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Ubiquitous Networking: Business Opportunities and Strategic Issues

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The ubiquitous network is positioned as a goal of the development of the next-generation information and communication technology (ICT) infrastructure under the e-Japan Strategy II, and the systemization of policies toward this goal is moving forward in Japan. In addition, there are signs of the gradual international evolution of this new paradigm as represented by vitalized activities in this field in South Korea and focused discussions by Japanese delegates about this theme at the World Summit on the Information Society (WSIS) of the United Nations held in December 2003 in Geneva.

This paper clarifies that the ubiquitous network is a total ICT paradigm that was rediscovered in Japan after we entered the 21st century and discusses business opportunities and related strategic issues based on the trends that have become clear since the spring of 2003.

In the process toward ubiquitous networking in Japan, various network infrastructures must be so developed as to acquire compatibility and interoperability. These infrastructures include wired networks with their focus shifting from high-speed to super high-speed network access, wireless networks aiming at being the world's most advanced networks, transportation system networks with their links being closer, broadcasting networks undergoing digitization, and physical object networks that will soon emerge.

Japanese companies are in a highly competitive position with respect to the development and dissemination of ubiquitous terminals. Favorable results in this field will lead to the growth of ubiquitous electronics, and will give birth to the possibility of facilitating the growth of clusters of diverse ubiquitous service solutions, with a new set of three sacred treasures consisting of ubiquitous home appliances, ubiquitous cars and ubiquitous offices.

In the realization of these business opportunities, approaches aimed at the development of original content and solutions from the user perspective are important at the stage of developing a network infrastructure. At the phase of developing the ICT utilization infrastructure, a vision for the realization of a strategic module vertical evolution model is needed. In evolving utilization solutions, the "industry-consumer reversal" phenomenon must be fully recognized.

I Progress in Activities for Ubiquitous Networking

1 Political Measures

(1) Positioning under e-Japan Strategy II

The political framework of achieving a national ICT strategy based on the e-Japan Strategy and the e-Japan Priority Policy Program began in 2001. From the outset, this framework included a review of the appropriateness of the strategy at an intermediate stage before the target year of 2005. Work for this planned review was energetically conducted by the Task Force on Future IT Strategy from November 2002 to April 2003. Consequently, e-Japan Strategy II was adopted in July 2003 by the IT Strategic Headquarters headed by Prime Minister Junichiro Koizumi.

The basic features of e-Japan Strategy II are outlined in Figure 1 for easier understanding. The vertical axis of Figure 1 is divided into two categories depending on whether the focus of a strategy is related to the development of the ICT infrastructure or to the promo tion of ICT utilization. The horizontal axis consists of two categories with respect to how each national ICT strategy is to be achieved. One category pursues achievement by using the existing ICT environment, and the other category does so by building a new environment originated in Japan.

The first feature of e-Japan Strategy II is that the focus of the nation's ICT strategy was dramatically shifted from the development of the ICT infrastructure, which was aimed at promoting broadband capabilities, to the promotion of ICT utilization. This means a shift from the development of the ICT environment to actual utilization.

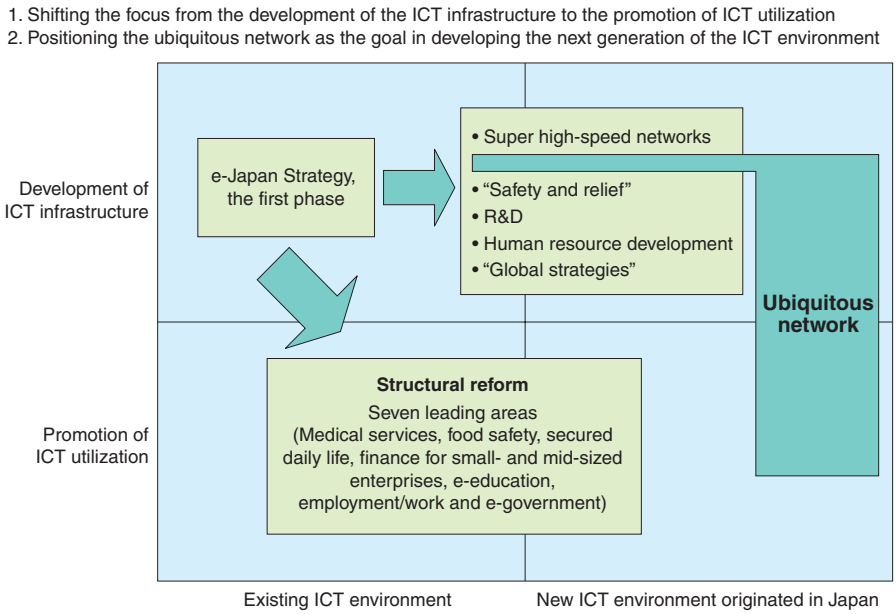
To promote ICT utilization, e-Japan Strategy II presents specific visions for activities in seven leading areas: medical services, food safety, secured daily life, finance for small- and medium-sized enterprises, education, employment/work and e-government. Under the recognition that while development of the infrastructure is progressing in the form of increased broadband capabilities, much yet remains to be done with respect to its utilization, specific targets were set up in these seven fields. This strategy indicates what is to be done in terms of not only ICT but also structural measures to promote ICT utilization, together with milestones for each target year.

With respect to the specific elements of each target, unlike those that have frequently been seen in this type of document in the past and which were considered satisfactory only by showing what is to be done by the government, this strategy indicates the overall process to promote ICT utilization and includes related activities by the private sector in addition to government measures.

This shift is probably the most significant feature of e-Japan Strategy II. However, even though the focus of the strategy was shifted, this does not necessarily mean that certain measures are no longer necessary with respect to the development of the infrastructure as progress is being made in the transition to broadband services. While broadband services are smoothly diffusing in the form of the rapid spread of asymmetric digital subscriber lines (ADSL) and a take-off of fiber-to-the-home (FTTH), the current situation can by no means be seen as having reached the stage where no specific measures are necessary. Rather, another decisive strategic approach was lacking in order to establish the world's truly most advanced ICT utilization environment in a short stretch.

Moreover, because the seven pioneering projects have the strong connotation of being implemented by means of ICT as part of structural reform, these activities are

Figure 1. Two Features of e-Japan Strategy II



expected to significantly contribute to the achievement of the top-ranking basic political goals pursued by the Koizumi administration. However, time will be required for these measures to produce economic effects, and the effects will be indirect to the industries involved. Accordingly, there is no doubt that the industrial world has perceived these policies to be slowgoing and irritating. The ICT industry, which is continually exposed to international competition and which is expected to increase productivity and create new value, has emphatically called for the emergence of a national ICT strategy that will bring a competitive edge to Japan. Japanese industries that utilize ICT have also asked for such a strategy.

The second feature of e-Japan Strategy II is strongly related to these requirements. In order to meet such requests, this strategy proposed the ubiquitous network as a goal for the development of the next-generation ICT environment (probably for the first time in the world). The second feature relates to this strategic decision.

While the details are explained later, the ubiquitous network refers to an environment where network connection is possible "at any time, in any place and with any object." While this definition comes from the perspective of the user, the process of building the infrastructure itself as well as the utilization of such an infrastructure is expected to have a major impact on the revitalization of Japan's economy.

e-Japan Strategy II clearly set up a goal of establishing the ubiquitous network environment at the opening of the section of "Infrastructure Development for the New IT Society," and placed emphasis on the development of a related network infrastructure, the establishment of a secure environment and the promotion of research and development (R&D). It also stressed the importance of verification tests that incorporate the user perspective.

(2) Activities aimed at systematizing the policy of ubiquitous networking

Activities related to ubiquitous networking among private-sector companies have already been evolving in a variety of forms. Since around April 2002, moves have become obvious in which major ICT-related companies in Japan have shed short-term activities such as holding trade shows with a theme of ubiquity and implementing one-time, all-inclusive R&D projects, and have instead started long-term approaches by establishing long-lasting organizations whose names are prefixed by the word "ubiquitous" within a company.

These moves have been accelerating and involving a wider range of fields since April 2003 when the formulation of the essential elements for e-Japan Strategy II was completed (Table 1). Consequently, most major ICT-related companies in Japan have now started to promote specific activities related to the ubiquitous network in one form or another. With the results of these activities continually taking concrete shape, companies will begin to propose a variety of solutions to users.

At the same time, the government also began to take a consolidated approach toward ubiquitous networking. In the past, each ministry took discrete approaches to this goal as represented by the different names they used. The Ministry of Public Management, Home Affairs, Posts and Telecommunications (MPHPT) called it the ubiquitous network; the Ministry of Economy, Trade and

Table 1. Major Companies Establishing Organizations Related to the Ubiquitous Network

Date established	Company name (organization name)
2004 April	Fujitsu (Ubiquitous Platform Division)
April	NEC Corp. (Software Business Unit, System Software Operations Unit, Ubiquitous Software Division)
April	NTT Communications Corp. (Ubiquitous Service Department)
April	NEC Soft (Ubiquitous Systems Division)
April	NEC Engineering (Ubiquitous Business Promotion Center)
March	SGI Japan (Broadband Ubiquitous Solution)
March	Hitachi (Ubiquitous Platform Systems R&D Laboratory)
January	NEC Corp. (Solution Development Laboratories, Ubiquitous Platform Development Division)
2003 December	Fujitsu (Ubiquitous System Group)
December	Yokogawa Electric Corp. (R&D Ubiquitous Field Computing Research Center)
October	Hitachi (HDD Platform Project)
September	Mitsubishi Electric Corp. (ubiquitous product business group)
June	NTT DoCoMo (Ubiquitous Business Department, Mobile Multimedia Division)
April	Hitachi Capital Corp. (Strategic Planning Office, Ubiquitous Platform Systems)
April	Fuji Xerox Co. (Ubiquitous Media Business Development)
April	Mitsubishi Electric Corp. (ubiquitous video technology department)
2002 October	Fujitsu (Ubiquitous Platform Division)
October	Hitachi (Ubiquitous Solutions Operation)
October	NRI Data Services (Ubiquitous Project Department)
October	Ricoh Co. (Ubiquitous Solution Lab)
April	Hitachi (Ubiquitous Platform Systems)
April	Sony Corp. (Ubiquitous Technology Laboratories)
April	Nihon Unisys (ubiquitous business center)
April	Hitachi (ubiquitous solution headquarters)

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.

Industry (METI) pursued the ubiquitous information society; the Ministry of Land, Infrastructure and Transport (MLIT) called it a ubiquitous information network and the Ministry of Education, Culture, Sports, Science and Technology (MEXT) named it ubiquitous computing. From fiscal 2003 (April 2003 – March 2004) to fiscal 2004 (April 2004 – March 2005), their direction has gradually appeared to coincide.

MPHPT compiled the budget for all activities related to the ubiquitous network on a consolidated basis in the budget formulation for fiscal 2004. MPHPT started the Policy Roundtable for Realizing a Ubiquitous Network Society in March 2004 in an effort to form a long-term political vision not only up to 2005 but also of 2006 and thereafter.

