is that “the establishment of the ubiquitous IT utilization environment” is included as one of five strategies of the Vision for Information-based Economy and Industries.

This vision adopts the position of actively using the ubiquitous paradigm in response to a proposal made by a committee consisting of two management executives, i.e., President Etsuhiko Shoyama of Hitachi and President Masamitsu Sakurai of Ricoh, Professor Jiro Kokuryo of Keio University and myself who participated in the formulation of the u-Japan policy and Professor Shoichiro Asano of the National Institute of Informatics who introduced the Weiser publications.

Whatever the case may be, the two ministries supporting the IT Strategic Headquarters, MIC and METI, have decided to adopt the ubiquitous paradigm in formulating the five-year vision for the IT utilization environment.

3 Principles for Formulating the Basic Science and Technology Policy

In the science and technology policy that is supporting the information and communications policy as well as the industrial structure policy, an important position is also being given to the ubiquitous network. Under Japan’s basic science and technology plan, the targets of research and development investment have so far been set at 17 trillion yen for Phase 1 and 24 trillion yen for Phase 2, positioning research and development as one of the most important priorities of the government even under the current situation of financial austerity.

The Phase-2 basic plan intends to allocate greater portions of the budget to the four priority fields of IT, biotechnology, nanotechnology and the environment. Actually, the rate of budget allocation for these four fields was increased from 37 percent in fiscal 2001 to 45 percent in fiscal 2005. Active efforts have also been made to increase the funds of the research support programs, to promote cooperation among industry, academia and government, and to corporatize national universities and test/research organizations. These efforts have steadily been producing results in science and technology. At the same time, it is also true that there are only a few cases in which the expansion of the investment in science and technology has clearly led to acquiring the predominance of industrial competitiveness.¹⁶

Under these circumstances, the Council for Science and Technology Policy announced Phase-3, “Principles for Formulating the Basic Policy for Science and Technology,” in June 2005.

These basic principles clearly set forth the aspect of “science and technology policy supported by society and

people” with consideration given to the strengthening of accountability concerning the science and technology policy itself, raising people’s interest and encouraging voluntary participation, and the need to deal with the negative aspects of science and technology. Consequently, the three basic ideas of (1) adding to the wisdom of human beings, (2) creating the source of national strength and (3) protecting health and safety are shown in the form of specific policy goals consisting of 6 major goals and 12 supporting goals.

These goals are explained as having the nature of “social goals established to convey what the final science and technology policy is aiming at in an easy-to-understand manner in an effort to share the results of science and technology policy with people.”¹⁷ These efforts can be seen as those to visualize policy to continue to give priority to budget allocation under the limited sources of revenues.

Figure 9 shows a systematic overview of these basic ideas and goals. In this overview, the ubiquitous network is treated as one of three supporting goals under Goal 4 of Innovator Japan, which is expressed as “the realization of the ubiquitous network society that is captivating the world.” The ubiquitous network society is explained as “a society where convenient, safe and comfortable living is possible with all people and objects connected at anytime, anywhere and as one requires by information and communications technol-

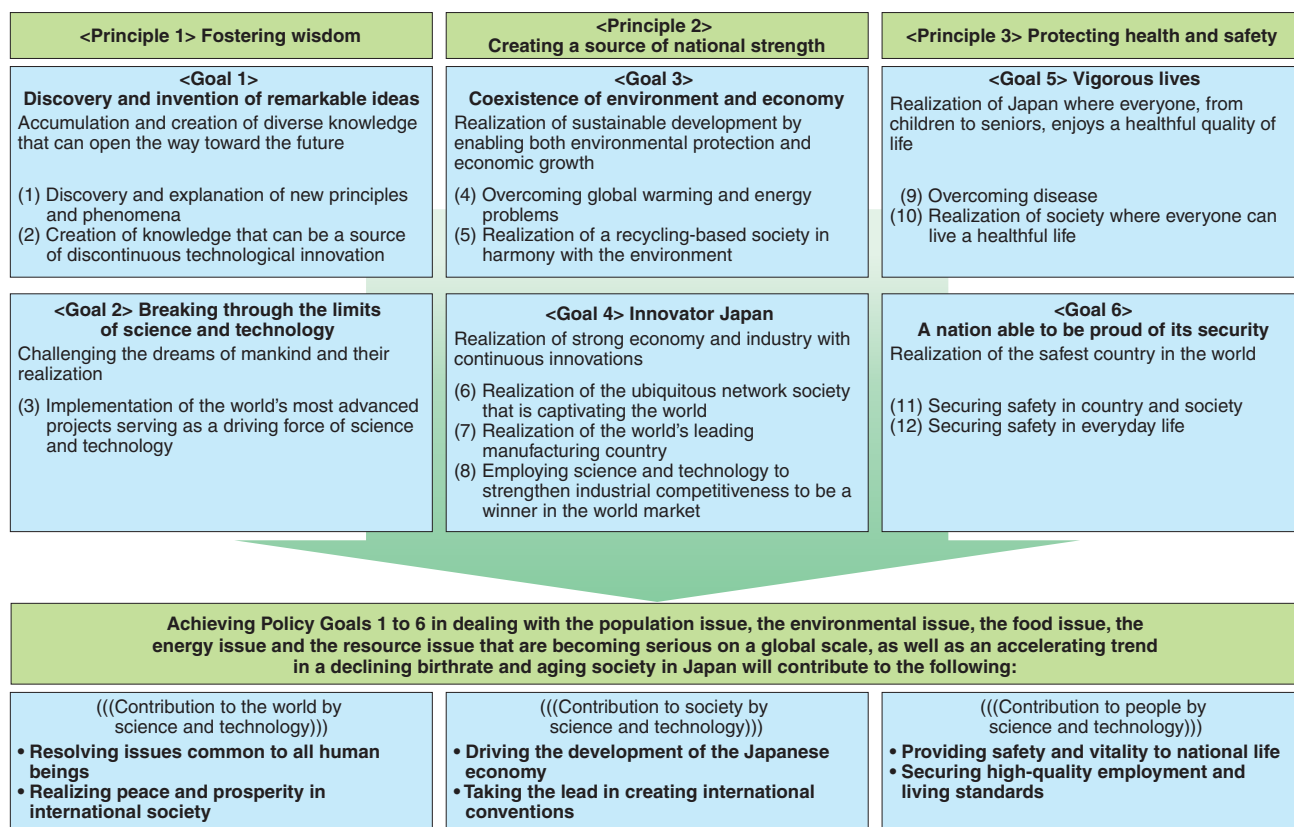
ogy.” Basically, this conforms to the policy idea pursued by the u-Japan policy.