Following their activities aimed at promoting digital home appliances with communications capabilities in fiscal 2003, METI started to take a full-scale approach in fiscal 2004 to the development of products based on electronic tag technology. (Such a tag incorporates an IC chip and antenna enabling the reading of identification numbers and other information about the object.) Verification field experiments are planned in an extensive range of industrial fields.

The year 2004 is also an important year for MLIT as the 11th World Congress on ITS (Intelligent Transport Systems) is planned in Nagoya Prefecture dealing with transportation system networks (networks that can be connected from fast-moving vehicles) are actively being implemented. MEXT is also focusing on its digital content policy from the perspective of promoting its intellectual property strategy.

When the ICT policy of each ministry finally started to move in the same direction in terms of ubiquitous networking, the tendency of amusingly commenting on these moves, such as "the 1980s are coming again," started to emerge in the media. These comments depicted this situation as a quarrel between MPHPT and METI over ICT policy jurisdiction.

A budgetary overlap would be out of the question in which two different ministries intend to implement projects of the same nature under different budget allocations. However, under the Japan's administrative system that does not have a dedicated organization such as an information and communications ministry, it would be understandable that similar themes would appear for the same field from multiple ministries and agencies. This is because the guidelines for the ICT policy that covers multiple fields such as ubiquitous networking involve separation of the responsibilities assigned to each ministry, such as a distinction between computers and communications, and between information equipment and networks. If the question involves important issues related to the Japanese economy and/or the development of the ICT utilization environment, it would be surprising under the current administrative system if similar themes did not emerge at all.

Nevertheless, it is also true that what is even more requisite is a sensible attitude among the multiple ministries and agencies to facilitate the cross-referencing of study results on similar themes and to mutually implement related measures, thereby making the best use of the results achieved as a result of mutual respect and openly criticizing the shortcomings of the respective measures.

The interim report compiled by the assessment study group of the IT Strategic Headquarters at the end of March 2004 proposed that the Cabinet Secretariat demonstrate greater initiative from the perspective of performance goals, rather than measure goals. It did so with respect to the important issues related to ICT policy covering multiple government offices under "performance-based principles from the perspective of users."

While there is only one direction toward the achievement of the goal, the implementation of measures to reach the goal in a political area such as ubiquitous networking must involve multiple ministries and agencies. I hope that the best practices for achieving this goal will emerge from these struggles in a form that realizes specialty and comprehensiveness in a well-balanced manner.

2 Preventing Misunderstandings regarding Ubiquitous Networking

During the past year, the concept of ubiquitous networking has undergone a shift from one positioned as one of the scenarios for the future of ICT to a paradigm that forms part of Japan's national ICT strategy.

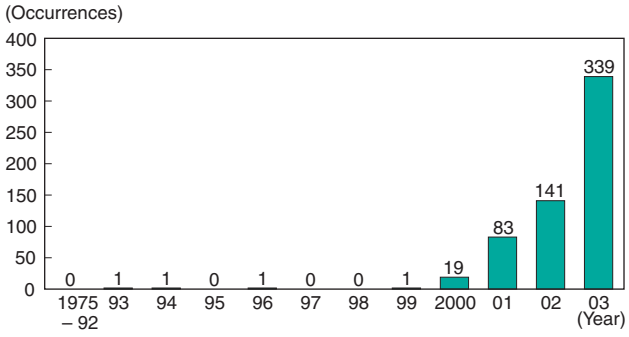
At the same time, the term "ubiquitous" has started to be increasingly used in ordinary newspapers, magazines and corporate advertising. In addition, an increasingly greater diversity has been seen in its use. Starting with the ubiquitous network and ubiquitous computing, its extremely diversified use includes ubiquitous information society, ubiquitous revolution, ubiquitous society, ubiquitous solutions, ubiquitous business and so on. According to my (admittedly) rough count, some 35 or more phrases prefixed by the term "ubiquitous" are now being used. Moreover, the situation has reached the stage where the term "ubiquitous" is even used in the subject matter of comics.

Under these circumstances, it is likely that the ubiquitous network as one element of the national ICT strategy may also be given a variety of meanings from respective perspectives. To avoid any misunderstanding, this paper intends to clarify the concept of the ubiquitous network by focusing on the following three points.

(1) Full-scale penetration since we entered the 21st century

This first point relates to the fact that the ubiquitous network is a concept that has gained full-scale popularity since we entered the 21st century.

Figure 2. Frequency of Use of the Term "Ubiquitous" in Four Nikkei Newspapers



Note: The four Nikkei newspapers are *Nihon Keizai Shimbun, Nikkei Business Daily, Nikkei Marketing Journal* and *Nikkei Financial Daily*.

Figure 2 shows how many times the term "ubiquitous" appeared in four Nikkei newspapers (*Nihon Keizai Shimbun, Nikkei Business Daily, Nikkei Marketing Journal* and *Nikkei Financial Daily*) in one year. As far as the four Nikkei newspapers are concerned, the frequency of use of this term was close to zero until 1999. The term gradually began to emerge in 2000, and its frequency of use continued to increase in 2001 and 2002. In 2003, its use reached the stage where an ordinary business person in Japan saw this term in a newspaper as often as once a day.

While some say that this term had been discussed in the past, it is after we entered the 21st century that the term started to be used as frequently as today in terms of recognition by the industrial world. In this sense, the term still represents a growing concept. There is the possibility that the essential content of the term may change in the future in response to technological innovations in the ICT field and structural changes.

(2) The ubiquitous network was rediscovered in Japan

The second point is that the ubiquitous network is a concept that was rediscovered in Japan and is beginning to attain a unique maturity in terms of the formation of the concept.

When I conducted surveys in the United States in 1999, the term "ubiquitous" was being used by the Worldwide Web Consortium (W3C) and Sun Microsystems. In discussing this theme in Japan, however, the concept of ubiquitous networking was clarified by introducing the concept of ubiquitous computing as this case represents the most easy-to-understand example for many people. That concept was first articulated by Mark Weiser, a chief technologist at the Xerox Palo Alto Research Center (PARC).

Weiser advocated a new computing (the use of computers) paradigm called ubiquitous computing in 1988. Ubiquitous computing consists of context-aware concepts (the system itself can make a decision based on the circumstances) in which computing capabilities are incorporated everywhere and are linked to automatically generate an optimal status.

While the background environment behind Weiser's proposal in 1988 (which is prior to the spread of the Internet) included the penetration of personal computers (PCs) and open architecture (systems for which the specifications of hardware and software are known), the ICT environment following the spread of the Internet was naturally assumed when we began research and study in this field at Nomura Research Institute (NRI). However, at that time, the Internet was extremely inconvenient to use because the access method involved narrowband dial-up connections. Moreover, because of concern over communication charges, people were a bit hesitant about their use of the Internet.

As we started to consider the concept of "ubiquity" under these circumstances, ubiquity in terms of network access, in particular Internet access, seemed far more important for us than the ubiquity of computing capabilities. Since then, we have consistently used the phrase "ubiquitous network." The factors behind our adoption of this expression included the start of Internet service for cellular phones in February 1999 as well as the existence of an IT environment enabling us to anticipate that connecting video game machines and TV sets to the Internet would be only a matter of time.

Accordingly, the concept of the ubiquitous network was born in Japan, and was fostered (in an extremely short period) under an ICT utilization environment where cellular phone Internet and car navigation equipment are nothing out of the ordinary. In terms of its relationship with ubiquitous computing, it can be said that the ubiquitous network is an ICT paradigm that was rediscovered in Japan. In other words, we are not importing the technologies born in the United States called ubiquitous computing.

(3) The ubiquitous network is a total paradigm, not an individual ICT element

The third point is that the ubiquitous network does not refer to an individual ICT, but to a total, comprehensive ICT paradigm or, in other words, the environment for ICT utilization for users.

Sometimes, the term "ubiquitous" is treated as a synonym for mobile Internet with cellular phones, and sometimes it is placed in the same category as that of digital home appliances having communications capabilities. Since around the beginning of 2003, there has been a tendency to call anything using electronic tags "ubiquitous." However, the ubiquitous network does not simply refer to such individual ICT elements. As is the Internet, the ubiquitous network is a single integrated ICT paradigm that covers a full range of key elements from network infrastructure, digital equipment with communications capabilities and digital platforms (infrastructure environment) to solutions, and represents the environment for ICT utilization.

The e-Japan Strategy II defines the ubiquitous network as an environment for ICT utilization where "a

network is connected at any place, at any time and with any object." This means the ubiquitous network is defined from the user perspective, rather than referring to individual ICT elements and/or networks. In this sense, ubiquitous networking is not something that will be achieved with only the spread of specific ICT elements such as electronic tags and sensor networks. Rather, it represents a major change that involves the entire social system ranging from legal frameworks and usage practices to value judgments.

3 The Ubiquitous Network from the User Perspective

As stated above, e-Japan Strategy II defines the ubiquitous network from the three aspects of connecting a network "at any place," "at any time" and "with any object." This is a definition of a ubiquitous network from the user perspective.

In my paper titled "Establishing the Ubiquitous Network Environment in Japan: From e-Japan to U-Japan,"[1] I defined the ubiquitous network from the aspects of both sides, suppliers and users, and formulated some conceptual frameworks. That the definition from the perspective of users comes to the fore in e-Japan Strategy II represents efforts to build the strategy on the principle of consistently focusing on the user perspective. In subsequent discussions after determining this strategy, many views and opinions from the user side were actively presented with respect to the ubiquitous network.

Figure 3 shows a framework for understanding the evolution of the format of use by dividing the process into four stages with respect to each of the three axes defining the ubiquitous network from the user perspective.

The first axis is connecting "at any place." Those who are 30 years old or over and who are enjoying their Internet connections will probably still remember their excitement when they first surfed the net by using Mosaic, a browser that was popular during the first half of the 1990s.

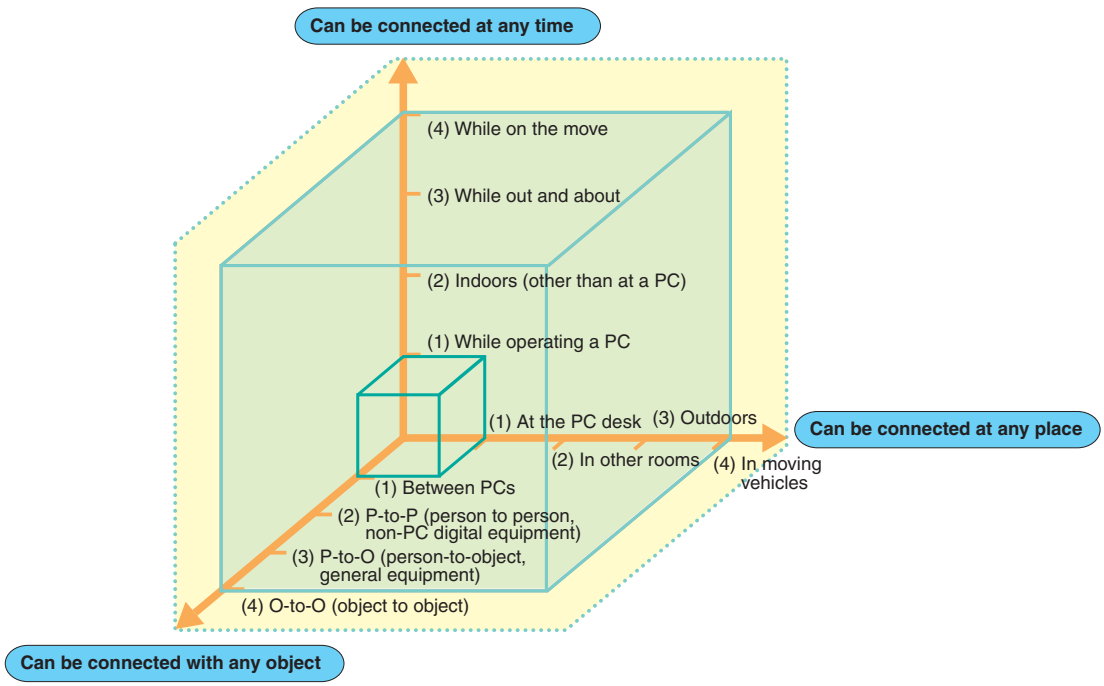
A person who had mostly engaged in activities in a space within several tens of kilometers felt indescribable excitement when he or she could be connected to the United States, the Netherlands or anywhere else via a network by just one click. This was truly a communications revolution.

However, this revolution only occurred when the user sat down before a PC. Once the user got up and left the PC, this supernatural power disappeared.

Since the emergence of the mobile Internet service for cellular phones started by NTT DoCoMo in 1999, a variety of information technologies enabling us to connect to a network other than by a PC have simultaneously come into bloom. These technologies include Bluetooth, wireless LANs (local area networks) such as IEEE802.11b, a and g, electric power line networks (Internet connections by using the existing electric power lines), RFID (radio frequency identification, a type of automatic identification system using tags available to provide certain information), network cameras (digital cameras connected to a network), car navigation equipment and ITS.

By making full use of these technologies, we are going to arrive at an environment enabling us to connect to a network "at any place" at considerably lower cost. "Any place" examples include: (1) in front of a PC, as before; (2) in individual rooms such as kitchens, living rooms and children's rooms in the case of households and in conference rooms and reception rooms, around coffee servers, etc. in the case of offices; (3) outside the home and office,

Figure 3. Evolutionary Stages of the Ubiquitous Network from the User Perspective



at convenience stores, airports and train stations, baseball stadiums, etc. and (4) when one is in a vehicle moving at a high speed, such as cars, trains and airplanes.

The second axis relates to connecting "at any time." This means service that is always on. Starting in 2001, which is called the first year of broadband, dedicated access service has become available in Japan via ADSL and CATV (cable TV) Internet. While these services provide an "always-on" environment only when a user can receive these wire-based broadband services in front of a PC, (1) access is not available when the user moves away from the PC. Even though 24 × 7 dedicated access is provided from the carrier perspective, "always-on" connections mean nothing for a user who is not in front of a PC.

To enable connections "at any time," connections must be possible "at any place" on an always-on basis. Connections at any time can truly be realized only after an always-on status is made possible at any occasion (2) even when the user is not in front of a PC at home or in the office, (3) even when the user is out for shopping or entertainment and (4) even when the user is traveling in a car, airplane, etc.

The third axis relates to connections "with any object." The ubiquitous network enables use of a wide variety of non-PC equipment such as cell phones, game machines and car navigation equipment, in addition to desktop and mobile PCs (1). While this will facilitate "better connections" between people (2), people who have experienced the "better connection" environment between people will soon go to the next stage of requiring "better connections" between people and objects (3).

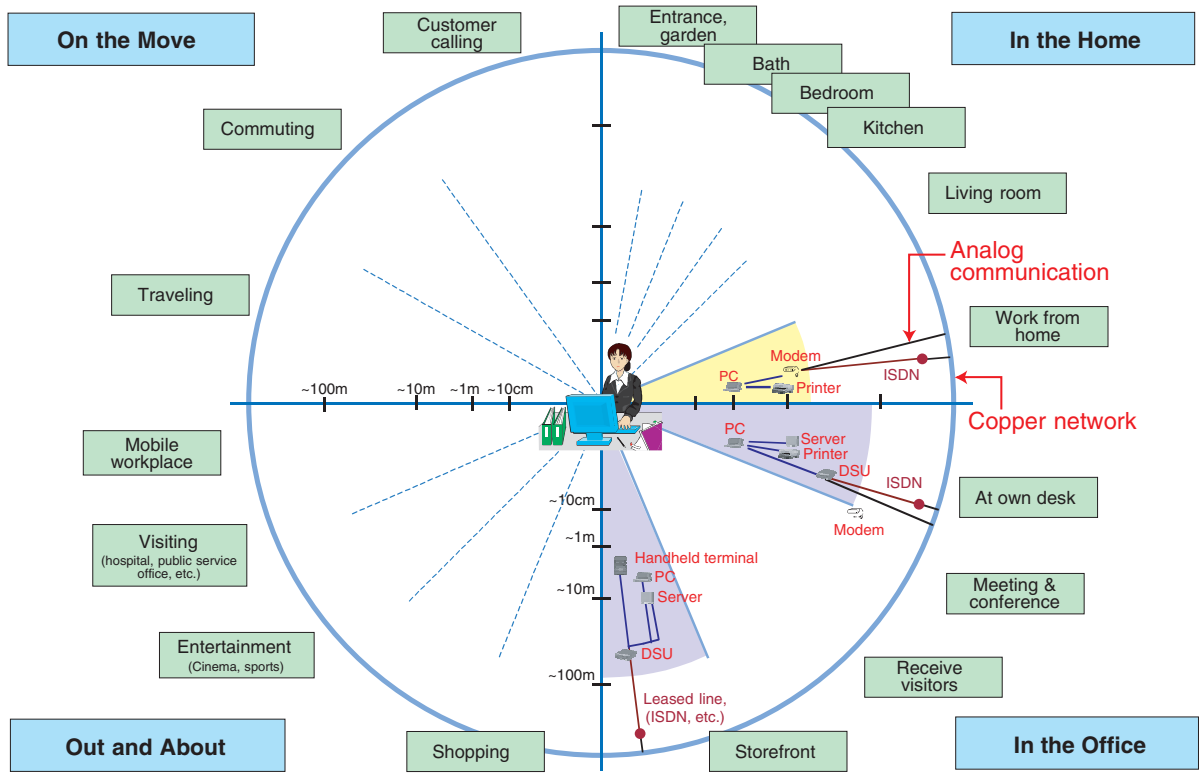
Digital home appliances with communications capabilities and network cameras will play a major role in satisfying the more sophisticated needs of users by connecting people with air-conditioners, refrigerators, DVD (digital versatile disc) recorders and security cameras. In addition, recent technical innovations are bringing such technologies as electronic tags, sensor networks and network robots down from the realm of science fantasy to the ordinary tools of everyday life.

Affixing electronic tags and/or sensors to objects such as beef, milk bottles, cabbage, window glass and curtain rods, which have had nothing to do with a network, will connect these objects to a network. Through object-to-object connections (4), for example, a refrigerator and a milk bottle will exchange information on how long the milk can maintain its fresh taste to facilitate the management of objects within a refrigerator. An automobile, walls of a parking lot, and a truck will mutually exchange signals to avoid collisions.

The process of ubiquitous networking can be seen as based on the three cubes shown in Figure 3. This process can be described as the course in which an innovation that occurred in a small cube, i.e., a communication revolution that took place in front of a PC, is further promoted and expanded to achieve the status indicated by the outermost large cube.

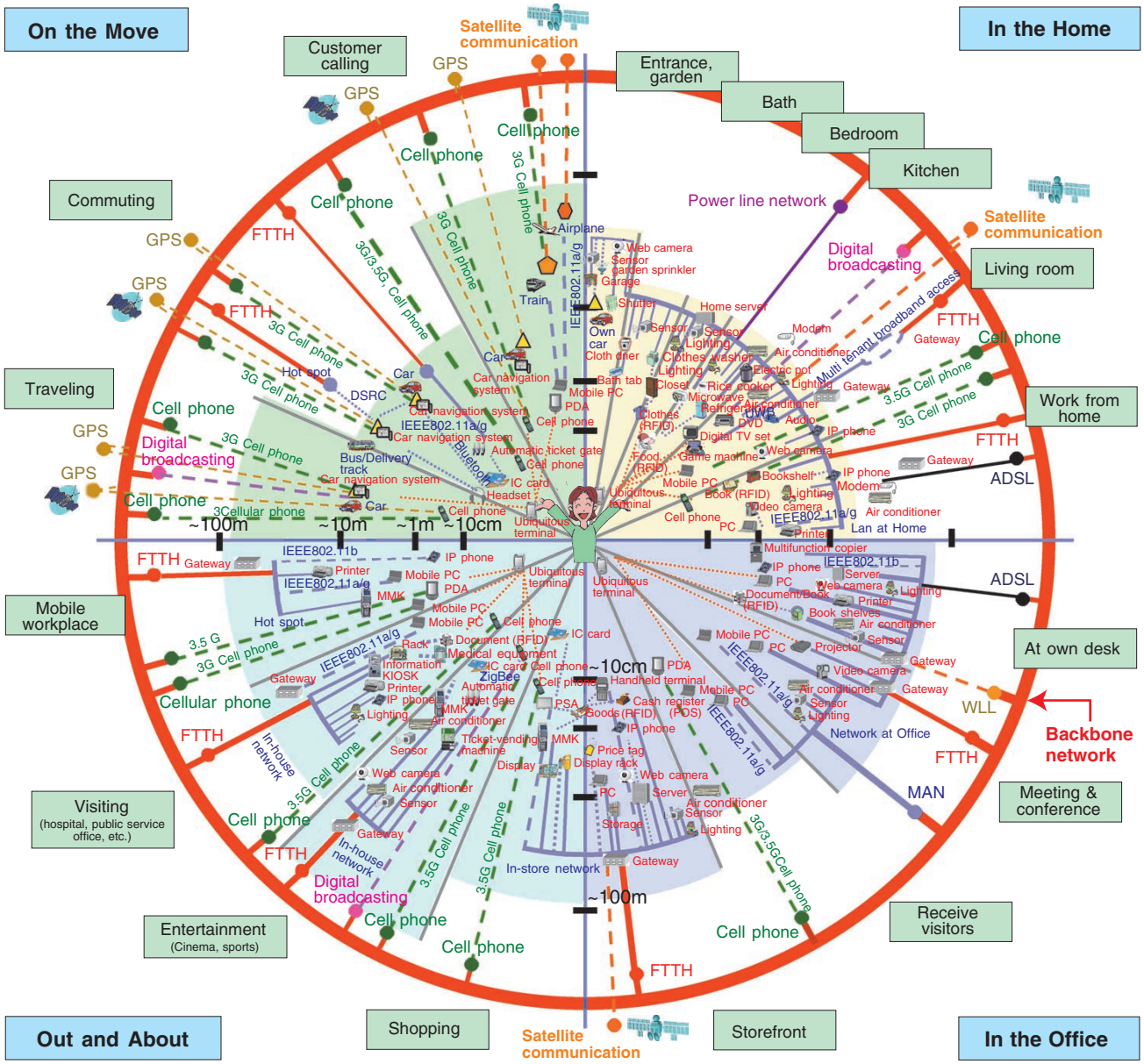
Figures 4 and 5 use the conceptual framework of Figure 3 to express the ICT unitization environment from the user perspective by four life-related categories of "in the home," "in the office," "out and about" and "on the move." The four categories are further divided

Figure 4. Start of Internet Penetration



Note: DSU = digital service unit (a device to connect terminal equipment to digital circuits).