In the Phase-2 science and technology policy, information and communications are treated as one of four priority goals. This positioning is considered to basically remain unchanged in Phase 3. Among the goals of Phase 3, science and technology concerning the realization of the ubiquitous network society is positioned as one of the nation’s 12 priority policy goals. This means that the ubiquitous network society has secured a clear position in the framework of Japan’s science and technology policy.

4 UNS Strategy Program

As the u-Japan policy was formulated and the vision for information and communications policy up to 2010 started to be shared, the Ministry of Internal Affairs and Communications began activities envisioning the mid- and long-term policies in every aspect of information and communications policy. In July 2004, studies were started concerning the required research and development activities to implement the ubiquitous network society at the Research and Development Strategy Committee of the Information and Communications Council. After about one year of study, the UNS Strategy Program was prepared in June 2005 and announced in July.¹⁸

Figure 9. Six Policy Goals to Be Achieved by Science and Technology



Source: Council for Science and Technology Policy, “Principles for Formulating the Basic Science and Technology Policy,” June 2005. Translated by the author from the original Japanese.

The initials UNS stand for the Ubiquitous Network Society. In addition, UNS also represents the three pillars of this research and development strategy: (1) Universal communications (knowledge creation program: universal communications technology strategy), (2) New-generation network (advanced international program: new-generation network technology strategy) and (3) Security and safety (security and safety program: ICT safety and security technology strategy).

The “U,” or the universal communication technology strategy, is aimed at establishing communication technology to promote activities for the creation of knowledge by making use of the world’s leading ubiquitous network, and realizing user-friendly communication technology for seniors, etc., by transcending the barriers of age, physical conditions, language and culture.

The “N,” or the new-generation network technology strategy, pursues the realization of network technology that can serve as infrastructure for the ubiquitous network society and principally consists of optical communications, mobile technology, etc., under the ongoing moves to restructure the backbone network by means of IP.

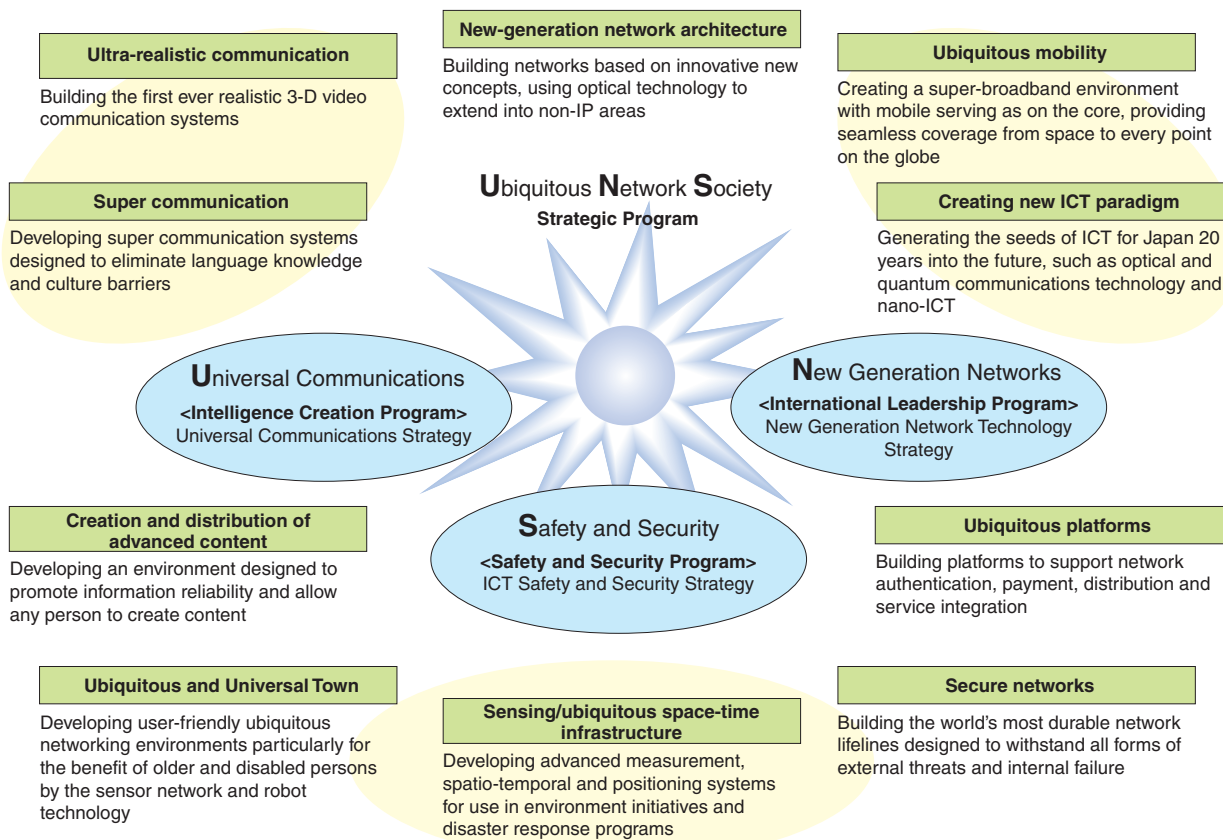
The “S,” or the ICT safety and security technology strategy, is aimed at realizing a safe and secure society by establishing an ICT infrastructure that is not interrupted by cyber attacks or large-scale disasters and by

overcoming social problems such as global environment issues, a declining birthrate and aging society by means of ICT.

To achieve these three pillars, this program assumed ten research and development projects, as shown in Figure 10. Targeted achievements from the user perspective are set up for each project. For example, the Ubiquitous Mobility project targets the “creation of the super broadband environment that covers from space to every corner of the earth on a seamless basis with ‘mobile’ serving as the core technology.” The Super Communication project aims at the “creation of super communications that transcend the barriers of language, knowledge and culture.” The Secure Network project pursues the “world’s strongest network lifeline that can be immediately reused even if being destroyed again and again.”

The target year of these research and development projects is set at 2010. Another benchmark year is set at 2015 in consideration of the characteristics of research and development such as the need for long-term approaches and that these activities accompany the uncertainty based on the concept that research and development activities up to 2010 should be preceded by setting the target year slightly ahead and establishing long-term goals for the new target year. For implementation, the ten research and development projects are

Figure 10. Overview of “UNS Strategic Programs”



Source: Research and Development Strategy Committee of the Information and Telecommunications Council, “Research and Development for Ubiquitous Network Society—UNS Strategic Programs.”

divided into elements. A rough roadmap is provided for each element with the target years set at 2010 and 2015.

As the general direction has been shown as described above, activities to implement the strategy program and the research and development projects are about to start in some fields. In the future, there is no doubt that research, development and planning activities are being aggressively pursued in these fields.

IV Next-Phase National IT Strategy and the Ubiquitous Network

1 Future of the Ubiquitous Network Paradigm

This paper has introduced the three most recent aspects of the ubiquitous network: (1) the penetration of the ubiquitous paradigm into Japanese society and corporate activities, (2) global evolution principally in Asia including Japan and (3) the importance given to the ubiquitous network paradigm in the IT field by the information and communications policy, the industrial structure policy and the science and technology policy.

The most important point in the future evolution of the ubiquitous network is what position is to be given to the ubiquitous network paradigm in the next-phase of the national IT strategy whose status is now that of a clean slate and will be formulated around the end of 2005. This chapter discusses the appropriate next-phase national IT strategy and positioning of the ubiquitous network paradigm based on what is explained in this paper and NRI's past activities for the ubiquitous network.

At the initial stage of the proposal for the ubiquitous network paradigm, the requirements from the supply-side perspective were defined as (1) a multi-modal broadband network, (2) with borderless connectivity of information equipment and (3) having seamless portability of content and solutions. My previous paper indicated the definition from the user perspective as the network that can be connected anywhere, at any time and by anything: the IT utilization environment enabling better connection not only between people, but also between people and objects and between objects.¹⁹ This paper also introduced the overall picture of the ubiquitous network society that integrates user-side and supply-side requirements.²⁰ The ubiquitous network paradigm also includes the study results of the u-Japan policy in order to achieve these defined requirements.

2 Ubiquitous Network as the Core of Next-Phase IT Strategy

(1) From e-Japan to u-Japan

It was in January 2001, when the e-Japan Strategy was started based on the IT basic strategy established at the

end of 2000, that the national IT strategy was first formulated in Japan. The e-Japan Strategy can essentially be regarded as a broadband infrastructure development strategy with the aim of making Japan one of the most advanced IT nations in the world by 2005 through the promotion of broadband services.