Figure 5. The Ubiquitous Network



Notes: 3G/3.5G = the third generation/the 3.5th generation, ADSL = asymmetric digital subscriber line, DSRC = dedicated short range communications, DVD = digital versatile disc, FTTH = fiber-to-the-home, GPS = global positioning system, IC = integrated circuit, IEEE802.11 = wireless LAN standard defined by the Institute of Electrical and Electronics Engineers, Inc. (currently, there are versions b, a and g), IP = Internet protocol, LAN = local area network, MAN = metropolitan area network, MMK = multimedia kiosk, PDA = personal data assistant, POS = point of service, PSA = personal sales assistants, RFID = radio frequency identification (IC tag), WLL = wireless local loop, ZigBee = new wireless network standards defined by the ZigBee Alliance in which Motorola and Honeywell of the United States, Mitsubishi Electric, etc., are participants.

into subcategories by setting. In the home, subcategories include "work from home," "living room," "kitchen," "bedroom," "bath" and "entrance/garden." In the office, these include "at own desk," "meeting and conference," "receive visitors" and "storefront." By each setting, the use pattern of a network and digital equipment with communications capabilities is shown by an equipment icon and network connection architecture, which is indicated by bold and dotted lines.

Figure 4 shows the use pattern of a network and digital equipment with communications capabilities during the period the Internet began to penetrate during the first half of the 1990s. Using the distance from the user as an index, the equipment used is placed on five concentric circles with a radius of 10 centimeters, 1 meter, 10 meters, 100 meters and more than 1 kilometer. How this equipment is connected to the network is indicated by bold lines in the case of a wired network, and by dotted lines in the case of a wireless network.

Figure 4 shows a very simple configuration. PCs, modems, servers and printers are installed in a workroom at home, at the desk in the office, and at the front of the store. These devices are connected to a backbone network via an analog network, ISDN (integrated services digital network), or leased lines.

In contrast, by applying the same framework used in Figure 4, Figure 5 illustrates how the situation would be if the supplier side attempts to provide an ICT utilization

environment supported by the ubiquitous network that is represented by the outermost cube in Figure 3.

Efforts were made to simplify the illustration by selecting one representative item and pattern respectively for digital equipment with communications capabilities and a network use pattern for each setting. Even with such simplification, the ubiquitous network (Figure 5) presents much greater complexity than that at the time the Internet began to penetrate (Figure 4) in terms of both equipment diversity and network topology.

4 Global Evolution of the Ubiquitous Network

(1) Approaches in South Korea

The ICT paradigm called the ubiquitous network gradually began to emerge in other countries as well. Such signs were first seen in South Korea.

As part of the research conducted by NRI concerning the ubiquitous network, materials related to the basic concept of such a network were published during the period from 2000 to 2002 as three separate books. Two of the three were successively translated into Hangul in November 2002 and February 2003. Director Won-Gyu Ha of South Korea's Electronics and Telecommunications Research Institute (ETRI), who translated these books, organized the U-Korea Forum consisting of interested persons from industry, academia and government. A seminar held by Ha and NRI in 2003 under the auspices of NRI's Seoul Branch was attended by most of South Korea's major ICT-related companies, indicating a growing interest in this field in South Korea.

The South Korean government is also starting to take measures related to the implementation of the ubiquitous network. As the ratio of apartment houses to other types of dwellings is high in South Korea and new construction of apartment houses is also active, success in the dissemination of broadband services has already proved that the introduction of state-of-the-art ICT based on individual apartment units is effective. As such, a resolute, large-scale approach is also seen for ubiquitous networking through the focus of the government on housing and urban development.

The Ministry of Information and Communication of South Korea is intent on the realization of the "digital home plan" in which digital home appliances with communications capabilities are installed in apartment houses as a total, integrated system. It is said that the ministry plans to invest 2 trillion won (about ¥200 billion) for 10 million households in the four years ending in 2007. Similarly, South Korea's Ministry of Commerce, Industry and Energy has promoted the "smart home plan." It is said that the country has budgeted 300 billion won (about ¥30 billion) for investment in this project over a period of five years.

In the private sector, financial groups are assuming the principal role in participating in these government projects in the form of a consortium. In addition, plans focusing on ubiquitous capabilities are also emerging such as the Dongtan ubiquitous city plan by the Samsung Group, in which a large-scale urban development involving 40,000 households with 120,000 residents is being pursued.

(2) Trends in Europe and the United States

At present, however, there are no countries other than Japan and South Korea where the term "ubiquitous" is used by ordinary business persons as part of everyday conversation. In Europe, except for only a limited number of organizations in the United Kingdom and Germany and certain international organizations, there are almost no situations in which this term is heard other than as an ICT technical term.

In the United States, the *Wall Street Journal* dated January 8, 2004, featured an article on the ubiquitous boom in Japan. However, this article by no means assumes that the ubiquitous network is an ICT paradigm that will have an impact on the ICT scene in the US. Instead, the tone is one of ridicule, reporting that the Japanese are again immersed in gadgetry. In US industrial circles, however, the term is increasingly apparent in discussions on the future vision of ICT in the United States.

Under these circumstances, the World Summit on the Information Society (WSIS) of the United Nations held in December 2003 in Geneva provided the first opportunity to discuss the ubiquitous network in an international venue other than in Japan and South Korea. In the addresses by the heads of state and in the related exhibitions, most of the more than 170 countries participating adopted themes focusing on how to disseminate existing ICT in developing countries, such as bridging a digital divide (gaps in ICT utilization abilities) and ICT education. The United States, which is usually enthusiastic in participating in international trade shows and events in which the supply side takes the initiative, seemed to take a weak approach in its participation in this international conference in which users played the principal role.

In contrast, 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 Public Management, Home Affairs, Posts and Telecommunications, Taro Aso, who attended the conference, called for the realization 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."

What was most impressive among the series of discussions was the panel discussion held under the auspices of the Japanese government. Following my detailed explanation about an ICT paradigm of the ubiquitous network, the panelists from Japan, the United States, Europe and South Korea introduced the current status of activities in their own countries. In the course of these

discussions, one panelist from Europe remarked that "it appears that we are about two years behind in this field."

I have not had even one experience recently of hearing the assessment that Japan is as many as two years ahead in the ICT field. From my experience, I wonder if it is too optimistic to expect to find a trigger here for Japan to again fulfill its important international responsibilities. This could be expected only after activities aimed at promoting the ubiquitous network in Japan drastically changed the Japanese economy and international assessment of ICT in Japan, which seems to have lost its positive reputation.

II Business Opportunities Brought About by Ubiquitous Networking

1 Ubiquitous Networking Processes and Business Opportunities

While the ICT paradigm of the ubiquitous network has gradually taken root in Japan and South Korea as the goal of the next-generation ICT utilization environment, the process of ubiquitous networking itself provides a wealth of business opportunities to the ICT industry and industries utilizing ICT.

The following section clarifies what sorts of business opportunities will be born at the three stages of ubiquitous networking, i.e., the development of a network infrastructure, the development of a utilization infrastructure, and the evolution of utilization solutions.

2 Development of a Network Infrastructure

(1) Wired networks with focus shifting from high speeds to super high speeds

As with broadband services, wired networks such as ADSL and CATV Internet remain to be the basis of the development of the ubiquitous network infrastructure. A shift of wired networks to broadband technology, which was a priority program in e-Japan Strategy, has been smoothly moving forward, as shown in Tables 2 and 3.

The subscriber base of ADSL, which is the primary source of broadband services, was fewer than one million at the time e-Japan Strategy commenced. However, by December 2003, it exceeded 10 million

Table 2. Comparison of Annual Velocity of Broadband Penetration (2001)

(Unit: Million persons)

	Broadband	June 2001	June 2000	Annual velocity of penetration	Rate of population penetration (Rate of household penetration)
South Korea	ADSL	3.51	0.68	4.22	11.5% (48.1%)
	CATV	1.95	0.56		
	Total	5.46	1.24		
US	ADSL	2.91	0.95	6.13	3.3% (9.7%)
	CATV	6.45	2.28		
	Total	9.36	3.23		
Japan	ADSL	0.29	0.001	0.93	1.0% (2.7%)
	CATV	0.97	0.33		
	Total	1.26	0.33		

Notes: (1) "Annual velocity of penetration" is an index that shows the increase in the number of ADSL and CATV Internet subscribers in the past 12 months; (2) The population used as the denominator in the rate of population penetration for each country is that in 2000; (3) The number of households used in calculating the rate of household penetration is that in 1990 for South Korea, in 1993 for the United States, and in 2000 for Japan.
Source: Compiled based on the materials of each country.

Table 3. Comparison of Annual Velocity of Broadband Penetration (2004)

(Unit: Million persons)

	Broadband	March 2004	March 2003	Annual velocity of penetration	Rate of population penetration (Rate of household penetration)
South Korea	ADSL	6.58	6.07	0.70	22.2% (92.3%)
	CATV	3.91	3.72		
	Total	10.49	9.79		
US	ADSL	7.68	5.10	7.09	7.6% (22.2%)
	CATV	13.68	9.17		
	Total	21.36	14.27		
Japan	ADSL	10.90	6.59	5.61 (4.83)	11.4% (31.0%)
	CATV	2.55	2.03		
	FTTH	1.04	0.26		
	Total	14.49	8.88		

Notes: (1) For the United States, figures for June 2003 and June 2002 were compared; (2) Other conditions are the same as those applied to Table 2; (3) The number in parentheses for the annual velocity of penetration for Japan does not include the number of FTTH subscribers.
Source: Compiled based on the materials of each country.

and continues to expand. While the number of subscribers increased at a terrific speed in 2001 in South Korea, growth has now fallen off, even in this country. In the United States, the growth of broadband services fell somewhat below expectations under circumstances where the failure of broadband policy has been rumored. As a result, Japan has now become the world's largest ADSL country.

With respect to a shift to optical fiber cable, the signs of gradual acceleration have been emerging with the number of subscribers passing one million in February 2004. When we look out over the world now, there are no countries other than Japan where as many as more than one million ordinary consumers are enjoying optical fiber Internet access service at 100 Mbps (megabits per second). Japan is behind South Korea in terms of the rate of population penetration of high-speed Internet access (11% in Japan and 22% in South Korea) and the rate of household penetration (31% in Japan and 92% in South Korea). Nevertheless, it is not too much to say that Japan is on the way to becoming the world's most advanced broadband nation if the situation is viewed in terms of absolute penetration numbers and progress in the development of super high-speed Internet access at 30 Mbps or more.

Now, in Japan, people's interest in broadband expansion is focused on potential target users, possible usage formats and the speed of penetration with respect to super high-speed Internet access.