The development of the broadband network infrastructure environment that started at around the same time proceeded smoothly, and the situation reached the level that enabled us to have full confidence in the development of such an infrastructure when the e-Japan Strategy was reviewed in 2003. Accordingly, the e-Japan Strategy II largely shifted the basic goal of the national IT strategy from the development of IT infrastructure to the promotion of IT utilization and consisted of pioneering IT utilization activities in the seven fields of medical service, knowledge, public service, etc., as its core elements. At the same time, the e-Japan Strategy II is the first national IT strategy that included the ubiquitous network as the goal of the next-generation IT utilization environment development.

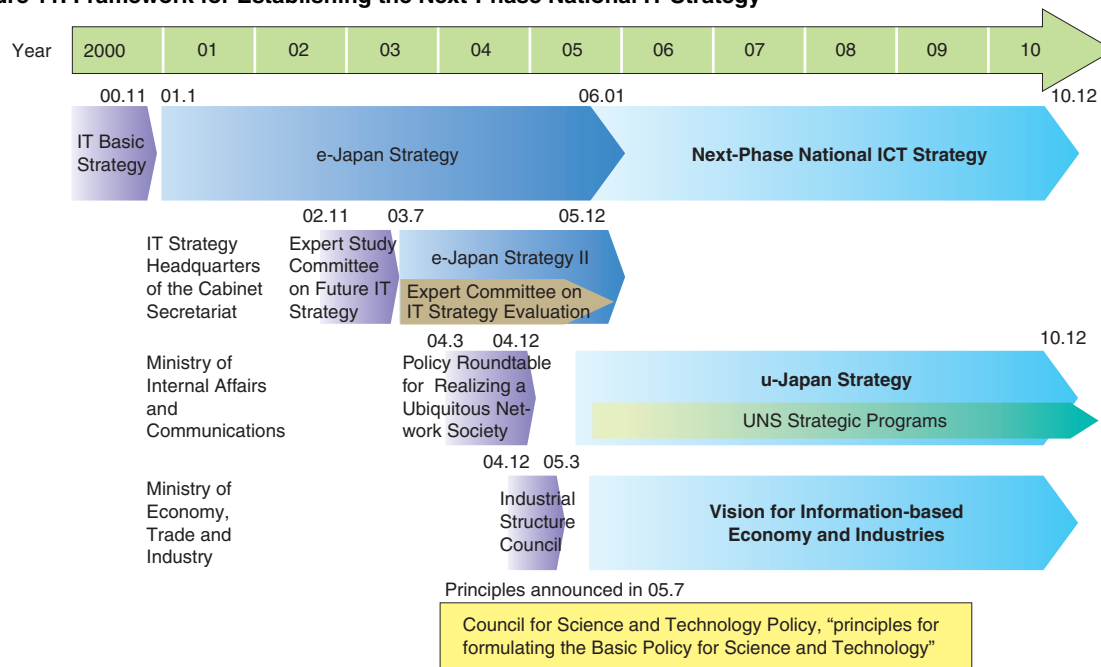
In December 2003, an Expert Committee for Evaluation of IT Strategy was organized in the IT Strategic Headquarters. At present, work to evaluate the extent to which the goal of being the world's most advanced IT nation by 2005 is being achieved is underway at this Expert Committee by evaluating the results of the five-year period of the e-Japan Strategy. While the current e-Japan Strategy II period covers up to the end of 2005, the national IT strategy in and after 2006 is now blank, regardless of the conclusions of the Expert Committee for Evaluation. Studies have already begun at the IT Strategic Headquarters for the next stage strategy (Figure 11).

With respect to this next-phase national IT strategy, while preliminary studies obviously must be made by two competent authorities for IT policy, the Ministry of Internal Affairs and Communications and the Ministry of Economy, Trade and Industry (METI), the former of the two made the first move.

In March 2004, the Ministry of Internal Affairs and Communications established the u-Japan Policy Roundtable and formulated the u-Japan Policy package through 10 months of discussions. As explained in the preceding chapter, u-Japan is not the IT vision as represented by the ubiquitous network, rather it refers to the social status wherein the socioeconomic issues that Japan will face in the future are resolved from the user perspective by means of ICT of the ubiquitous network.

In April 2005, METI also proposed an innovative industrial structure theory for the information economy field centered on platforms and solutions through profound discussions concerning changes in the industrial structure on the architectural level although this was done in a short period immediately after the formulation of the u-Japan policy. The foundation used by this Vision for Information-based Economy and Industries

Figure 11. Framework for Establishing the Next-Phase National IT Strategy



as the future image of an IT utilization environment was the “development of the ubiquitous IT utilization environment,” which is one of the five major strategies of this proposal. While the contents of this ubiquitous IT were not examined in detail, we may reasonably assume that they are almost the same as those of the u-Japan policy.

As noted in the preceding chapter, the Phase 3 principles for formulating the Basic Policy for Science and Technology also adopted the “realization of the ubiquitous network society that is captivating the world” as one of the 12 achievement goals.

Japan’s first national IT strategy has become well known among the public because of its name, e-Japan Strategy. Accordingly, the next-phase national IT strategy should have a similar name. As candidates, no names other than u-Japan are conceivable because the ubiquitous network paradigm has firmly penetrated into society and companies and has been adopted as the core concept in the next-phase information and communications policy, industrial structure policy and science and technology policy.

First, the next-phase national IT strategy should convey the message of broadly switching the tone of strategy from the typical catch-up type of strategy to the national IT strategy of being the front runner. In order to clearly show the world that Japan’s national IT strategy has changed, it is preferable to avoid the use of “e,” which gives the impression of a hackneyed term, or “I,” which has long been used by the EU and Singapore. In contrast, “u,” which stands for “ubiquitous,” also stands for “universal” and “user-oriented,” connoting a wide range of meanings.

Second, because the next-phase national IT strategy will be publicized throughout the world, it should be

something that highlights the strength of the Japanese IT environment. In particular, at its initial stage, the ubiquitous network paradigm was planned and intended to enable the development of information equipment that would give the Japanese IT industry a certain degree of international competitiveness. The aim was regenerating the Japanese IT industry so that it would occupy the core position of IT.

The end of the 1990s, when the e-Japan strategy was discussed, corresponds to the period when Japan lost confidence of just about everything after going through the “lost ten years.” One of the major reasons for this lost confidence was that Japan could not become involved at all in the initiative in the world flow of the IT paradigm in the 1990s (the situation that had changed completely from the 1980s).

During the five years under the e-Japan Strategy, Japan’s IT industry and electronics industry recovered confidence under an accelerated trend in promoting broadband services, and strengthened their confidence by generating a flourish in the production of digital home appliances in Japan. However, this confidence was based on a fragile foundation.

The next-phase national IT strategy must be aimed at ensuring the recovery of the confidence of the Japanese IT industry. The term *ubiquitous* was first used in the United States in the expression of ubiquitous computing. However, the ubiquitous network is the IT paradigm that was re-defined and re-invented in Japan.

Third, the next-phase national IT strategy should envisage the trends of IT strategies in other countries. Around the time when the Ministry of Internal Affairs and Communications established the u-Japan Policy Roundtable and Minister Aso announced the u-Japan Plan, Korea announced the “u-Korea Promotion

Strategy.” Following this, Korea implemented the IT839 Strategy. By adopting and promoting a typical government-led industrial policy, Korea has steadily pursued the fulfillment of such a strategy. China has also started to address the ubiquitous paradigm by using the Chinese equivalent of *suiyi*. Background factors behind these moves are likely to include the start of full-scale approaches to the ubiquitous paradigm principally among the IT companies in Japan.

While the diplomatic relationships between Japan and Korea and between Japan and China have recently tended to be somewhat uncomfortable, the underlying tone of collaboration and cooperation among Japan, Korea and China in the IT field has remained unchanged, while competition continues. Japan will certainly be able to contribute to this framework by taking the lead in the u-Japan policy, establishing the IT paradigm and promptly achieving the ubiquitous network society in Japan.

While the EU advocates ambient intelligence and appears to have distanced itself from the ubiquitous network paradigm, its basic direction appears to be the same. The United States consistently remains indifferent. For some time in the future, the IT strategy of the United States will remain neither too close to nor too remote from national security, and will focus on the dissemination of the IPv4-based Internet paradigm, which was established in the late 1990s all over the world.

While moves to promote broadband services are just starting to be accelerated in the United States, these moves are far different from the u-Japan concept that plans to develop a broadband mobile network and to connect electronic tags, sensor networks, network robots and even ITS by establishing compatibility among these systems. Of course, there is no reason that Japan’s national IT strategy should conform to that of the United States. The past mistake made with the home-manufactured basic software TRON should not be repeated.

(2) From “utilization strategy” to new “value creation strategy”

The e-Japan Strategy II was without parallel in that the focus of the national IT strategy was shifted from the development of IT infrastructure to the promotion of IT utilization. Through this shift, Japan’s IT policy has been changed from one that emphasizes hardware to one that is well balanced by including software that also is as comprehensive as services and solutions. The road map has been established for the details of the e-Japan Strategy II measures. Based on this road map, the progress in the pioneering activities being conducted in the seven fields of medical service, food, lifestyle, small and medium enterprise financing, etc., is being managed.

However, these pioneering activities are being conducted basically to promote the utilization of existing IT. The underlying concept for these activities is the promotion of utilization “as the means of disseminating IT.”

These efforts attempt to promote structural reform based on IT in the field of public service as well as by creating leading model projects to facilitate IT utilization in that field such as medial service and knowledge where IT is not fully utilized.

In households and companies, the promotion of IT utilization is left up to the preference of users. While the government should contribute to the improvement of basic IT literacy, it is up to users who will ultimately decide whether to use IT. However, if the situation is left alone in the field of public service, IT utilization that can lead to service reforms might never start. This will cause difficulties in the world of networks that are strongly influenced by outside factors. The promotion of IT utilization in the field of public services will have greater significance than structural reform as a political slogan. This significance may grow even greater if ripple effects can be generated in fields other than the initial seven fields.