(2) Toward the world's leading wireless network infrastructure

From the standpoint of promoting ubiquitous networking, in addition to wired networks, the progress in broadband technologies applied to wireless networks for which active technological innovations are expected will become increasingly more important. These include network access via the third and subsequent generations of cellular phones and wireless LANs, such as IEEE802.11 (wireless LAN standards defined by the Institute of Electrical and Electronics Engineers) and ZigBee (wireless network standards jointly defined by companies in the United States, Japan and Europe) and UWB (ultra wideband radio technology).

What is most important for the moment among these technologies is the trend in the penetration of network access by third-generation cellular phones. It was in the autumn of 2001 that NTT DoCoMo started the world's first third-generation cellular phone service employing the W-CDMA system. At the initial stage, when service was introduced, the number of subscribers did not grow as anticipated. Now, however, the rate of growth is accelerating, and the subscriber base exceeds 3 million with the inclusion of Vodafone. The adoption of flat rate pricing is expected to accelerate expansion even more.

"Cdma 2000 1x," which was started at around the same time by au Group, has rapidly increased the number of its subscribers with the support of au's strategy focused on developing appealing content. At present, the subscriber base of this service including that of "1xEV-DO" (using wider bands) amounts to 13.5 million.

The initial goals of e-Japan Strategy were connecting 30 million households via high-speed Internet access and 10 million households via super high-speed Internet access. These goals were achieved during the second year. e-Japan Strategy II, which was determined after a review conducted during the third year, proposed that actual connections in place of possible connections should be treated as the target value.

Broadband penetration in Japan is progressing at a rapid pace that can easily be characterized as the world leader, as noted previously. However, if the target value assumes a 100-percent utilization rate for possible connections, the targeted number of subscribers will be 30 million and 10 million, respectively. These are extremely high values. As the current numbers are 13.5 million for high-speed access and 1 million for super high-speed access, the current numbers are far behind these goals.

In March 2004, in addressing this issue, the IT Strategy Assessment Task Force of the IT Strategic Headquarters in which I participate submitted an interim report that proposed a new way of setting goals.

As stated previously, the ubiquitous network was adopted as a new goal for the development of a network infrastructure at the time of shifting from e-Japan Strategy to e-Japan Strategy II. Even though there was such a major change in the goal with the emergence of diversified high-speed Internet access with cellular phone methods as the background, such as mobile Internet and wireless access, these trends were not at all reflected in the target values. Under the view that this change should be properly reflected, the target value for the development of a network infrastructure was redefined as described below, and an increase in the target value for high-speed access from 30 million to 40 million was proposed.

> "Achieving 40 million subscribers to high-speed Internet access (144 kbps – 30 Mbps) and 10 million subscribers to super high-speed Internet access (30 Mbps or more), regardless of whether via wired or wireless networks, through the promotion of utilization and the enhancement of content services by 2005."

Efforts to realize the world's most advanced ICT utilization environment will require support by the promotion of policies that facilitate the establishment of the finest broadband environment, not only for wired networks but also for wireless networks.

(3) Convergence of transportation system network infrastructure

The third point in the development of a network infrastructure relates to network access in vehicles moving at fast speeds, or the development of a transportation

system network infrastructure. Japan is the world's largest market of car navigation devices, with the total number already shipped exceeding 10 million units. Many of these devices are connected to VICS (vehicle information and communication system), thereby providing information on traffic conditions on a virtually real-time basis. The total shipment of VICS has exceeded 6.5 million units.

Currently, an accelerated trend has been seen in the penetration of ETC (electronic toll collection system). As the 11th World Congress on ITS scheduled to be held in Nagoya this year will also feature this trend, information exchange between objects and objects, not only between vehicles, such as AHS (advanced cruise-assist highway systems), but also between objects including vehicles and facilities on the roadside, has gradually become a reality.

However, the present systems, VICS, ETC and AHS, were developed as separate systems and networks. As the future linkage between vehicles and the Internet increases, it can be imagined that some form of convergence among these systems will take place.

The development of an environment for network access within trains or airplanes has steadily progressed, and studies have begun with respect to access within ships and subways. When we consider a transportation system network infrastructure from the viewpoint of facilitating "network utilization effects with a focus on users" in the same way as we did for other networks, it is desirable that a seamless and borderless information utilization environment will become available even among different transportation modes through the convergence of vehicle, train/bus, airplane, ship and subway systems that are now separated.

(4) Digitization of broadcasting networks

The most important issue in the broadcasting network, which is the forth point in the development of a network infrastructure, is the trend toward digital terrestrial broadcasting. Digital terrestrial broadcasting is planned to bring about market penetration in 47 million households and 100 million TV units by July 2011. Achieving this goal, and simultaneously realizing higher-quality broadcasting and improved efficiency in frequency allocations will require full utilization of the features of the ubiquitous network. Such a network must be capable of providing linkages to overcome technological boundaries, such as using interactive communications, linking with cellular phones, collaborating with car navigation devices, and contributing to the development of a disaster preparedness network.

(5) Challenges to physical object networks

The technical development of electronic tags has been actively advanced by both the government and the private sector, and the perspective envisioning extensive use of electronic tags in industrial operations and the activities of everyday life has gradually become a reality. At the same time, research and development on sensor network technology that has its origin in military research in the United States has gradually become active. From these developments, another network infrastructure category that is somewhat different in terms of characteristics from the so-called backbone and access networks including wired, wireless, transportation and broadcasting systems is making its appearance.

Bluetooth and home wireless LANs are short-range radio links in a wireless network infrastructure, in which people are involved in some form. The new category is also different from these systems, and represents the concept of connecting equipment and objects that have had nothing to do with a network in the past.

For example, this category includes electronic tags, sensor networks, network robots and GPS networks. Unlike a network that connects people who want to be connected as they choose, or that connects such people and objects, this type of network actively approaches objects and directly incorporates such objects into part of the network. In terms of privacy, security and reliability, the full-scale realization of this type of network will involve difficulties at a level different from that encountered in the past.

This network, which I may call a "physical object network," should be considered part of an independent and separate category of network infrastructure, and will require approaches that are different from conventional methods.

3 Development of a Utilization Infrastructure

(1) Ubiquitous terminals and strategic modules

The key to the realization of the ubiquitous network is a ubiquitous terminal that is operated by people individually whenever they want to be connected to other people, various devices and objects via the network. This terminal can serve as a transmitter/receiver of a video phone that will be used by people on a daily basis, will turn on the home air-conditioner remotely in the summer, will pay for tickets at a station and/or a movie theater, will read the production record of a specific cut of beef and make payments at a convenience store. The terminal will be with a person all the time in the same way that a person always carries a wallet now.

A ubiquitous terminal is the most important element that drives the process of ubiquitous networking. Unless high-performance ubiquitous terminals that can aggressively meet user demands of "want to be better connected" continue to be marketed and unless users choose to pay network usage fees by making their own investment, the process of ubiquitous networking will not move forward.

At present, this process is moving forward mostly following the route created by the offering of higher value-added services for cellular phones.

Consumers in Japan probably have the most sophisticated and mature consumption behavior in the world with respect to digital information equipment.

The Surveys of 10,000 Consumers conducted by NRI categorized the consumption style of Japanese people by using two axes: attitude toward prices and attitude focusing on one's own favorites. Based on this categorization, four consumption styles were established: premium consumption, convenience consumption, best-effort price consumption and thorough investigation consumption.[2]

While what is called the conservative consumption tendency, seen after the collapse of the bubble economy, made best-effort price consumption the consumption style used most often, the impetus of this trend has already been weakened. After we entered the 21st century, the styles focusing on one's own favorites, such as thorough investigation consumption and premium consumption, have begun to prevail.

In particular, premium consumption in which people pay prices appropriate to the value added to their liking is growing. It would be this consumption stratum that will first choose the high-performance ubiquitous terminal that can satisfy the desire of "being better connected." The ratio of this stratum increased from 13 percent in 2000 to 18 percent in 2003, and continues to expand.

Another route for the evolution of ubiquitous terminals is the one in which higher performance and more compact PCs and PDAs (personal data assistants; portable data terminals) are offered. While interest in this route is growing in the United States, both in terms of software and hardware, market response is slightly lacking the anticipated enthusiasm. Noticeable under these circumstances is the "ubiquitous communicator" whose development is promoted by Professor Ken Sakamura of The University of Tokyo who heads the T-Engine Forum, which is an international technology forum established with the aim of developing a TRON-based ubiquitous infrastructure. TRON is a domestic OS (operating system) pioneered by Sakamura.

This terminal has a larger display than a cellular phone, and enables short-range communications such as Bluetooth and infrared data transmission in addition to Internet access via wireless LANs and PHS (personal handyphone system). It also features multiple functions that provide voice output of electronic tag readings at not only 2.5 GHz and 13.56 MHz but also in the UHF bands. With such a variety of functions, efforts to develop a more compact size have now produced a terminal with a size almost equivalent to that of PDAs.

Because the ubiquitous communicator is TRON-based, control functions for digital home appliances with communications capabilities and links with sensor networks would constitute its advantage. By incorporating the IP telephony function and the GPS function, this terminal appears to be closest to the ideal position of a ubiquitous terminal in terms of the functions that it should offer.

While it is still unknown when the terminal can be marketed to users at reasonable and affordable prices, the ubiquitous communicator is gaining increased attention as the piece of digital equipment that can function as a ubiquitous terminal in a route different from that of cellular phones. In particular, recent attention has mostly been paid to the function of electronic tag reader. However, as noted at the beginning of this paper, electronic tag reading and GPS functions are secondary functions. Before anything else, the first priority must be given to the realization of a ubiquitous terminal that will serve as the de facto standard for the promotion of ubiquitous networking.

One more route that is showing increased possibility as a ubiquitous terminal is the scenario in which a stationary TV set serves as a ubiquitous terminal. The rapid spread of the DVD recorder/player with built-in hard disk is expanding the use of a TV set as a video and moving picture display device. If the capacity of the hard disk of the DVD recorder/player continues to grow, and connections with a variety of networks become common, the pattern of accessing the Internet via the remote control of a TV set, which was tested several times in the past but failed, may finally find a way to success.

The use of a remote control ten-key pad as a means of entering numbers, letters and Japanese characters has become increasingly popular as a Japanese style due to the popularization of sending e-mail via cellular phone. The so-called "year 2007 issue," the year in which baby boomers who are more suitably classified as the TV generation than the PC generation will start to reach retirement age, may also give an impetus to using TV sets as ubiquitous terminals.

Whichever route may be followed, product development in this field is the strong point of Japanese industry. As I noted in *NRI Papers* No. 66, July 2003, strategies to build competitive predominance should be predicated on the strongest module of each company from among general-purpose modules, such as communications, authentication, sensing, application and OS, as well as from specialized modules, such as display, input system, energy supply and data storage.

(2) Development of a ubiquitous platform

If the network and the ubiquitous terminal are available, the minimum use of the ubiquitous network is possible. However, in order to build this minimum level to the venue of business transactions, a robust digital platform is necessary.