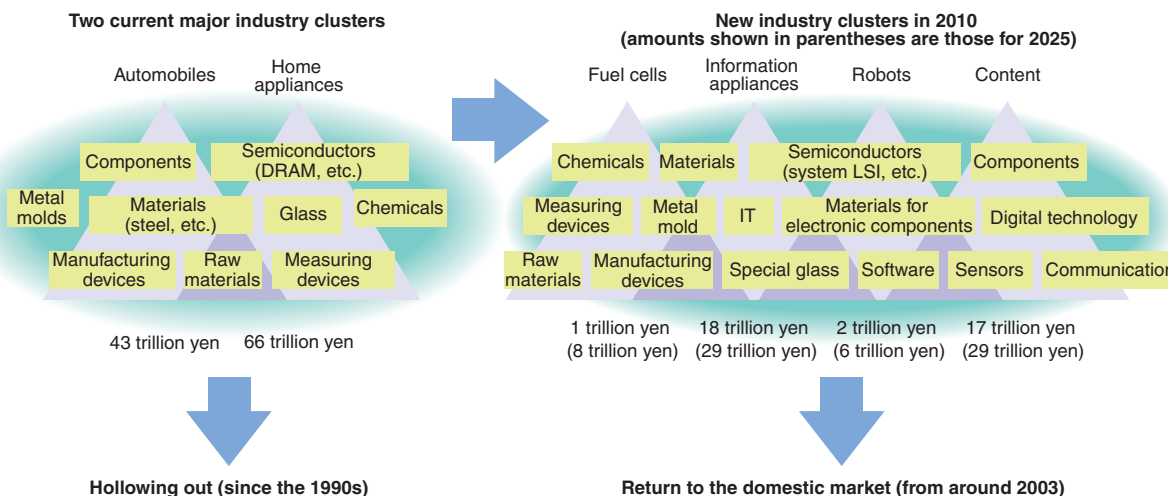
Then again, the next-phase national IT strategy should be the one that provides solutions to various social and economic issues facing Japan and that fulfills the expectations and dreams that people have of IT. Accordingly, the next-phase national IT strategy should cover the overall aspects of lifestyles, companies and society without limiting its focus on only the field of public services. If such a shift is made to pursuing extensive goals, what achievements should be pursued by the next-phase national IT strategy?

Clues for the answer may be required of the industrial structure policy being developed by the Ministry of Economy, Trade and Industry. The Vision for Information-based Economy and Industries formulated in the IT field comes under the framework of the “New Industry Creation Strategy.” This strategy was formulated in May 2004 with the aim of revitalizing a strong manufacturing industry and creating various service industries that could generate employment opportunities (Figure 12).

The strength of the Japanese industries that is based on the current structure in which the two major industrial groups of automobiles and home appliances are supporting the Japanese economy is being lost due to the progress of globalization and hollowing-out in the 1990s. If no measures are taken, the advanced component and material industrial cluster that is now barely competitive in Japan may also be lost. As a vision of overcoming this situation, this strategy proposes the establishment of the leading-edge industrial fields of fuel cells, digital home appliances with communications capabilities, robots and content, and the creation of fields to respond to three market needs of health and welfare, the environment and energy and business support in the domestic market.

In other words, the new industry strategy intends to find a way for the advanced component and material industry cluster to survive by creating new industries

Figure 12. New Industry Clusters in 2010 Expected in the “New Industry Creation Strategy”



Notes: DRAM = dynamic random access memory, LSI = large scale integration.
 Sources: Compiled based on the “New Industry Creation Strategy,” May 2004, and the “New Industry Creation Strategy 2005,” June 2005, the Ministry of Economy, Trade and Industry.

such as digital home appliances with communications capabilities and fuel cells before this industry cluster is exported overseas.

There is no doubt that IT is involved in the development of home appliances from current digital home appliances to digital home appliances with communications capabilities, thereby creating a means of vitalizing the advanced component and material industry cluster. IT is going to play an important role not only for digital home appliances with communications capabilities but also in all of the seven new industries previously mentioned. What is required of IT in playing such an important role is not the promotion of IT utilization, which is the goal from the perspective of the IT side, but is the support of innovations to be implemented by the home appliance industry for their own survival. This is no less than “value creation” for industries. In sum, what the new industry creation strategy suggests to the next-phase national IT strategy is that IT should pursue a “value creation strategy” by going beyond the strategy of utilization promotion. The creation of value means the creation of new industries.

During the five-year period of the e-Japan Strategy, IT has become firmly established as the basic infrastructure for industries. In the future, any new industry will be created on the IT infrastructure. The ubiquitous network will make the creation of value, i.e., new industries, extremely easy by providing infrastructure where various industrial functions are freely combined and connected. The platform strategy presented by the Vision for Information-based Economy and Industries will implement these targets with greater efficiency.

This value creation strategy should not be confined only to supply-side fields, i.e., industries, and should be extended to the user side such as life and society. The Expert Committee on Evaluation of the IT Strategic Headquarters is also implementing a “priority evalua-

tion” that assesses individual policies for the seven pioneering activities such as medical service, food and knowledge, in addition to an “overall evaluation” that assesses the achievements of the e-Japan Strategy over five years. The basic concept behind the implementation of these evaluations is “achievements of outcome from the user perspective.”

More than 300 measures to be implemented by eleven ministries to realize the e-Japan Strategy have individual goals and a target year for fulfillment. While an important aspect in the policy evaluation is to evaluate whether these measures are progressively implemented, the evaluation of IT strategy should not be confined only to such evaluation. To evaluate whether these measures are meeting their intended purposes, the achievements that these measures are providing users, the ultimate beneficiaries, must also be evaluated.

For this purpose, in implementing priority evaluation, the Expert Committee of Evaluation analyzed not only output (supply) but also outcome (achievement) of the measures to the greatest extent possible. The basic stance of guaranteeing effectiveness in the outcome aspect in addition to the output aspect of the policy itself that is implemented by making use of limited policy resources inevitably results in making a proposal suggesting the use of a PDCA cycle in policy implementation.

The aim of the u-Japan Policy Roundtable was to accomplish this goal of “achievement of outcome from the user perspective” from the beginning of the formulation of the policy vision. What were first implemented were not studies of the benefits to be brought about by ubiquitous network ICT, but were studies of the dissatisfactions and apprehension that people, ICT users, have as we move towards 2010, and their expectations and requests of social systems. The ICT utilization environment that was considered as appropriate to resolve the

various problems identified in these studies was the ubiquitous network ICT utilization environment. This environment enables the limitless combination of services and business models at low cost and transcends time and space by means of the “network that can be connected anywhere, at any time and by anything.”

In the ubiquitous network society, the network is fully utilized in any scene of life and society because it is accelerated by the basic desire of users to “be better connected.” In this society, new values, i.e., realizing user expectations and resolving social issues, are created one after another. The framework of the u-Japan policy itself was originally established as the mechanism to create value from the user perspective.

The value creation strategy for life and society is explicitly described in one of the characteristics of the ubiquitous network—IT for the resolution of various socioeconomic issues facing Japan in the future. The ubiquitous network will bring about the possibilities of the development of new industries, such as a diversity of digital content, ubiquitous home appliances, ubiquitous cars, ubiquitous housing/offices, etc. Furthermore, the ubiquitous network will resolve a variety of issues based on these newly developed industries, such as a declining birth rate and an aging society, a safe environment for life, medical and welfare service, employment of young people, females working throughout life, life-long education and training, environmental issues closely related to our quality of life, etc. The biggest and probably ultimate purpose of the ubiquitous network is the achievement of value creation by highly effective and economical solutions.

In the case of the electronic commerce paradigm, the realization of IT for this purpose itself constitutes a source for the creation of new value. However, this does not apply to the ubiquitous network. The ubiquitous network simply provides a means of creating value. However, the ubiquitous network offers convenience that can be expressed as “ultimate” as far as IT and network utilization are concerned to entrepreneurs who intend to create value and to users who want to benefit from such new value. Accordingly, extensive measures are required to implement the ubiquitous network, such as deregulation, research and development and the establishment of a legal framework. This is why the ubiquitous network should be promoted under the national IT strategy or “the u-Japan value creation strategy” that mobilizes industry, government, academia and people.

(3) Indispensable security, privacy and network crime measures

The ubiquitous network will bring about ultimate network convenience and, at the same time, it has the possibility of bringing ultimate vulnerability. This is clear from the fact that as many as 100 issues were identified as negative aspects of the ubiquitous network society, as

noted in the previous chapter, including viruses, spam and phishing.

These problems have been quite apparent since the 1990s when Internet use started to spread. The network society is destined to continue to deal with these problems. With the progress in ubiquitous networking in the future, many of these problems will become increasingly serious and might give rise to very new problems. Accordingly, the progress in ubiquitous networking simultaneously means an intensification of effectively dealing with these negative aspects.

It is impossible to formulate any national IT strategy without dealing with the negative aspects that can be collectively called “the security and privacy issues.” The e-Japan Strategy was initially started without having a priority area devoted to security. It was in 2003, when the e-Japan Strategy II was established, that security was added to four priority policy areas, creating five priority policy areas. After the enforcement of the Personal Information Protection Law in 2005, privacy was added to these priority areas. The next-phase national IT strategy must highlight measures addressing these negative aspects as an important policy area.

What is important in these efforts is the viewpoint of “chasing an attacker.” A tendency of criticizing inadequate “measures on the victim side” continues to be seen in the response of the mass media when security- or privacy-related events or accidents occur. When the website of a company is compromised or unauthorized access is gained, the first to be denounced is the victim, whether a company or an individual. The fact that appropriate measures have not been taken is denounced. It is very important to establish social common sense or to create a culture concerning the need for users to take their own security precautions. With respect to security, this recognition is already well established to a substantial extent. In the future, there is no doubt that activities to disseminate such recognition with respect to privacy will become increasingly important.