The digital platform requires functions such as authentication, charging, payment, copyright management, security and privacy management, as well as a system infrastructure that integrates these functions. In particular, as the ubiquitous network, which is accessible by diverse information equipment, is vulnerable to attack, the security issue could be the most serious bottleneck in promoting its penetration. While the ubiquitous

network is the network that will bring ultimate convenience to users, at the same time it has the possibility of becoming the network that will bring ultimate fragility.

The security issue of the ubiquitous network can only be dealt with by mobilizing all the technologies available. Although we now rely on the United States for most of these digital platform technologies, an opportunity is likely to come to companies in other countries when a shift is made from technologies based on the narrowband Internet to those assuming use of the ubiquitous network.

Security protection is also the issue that should be addressed by providing a deterrent through the establishment of a legal framework and by making use of cultural approaches such as entrenchment of the culture of security. While the security issue is a serious problem that requires such extensive consideration, at the same time, it brings about major business opportunities for reliable service suppliers. This is the reason why assets such as the reliability formed between suppliers and users constitute a company's largest invisible asset.

4 Evolution of Utilization Solutions

(1) Business models for digital content

When the network infrastructure, ubiquitous terminals and the digital platform are constructed and the ICT environment for the ubiquitous network is completed, companies and consumers will begin to participate in a variety of utilization activities on this new infrastructure. New business opportunities will emerge from such diverse activities (Figure 6). The field that first comes to the fore is the distribution of digital content.

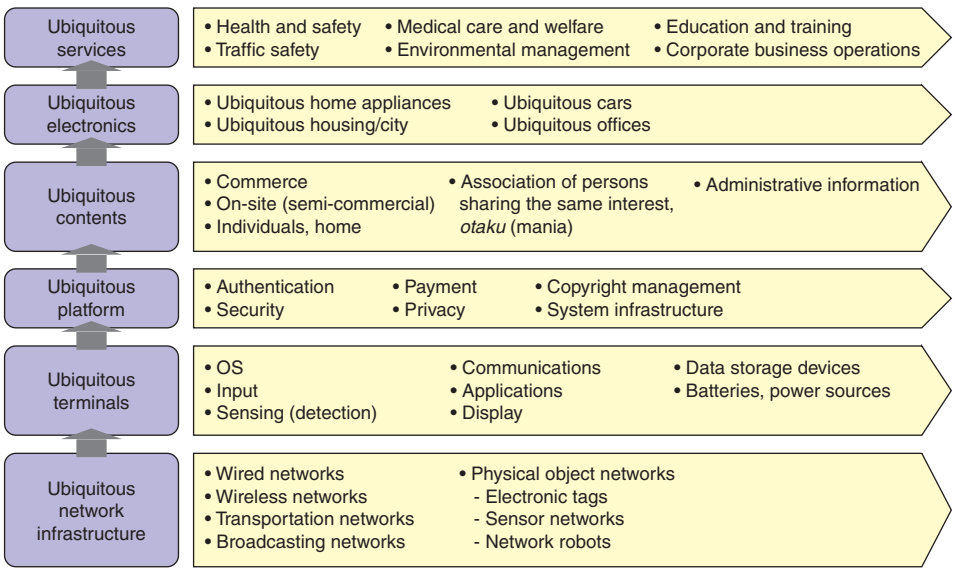
As is generally known, expectations to create an area of new business opportunities are expanding in the fields of animation, games and karaoke that are sometimes called "J-Cool." Under the ubiquitous network environment, not only this commercial content but also a group of semi-commercial content items is expected to play a major role. The semi-commercial content includes content created by semi-pros and independent content creators who are popular in Akihabara and/or Comiket (Comic Market; a nationwide event of a comic coterie magazine publisher), which are called *otaku* (mania) content or *dokokai* (association of persons sharing the same interest) content, and on-site content that is generated on a daily basis at local playgrounds and entertainment events.

However, the content that is economically important for the time being would, after all, be commercial content. It is estimated that Japanese products account for 40 percent of all game software on the North American market and for 60 percent of all animation broadcast volume in the world. According to the survey by METI, although the sales of POKEMON (animated character) game software itself were ¥93 billion, the sales of related products and services amounted to about ten times that figure. These include a wide range of products and services from guides for the software, TV animations, movies, comics, card games, toys, food products and clothing that use this character. The survey further reveals that if the indirect effects are included, POKEMON generated a ripple effect of ¥2.3 trillion.

Without the need to wait for the revelation by Douglas McGray, who wrote the article entitled "Japan's Gross National Cool" with respect to the cultural export of coolness in things Japanese, there is no doubt that the Japan's digital content industry has already been conducting extremely important economic activities. Unfortunately, substantiating data are not available simply because there are currently no proper measurement indexes.

As one of the four priority policies for fiscal 2003, METI selected strengthening of competitiveness through the establishment of Japanese brands, which is

Figure 6. Business Opportunities of Ubiquitous Networking



referred to as "J-Brand." Similarly, MPHPT and MEXT also started to focus on the creation of digital content and the development of the distribution environment. In parallel with these policies aimed at establishing multi-layered Japan brands, specific approaches toward becoming the nation of advanced digital content will steadily move forward.

Contrary to these approaches by the government, the animation and game industries are facing a severe situation involving intense competition from abroad and a slowdown of the growth of the entire market. Nevertheless, content creation activities that support industry are continuing to expand.

What is most important in this process is the establishment of an evaluation system by Japanese people for digital content created in Japan, and the transmission of easy-to-understand information on digital content to the entire world. In the process in which an industry or culture takes off, journalists that understand the essence of such an industry or culture and openly give expert opinions generally play an important role. Similarly, the birth of competent digital content journalism is also indispensable in this field. By reversing the frequently seen pattern in which digital content created in Japan gain great popularity only after receiving high evaluation in other countries, a cycle in which an appropriate evaluation in the Japanese market is conveyed to other countries in an easy-to-understand way should be created.

With an eye on "Cool Britannia" (the plan to strengthen creative industry in the United Kingdom) and "Cyber Korea 21" (a plan to develop the digital content industry in South Korea), Japan should establish as soon as possible a global award for digital content that is equivalent to the Academy Awards in the field of animation, electronic games, CG (computer graphics), etc.

While several organizations are separately sponsoring small-sized international contests or festivals in specific regions, none of these events has yet become a proven, established international event. To overcome this situation, a symbolic core city equivalent to Hollywood or Cannes that has a series of functional clusters, such as core facilities, support industry complex, educational organizations, and accreditation organizations, might be necessary.

(2) Ubiquitous electronics and the new three sacred treasures

The largest business opportunity that ubiquitous networking brings to industry is the emergence of a new industry category that might be called ubiquitous electronics. This new category will be generated through a change in the method of connections between people and objects, in particular, durable consumer equipment, such as automobiles and digital home appliances having communications capabilities. At present, Japan's economy is in the state of a mini-boom called the "digital boom." This rising economic condition is due neither to the expansion of fiscal spending in the macroeconomic perspective nor to the microeconomic supply-side policy. Growing expectations are placed on a full-scale self-supporting revitalization by industry. Supporting this autonomous revitalization are the groups of products referred to as the "three sacred treasures of digital home appliances."

This term, which originally referred to the emblems of the imperial throne, first began to be used as an economic term in the 1950s when Japan's economy began to move toward high economic growth after going through postwar rehabilitation. At that time, black and white TVs, electric washing machines and electric refrigerators were called the three scared treasures of Japanese consumers. Following this, the three sacred treasures as an economic term changed according to a shift in the economic environment. During the period from the 1960s to the 1970s, color TVs, cars and coolers (air-conditioners) became the new three sacred treasures, which were called the "3Cs" from their initial letters. In the 1990s, there was a time when PCs, cellular phones and e-mail addresses were thought of as the three sacred treasures.

Through these changes, the products now called the "three sacred treasures of digital home appliances" in the 21st century are digital cameras, PDP (plasma display panel) and LCD (liquid crystal display) TVs, and DVDs.

The rapid spread of digital cameras started in 2000 with the world shipment exceeding 10 million units. In 2002, the shipment of digital cameras in Japan finally exceeded that of silver halide cameras (conventional film-based cameras). Reflecting good sales in the overseas markets, the high growth trend has continued. Manufacturers are faced with the need to continually increase their production to meet a torrent of orders.

In the field of TVs, the market for thin-display TV models surpassed the market for cathode-ray tube TV models in terms of monetary amounts in 2002. LCD TVs, which have grown as compact and thin 14- to 20-inch TVs designed for individuals, have recently been gaining in popularity as are large, thin TVs with 30-inch or larger displays, which are treated as the main TV for each household. LCD TVs are continuing to experience high-level growth in the Japanese market.

Growing expectations are given to PDP TVs because they are creating a new market category of thin TV models with 30- to 50-inch large displays and because Japanese companies hold most of the basic patents. A high rate of growth is continuing in this field, as well. As is generally known, PDP panels themselves are the targets of active capital investment.

Under these circumstances, the product with the highest rate of growth over the previous year (double) is the DVD recorder/player with a built-in hard disk. In the field of media players, DVD had already exceeded VTR in terms of units shipped in 2002. As a recorder, the

trend of digitization has been accelerating unmercifully, creating a major arena of home appliance manufacturers.

The Japanese economy is now at a crossroad: does such a boom of the "three sacred treasures of digital home appliances" merely end as a transient boom or can this boom develop into a major industrial swell toward a full-scale economic revitalization?

When we look beyond this crossroad, we see an important role that can be played in our vision of the ubiquitous network. If we view the future evolution with a vision of the ubiquitous network, the current "three sacred treasures" must first of all be strengthening links with a network.

Some digital camera models can already exchange data by connecting to a network. At the same time, the communication tools called "cellular phones with cameras" (or "cellcams") in which digital cameras have been incorporated into cellular phones with Internet access are gaining explosive popularity. Accordingly, a trend in which digital cameras are attached to cellular phones with network access functions is assuming a dominant position rather than a trend in which network access functions are attached to digital cameras.

The next move involves connections of PDP and LCD digital TVs to networks. While attempts to connect TVs to the Internet have been made several times in the past, all of these attempts seemed to be evolved through efforts to find ways for Japanese consumers to accept technologies and concepts developed in the United States. The current efforts to connect TVs with networks assume use by Japanese consumers from the outset. I look forward to the emergence of new use models from among these endeavors.

A DVD recorder/player is generating a new TV use pattern in which people record everything they think they might be interested in and view the contents later, and has a propelling power that might drastically change the positioning of TVs in society. In the future, competition will increasingly focus on the attractiveness of the content itself. At such a time, network connectivity will be an indispensable element.

Being connected with networks, a DVD recorder/player will bring about remarkable improvements in the video and moving-picture storage and editing functions of PCs and digital video recorders. At the same time, if it is equipped with home server functions, remote recording reservations and instructions will be possible via cellular phones and/or PCs by using electronic program scheduling available on a network.

By following such courses, the products that have evolved into the "three sacred treasures of network home appliances" will, before long, be mutually connected via respective networks. These enhanced products will bring higher values to consumers, and will reach a stage where a new category of "ubiquitous home appliances" emerges. This is evolution in this field as seen from a vision of the ubiquitous network.

These ubiquitous home appliances also have the possibility of further developing into a larger category of "ubiquitous housing." Ubiquitous housing will be realized through such measures as daring to combine functions that are friendly to seniors or thoroughly pursuing convenience for working couples with children.