However, if efforts are to be made to spread a new social common sense or culture, any measures leaning toward responses on only the victim’s side cannot be regarded as balanced. Tampering with websites and unauthorized access are crimes. While such acts were not considered crimes at the initial stage of Internet usage, with the progress of the penetration of the network society, a new awareness has given birth to a legal framework. At present, unauthorized access is a crime subject to a penalty. What is important in the social system is not to press victims to take appropriate preventive measures but to punish perpetrators of such acts.

At present, the network society is at a turning point of whether it can be a truly essential infrastructure for everyday life and corporate activities. While users have gone as far as feeling they are unable to live without the network or the Internet in terms of the recognition of its convenience, at the same time they are tired of viruses,

spam, phishing, the disclosure of personal information, etc. If these negative aspects become too prominent, there is a possibility that current users (late majority as well as early majority) may limit their use of the network or avoid it altogether.

In order to prevent such a situation, now that the network society has taken firm root, the focus should be shifted to the prosecution of offenders and the establishment of a framework that enables the following actions: first, “detering” an offender from committing the crime in the first place, second, “arresting” offenders without fail through thorough investigation once a crime is committed, and third, “meting out an appropriate punishment.”

Although security measures were incorporated in the national IT strategy in 2003, measures to protect privacy should be added in the next-phase national IT strategy. At the same time, approaches by society to catch and punish offenders should also be included in addition to measures promoting preventive actions on the victim side, which have received priority in the past.

In this sense, “security, privacy and network crime measures” should be established as core areas in order to make it abundantly clear that network attacks are crimes and will result in strong punishment.

In this respect, there is much that we can learn from the advanced and comprehensive approaches taken in the United States. Since the September 11 terrorist attacks, the United States has been allocating substantial resources not only to national security and public order in the real world, but also to advanced security measures for the world of electronic networks. In this respect, it will be important to make the next-phase national IT strategy effective by learning from the extensive experience accumulated in the United States and by keeping in step with that country.

Notes

- (1) While the trend of using the term *ICT* (information and communications technology) vs. *IT* (information technology) and using such expressions as “ICT strategy” and “ICT paradigm” has recently increased, this paper mostly uses “IT” except for the portions related to “u-Japan policy” in order to maintain consistent usage with my past papers.
- (2) Masahiko Sato Laboratory of Keio University, *Nihon no switch* (Japanese Switch), the Mainichi Newspapers, 2004.
- (3) Teruyasu Murakami, “Establishing the Ubiquitous Network Environment in Japan: From e-Japan to u-Japan,” *NRI Papers*, No. 66, July 2003 and “Ubiquitous

Networking: Business Opportunities and Strategic Issues,” *NRI Papers*, No. 79, August 2004.

- (4) Mark Weiser, “The Computer for the 21st Century,” *Scientific American*, September 1991.
- (5) Table 1 of “Ubiquitous Networking: Business Opportunities and Strategic Issues,” *NRI Papers*, No. 79, August 2004.
- (6) *Yubikitasu nettowaku* (The Ubiquitous Network), NRI, 2000, *Yubikitasu nettowaku to shijo sozo* (The Ubiquitous Network and Market Creation), NRI, 2002 and *Yubikitasu nettowaku to shin shakai sistemu* (The Ubiquitous Network and New Social System), NRI, 2002.
- (7) Teruyasu Murakami, “Ubiquitous Networking: Business Opportunities and Strategic Issues,” *NRI Papers*, No. 79, August 2004.
- (8) Teruyasu Murakami, “The Ubiquitous Network: The New ICT Paradigm,” Second International Ubiquitous Computing Symposium 2004 in Seoul, October 24, 2004.
- (9) Same as Note 7.
- (10) The Tokyo Ubiquitous Network Conference, May 16 and 17, 2005 (www.wsis-japan.jp/index_j.html).
- (11) Liu Jiren, “Applications and Practices of Ubiquitous Computing in China,” The Tokyo Ubiquitous Network Conference, May 2005.
- (12) Teruyasu Murakami, “The Ubiquitous Network as the New ICT Paradigm,” Forum on the Construction of Ubiquitous Digital Society in Shanghai, May 31, 2005.
- (13) “The Final Report of the Policy Roundtable for Realizing a Ubiquitous Network Society,” Ministry of Internal Affairs and Communications, December 2004 (www.soumu.go.jp/joho_tsushin/eng/Releases/Telecommunications/news041217_7.html).
- (14) Same as Note 13.
- (15) “Vision for Information-based Economy and Industries,” the Information Economy Committee of the Industrial Structure Council, April 2005.
- (16) “Principles for Formulating the Basic Policy for Science and Technology,” Council for Science and Technology Policy, June 2005.
- (17) Same as Note 16.
- (18) “Research and Development for Ubiquitous Network Society—UNS Strategic Programs,” Research and Development Strategy Committee of the Information and Telecommunication Council, June 2005.
- (19) Figure 3 of “Ubiquitous Networking: Business Opportunities and Strategic Issues,” *NRI Papers*, No. 79, August 2004.
- (20) Figure 5 of “Ubiquitous Networking: Business Opportunities and Strategic Issues,” *NRI Papers*, No. 79, August 2004.

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