At present, housing and electric home appliances constitute separate industries. Members of the electric home appliance industry are less than enthusiastic toward the idea of selling electric home appliances together with housing. Members of the housing industry take cautious approaches to selling electric home appliances and digital information equipment as part of a house because their depreciation cycle is totally different from the house itself. However, if the future of the Chinese market is envisioned, rather than in the Japanese market where the growth of housing investment has become slow, consideration should be given to business models that encompass both electric home appliances and housing.

In the Japanese market, attention should be directed toward generating a demand for reconstruction and/or remodeling through the creation of a senior-friendly living environment by using equipment and devices connected to the ubiquitous network. Ubiquitous home appliances and ubiquitous housing that are designed for seniors are likely to become the most expensive products that can loosen the purse strings of seniors who have a large portion of individual financial assets, which amounts to about ¥1,400 trillion.

Similarly, "ubiquitous cars" can make up a large product category. In a transportation system network, there is the possibility of the gradual convergence of the existing VICS and ETC, and AHS that will emerge in the future. As explained previously, there is also the possibility of the convergence of vehicle, train/bus, airplane, ship and subway systems in terms of information utilization from the user perspective.

If these transportation systems are networked via car navigation equipment that is increasingly strengthening its linkage with the Internet, we can easily imagine that a new product category of "ubiquitous cars" might emerge. Ubiquitous cars will offer (1) the element of safety and security in the use of cars, (2) the convenience of Internet cars that are connected to social systems and that themselves constitute part of the social systems, and (3) the entertainment element brought about by ubiquitous terminals.

Another large category concerns "ubiquitous offices." The ubiquitous network will significantly change the working style of company employees. Mobile PCs and cellular phones are already functioning to greatly improve employee mobility, and to increase the centrifugal force, which is pulling computers away from offices. The utilization of SOHOs (small offices, home offices) and the increase in outsourcing and partnering (strategic alliance) activities also serve to increase this

centrifugal force. Backed by these functions, a status is emerging in which workplaces and offices are not necessarily at the same location.

While the ubiquitous network enables work outside the office under an information environment equivalent to that in the office by increasing the centrifugal force from the office to the employees, the purposes of using the ubiquitous network in offices are not limited to this.

With respect to the use of knowledge in companies, NRI has advocated the importance of exchanging and sharing morphological knowledge (knowledge created through the convergence of tacit knowledge and explicit knowledge by using the ubiquitous network) in addition to tacit knowledge (knowledge that cannot be expressed in language) and explicit knowledge (knowledge that is expressed explicitly in a language form).[3] Rather, this emphasis on morphological knowledge indicates a focus on the centripetal force from the employees to the office.

The essential posture of exchanging and sharing morphological knowledge is the face-to-face exchange and sharing of knowledge and experience. Currently, in the office, it is impossible to gather people with the necessary knowledge and experience at one site when required on a face-to-face basis. The use of the ubiquitous network in the office is aimed at creating an environment that makes people feel as if all people are present at one site although they are actually dispersed.

Offices based on this concept will look considerably different from current offices. Furthermore, the process of creating and disseminating such offices is considered to be a source of major business opportunities.

At present, the Japanese economy is quickening its pace toward full-scale revitalization as triggered by good sales of digital home appliances. If this situation is viewed from the perspective of the ubiquitous network, digital home appliances will sooner or later strengthen their linkages with networks to become network home appliances, which will be further developed into ubiquitous home appliances. By mutually connecting to other industries that are connected to the ubiquitous network, "ubiquitous home appliances," "ubiquitous cars" and "ubiquitous offices" will constitute the new large-scale three sacred treasures. It would be at such a time that Japan could achieve a truly autonomous revitalization and can return to a position that permits Japan to again contribute to the world economy.

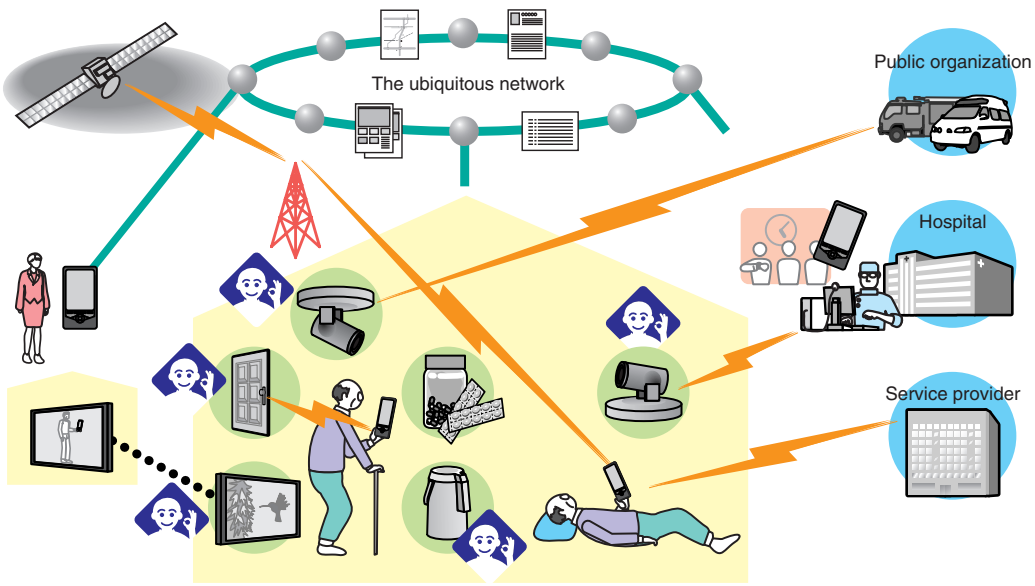
(3) Ubiquitous service solutions

In addition to its impact on the manufacturing industry, as discussed above, the ubiquitous network will also have a major impact on the service fields. In the sense of vast influence, a greater impact is likely to be exerted on this industry.

While the Japanese economy is fated to confront a major trend of an aging society with fewer children in the near future, the ubiquitous network can serve as a source of providing attentive service solutions at relatively low cost. Figure 7 illustrates conceivable service solutions in an example case of monitoring the health conditions of aged parents who live independently, apart from their children.

In a Japanese society characterized by an accelerating trend toward an increasing number of seniors and a declining number of children where the trend of nuclear families has firmly taken root, more and more children will work in the cities, living apart from their aged parents. The Surveys of 10,000 Consumers conducted by NRI revealed that the rate of "living together" decreased from 42 percent in 1997 to 36 percent in 2003. Instead, the rate of "living at a distance one hour or more away" increased from 48 percent to 52 percent, or a level exceeding half.

Figure 7. Utilization Example Addressing the Issue of Aging and Fewer Children (Monitoring Health Conditions of Aged Parents)



A wide array of offerings is conceivable in providing this service. One type may involve confirming whether aged parents are living at a constant everyday life pace through monitoring the frequency of use of a thermos bottle or checking the pattern of opening and closing a refrigerator. Another type might use a broadband always-on network to create an environment in which both parents and children can feel as if they live close to each other by providing displays of mutual rooms, and to directly call a local hospital or an ambulance in case of emergency.

Among these offerings, a "monitoring service" jointly provided by a cellular phone company and a security service provider uses cellular phones with GPS functions, which are worn by aged parents and which send signals from anywhere, both inside and outside the home, in case help is needed. A security service provider quickly dispatches personnel from a nearby service office as soon as a signal is received.

As represented by this service offering, it is becoming essential for cellular phone companies to incorporate GPS functions in their cellular phones in terms of strategy to keep their products competitive in the same way as for digital cameras and bar code reader functions. The situation has developed to such a stage that the purchasers of cellular phones may find GPS functions incorporated in their new phones without being aware of the functions.

Furthermore, security service providers have already completed construction of their nationwide office networks for emergency dispatches to users in an effort to smoothly conduct their business operations. If the commencement of this type of service were to require the development of infrastructure, an enormous investment amount would be necessary. Under the ICT environment of the ubiquitous network, however, additional investment can be minimized if these two functions are flexibly combined to create a service package that is optimized for user needs.

As such, the creation of new higher value-added services and/or service packages that can more attentively meet user needs will be made possible under the ICT utilization environment of the ubiquitous network through service-to-service connections. These approaches can be called "service integration." If viewed in terms of business categories, "service integrators" can be evolved in extensive fields, such as medical care/health, safety/security, nursing care/welfare, childcare, employment, education/training, traffic safety, environmental management, etc.

The future Japanese economy will face difficult social issues that are diverse in nature, such as food safety, childcare and employment of female workers, and the global environment, in addition to the issues of aging and a declining birthrate, which was discussed in this paper. The improvement of the ability to respond to these issues, which Japanese society can attain by establishing the ICT environment of the ubiquitous network, will bring about immeasurable effects.

An expanded possibility of evolving ubiquitous service solutions with a great social significance and a possibility of growth in a business category of service integrators might increase the number of opportunities to discover jobs worth doing and to create new businesses for young people without jobs, which represents a serious problem at present. For seniors, these possibilities may provide stopgap revenues for the unpaid period from the age of retirement to the age of eligibility to receive pension benefits.

In this sense, the development of the ICT utilization environment of the ubiquitous network should be approached from the perspective of facilitating the growth of the clusters of service solutions aimed at resolving the social issues that Japan is certain to face.

III Strategic Issues of Ubiquitous Networking

While ubiquitous networking will bring diverse and abundant business opportunities as overviewed so far, various uncertainties exist concerning whether such opportunities can be realized in the form of specific profit-making businesses. With respect to the strategic issues that will become important in establishing effective business models under such uncertainties, the following section points out the factors considered essential under the present situation for each of the three aspects of the development of a network infrastructure, the development of a utilization infrastructure and the evolution of solutions.

1 Development of Infrastructure from the User Perspective

The force driving the process of ubiquitous networking is the demand of users for "better connections."[1] The desires of users to "be better connected" was stirred up by the use of e-mail and net surfing, and pushed the technology up to the stage of exchanging messages with color still pictures by using a cellular phone with a built-in camera. Eventually, this trend will grow to messages with moving pictures, moving-picture interactive communications, and moving-picture communities (multilateral exchange networks), while compromising between the pace of technological innovation and cost reduction.

A variety of functions that ubiquitous terminals are going to provide, such as infrared communications, bar code reading, payments, GPS, electronic tag reading, control for digital home appliances with communications capabilities and sensor network functions, will assume a secondary position versus a powerful mainstream of the "want to be better connected." In the process toward ubiquitous networking, it is vital not to

repeat the harsh experiences of the Net bubble and the bursting of the bubble afterward that occurred at the turn of the century. For this purpose, the cart (secondary trends) should never be put before the horse (mainstream requirements).

What is important for this purpose is not to neglect the user perspective. Excessive investment that is far from reality should not be made uselessly simply for competition on the supplier side. Instead, efforts should always be made to look closely at qualitative changes in demand and not to make a mistake in forecasting the size and speed of the growth of demand. This is especially important in developing a network infrastructure.

Because business opportunities that emerge during infrastructure development among the processes toward ubiquitous networking are all large in terms of business units and have long-term characteristics, a careful approach must be taken in selecting appropriate strategies. At the same time, however, it must be noted that difficulties exist because the speed of technological innovation does not wait for delays in decision making.

In the process of promoting broadband services in wired networks, a number of political measures have been launched that included the evolution of pro-competition information and communication policy, the introduction of dominant carrier regulations, the promotion of deregulation, the strengthened operation of fair competition rules such as those about dispute settlement and the promotion of new participation. As is widely known, intensified competition has taken place in the field of ADSL services with the participation of Softbank BB Corp. as a trigger, which has resulted in remarkable results in terms of market vitalization. This competitive situation needs to continue in the future.

In addition to the competition among services in the high-speed Internet access field that has already occurred, a new competition may also emerge between high-speed Internet access and super high-speed Internet access. Prices for this latter service have already been reduced in what seems like an instant to a level accessible to general consumers. A fierce competition has so far evolved among ADSL service providers in terms of services and prices. In the future, high-speed access providers will face competition not only with those in the same service category, but also with super high-speed access providers by transcending the current service categories.

A shift from high-speed to super high-speed access has already begun among users at the innovator layer who are said to always exist in the market at a ratio of about 2.5 percent. If a clear separation in structure between high-speed and super high-speed access is not established at this stage in terms of content and applications, an alternative relationship may emerge, in which one replaces the other, leading to intensified competition to obtain customers through a price war.

In the field of wireless networks, intense competition took place in services such as second-generation cellular phones and its Internet access, which rapidly pushed up the penetration curve to reach the stage of maturity. As we entered the 21st century, third-generation cellular phone service began. This created a complicated competitive situation in which mobile carriers market both second- and third-generation cellular phones and compete against the second- and third-generation cellular phones offered by their competitors. In addition, a competitive status that might be expressed as a "dog-eat-dog competition" also exists between the second- and third-generation cellular phones offered by the same mobile carrier.

However, most of the competition that is actually occurring is not about whether the service offered is of the second generation or the third generation. It is competition in terms of convenience for users, i.e., which version of which cellular phone offers built-in camera functions or polyphonic ringtones at what timing, or which games are available.

Wired networks should focus on services that can take full advantage of the features of wired networks. Among wired networks, high-speed access services should provide the functions that are most appropriate for high-speed access, and super high-speed access services should also concentrate on their strong features. Similarly, wireless networks should focus on services that can best be provided by wireless networks. After establishing this separation in structure based on a complementary relationship, these services in the different categories will be connected via ubiquitous terminals in all directions, thus creating even more advanced complementary relationships. This is a desirable posture for ubiquitous networking.

If this differentiation is not sufficiently adopted at the utilization side and if competition concentrates on prices for homogeneous Internet access services of low switching costs, the competitive status may appear confused, involving the offering of high-speed and super high-speed services under wired networks as well as under the second- and third-generation services of wireless networks.

Until broadband wireless networks have penetrated the market to the extent that an independent market is established, a complementary relationship will be mutually maintained between wired and wireless networks. Although the competition within the respective categories of wired and wireless networks will remain intense, a loose collaborative relationship will be maintained between wired and wireless systems. However, at the point at which broadband wireless networks have fully penetrated the market, competition between wired and wireless systems for the same access services may take place if the differentiation in terms of applications and services is not fully implemented.

Progress in ubiquitous networking has a possibility of generating not only a complementary collaborative relationship between different network infrastructures, but

also a substitutional competitive relationship, depending on what attracts users. This projected evolution makes strategy selection in the field of a network infrastructure extremely difficult as it involves large-scale investment and a long time for recovery.

Among the processes undertaken toward ubiquitous networking, efforts to create original content, applications and services that are designed from the user perspective must always be made even at the stage of developing a network infrastructure. If these efforts result in offering unique features to users, such features may contribute to the creation of lock-in effects (the formation of a fixed set of users). A provider of these features may also be able to take an advantageous position in competing within the same network infrastructure.

Conversely, if a provider fails to make these efforts, fierce competition may occur for Internet access services even with different network infrastructures, which might develop into an exhausting price war.

The providers who intend to participate in the processes leading to ubiquitous networking are required to evolve strategies with a full understanding of the dynamic features of competition in this market. This dynamism could include competition within the same network infrastructure as well as competition among different network infrastructures. In addition, a flexible concept that can identify the essence of competition is obviously required of the government agency that formulates competitive policies.

2 Strategic Module Vertical Evolution Model in the Development of Utilization Infrastructure

Penetration of high-quality ubiquitous terminals equipped with supplementary functions such as GPS and electronic tag reader functions that meet the demands of users for "better connections" plays an important role in the process of ubiquitous networking.

As mentioned previously, there are three routes for terminals to become ubiquitous terminals: a route in which cellular phones with Internet access functions are developed into ubiquitous terminals; a route where PCs and/or PDAs are equipped with multiple functions; and a pattern of connecting TVs and DVD recorders/players to networks. While Japanese companies are expected to take an active approach to all of these routes, they are also expected to demonstrate strong competitiveness with respect to individual modules that make up ubiquitous terminals as well. These modules include displays, input systems, communications equipment, batteries and storage devices.

In the 1990s, US companies achieved brilliant successes in evolving horizontal and separate business operations. Specifically, they set up small, clear-cut areas such as OS, semiconductor devices, routers (network relay equipment), etc., deeply specialized in these respective areas and established global de facto standards.

In contrast, the Japanese electronics industry was strongly oriented toward generalization, and repeated a pattern involving fierce competition in which approximately ten companies were continually evolving all-out sales efforts for the same products including related parts and components. With the collapse of the ICT bubble serving as a major turning point, each company radically embarked on consolidation, reorganization, selling off and/or alliances in order to address the huge deficits each company had accumulated. Consequently, major progress has been made toward selection and concentration. Although it is still hard to say that these moves represent a shift from strategies focusing on generalization to those for horizontal and separate business operations with clear-cut fields of specialization, as seen in the United States, there is no doubt that a major first step was taken.

The process toward ubiquitous networking consists of several layers, starting from a network infrastructure and including ubiquitous terminals, digital platforms, content, equipment and service solutions.

These accumulated layers cannot be created concurrently in the process of ubiquitous networking. At least, ubiquitous terminals will not spread if a network infrastructure is not available. If the specifications of ubiquitous terminals are not crystal clear, it is not possible to design a digital platform. Without a digital platform, content business will not be vitalized, and ubiquitous electronics may be confined within a limited range. Ubiquitous networking moves forward in such a way that the accumulated layers cause a chain reaction with each other.

In terms of market size, the center of growth begins with a network infrastructure and gradually shifts to upper layers. Probably, the center of growth in terms of profit will also shift.

If a desirable business model is assumed to exist for this process, it would be a business model that permits following this shift of the center of growth in terms of profit, and that enables transition of the core of the business portfolio within one company or within one company group according to such a shift. In order to establish this sort of business model, a concept called the "generalization strategy" would be effective.

However, if this strategy leads to the continuation of the so-called "homogeneous generalization strategy," which expands the target business fields to the maximum in response to those of competitors, such continuation would result in a situation of putting the cart before the horse. For Japanese electronics companies, the first priority should now be given to a strategy that finds a way out of the low-profit structure derived from homogeneous generalization.

To pursue a desirable business model under such an environment, the focused strategic modules should first

be narrowed down to some extent, such as limiting to display systems, communications equipment or semiconductor devices, so as to modify the homogeneous generalization strategy that was exposed to criticism. In the vertical direction, moreover, vertical integration should be promoted, while strategically narrowing down the priority fields for each of the terminal and platform layers. Through such vertical integration, the development of a desirable business model should be pursued starting from a network infrastructure and going up the layers to finally reach digital content, ubiquitous electronics or service solutions that are closely related to end-users.

While strategic components, strategic terminals and strategic platforms should be covered by a company's own products, alliances with other companies should also be actively pursued. This means narrowing down the front line of competition that had spread out too much in the direction of building a business model of the "strategic module vertical evolution type."

At present, creating customer value and ensuring highly efficient management only constitute the means to improving the competitiveness of Japanese companies.[4] In particular, it is impossible to improve the competitiveness of a company without making continued efforts to maximize value for customers without being far apart from end-users, or consumers. In constantly continuing innovations in the electronics industry, an indispensable condition for survival is to always have business operations that can reach consumers in the form of equipment and/or services.

Of course, it is not possible to effortlessly reach the posture envisioned. However, under the ongoing trend toward ubiquitous networking, if each of the current general electronics manufacturers were to respectively select strategic modules that are somewhat different from those of other companies and could create a pattern in which they are also competing in the end-user market while still maintaining their generality (rather than pursuing a selection and concentration pattern in almost the same direction), they will be able to contribute to increasing the level of international competitiveness throughout the Japanese industries.

Surrounded by the United States that seems to be pursuing a principle of one-nation prosperity supported by strong military power, South Korea that is repeating strategic reorganizations with the ability to make decisions far more quickly and boldly than Japan, and China with its huge potential, the available options for competitive strategies that are left for Japanese industries to choose are limited.

3 Evolution of Utilization Solutions and "Industry-Consumer Reversal"

The success of service solutions at the stage when the ICT environment of the ubiquitous network is completed depends on how many "ubiquitous service integrators" make their appearance. A ubiquitous service integrator creates solutions by making the best use of management expertise such as franchising and low-cost operations through connecting heterogeneous services and equipment via the ubiquitous network, while anticipating consumer needs by understanding the social problems that Japan will face in the future and by removing regulatory restrictions.

What is expected in view of the current status of the Japanese economy is that venture businesses that are looking for new means to success, young people such as those known as free-spirited part-time workers and those striving to find jobs, women and seniors with a strong will to work, and people and companies with high potentiality should develop businesses based on new service solutions in this field one after the other. However, the entities that can first create this flow seem to be existing large companies that have abundant funds, human resources and expertise. It is especially important at the initial stage of commercialization that existing large companies embark on these attempts and experience some successes.

When we expect existing large companies to play such a role, there is one problem that must be resolved. This problem relates to the "industry-consumer reversal" under the ICT utilization environment. A reversal of a relationship between industry (companies) and consumers means a phenomenon where the ICT utilization environment of consumers becomes superior to that of the industry (companies).

It is said that the history of computer use by Japanese companies dates back to 1955 when Nomura Securities Co. introduced a UNIVAC-120. Since then, large companies have continued to develop the latest ICT utilization environments and owned the related systems.

It was the system departments of large companies that always took the lead for new phenomena, such as the MIS (management information system) boom in the 1970s, the SIS (strategic information system) boom in the 1980s and the Internet boom in the 1990s. Before the Internet started to gain popularity among households in the latter half of the 1990s, intranet use had spread among companies and government offices. The process by which consumers experienced using the Internet at their workplaces laid the groundwork for Internet use in their homes, led to interconnections among users, and has reached the present stage.

Efforts continue to be made at companies to always keep their ICT environments unsurpassed by those of other companies by making investments in systems amounting to several billion yen to several tens of billions of yen. In the course of making such efforts, a company's chief information officer (CIO) and responsible personnel in a system department might naturally consider that the ICT utilization environment of a company is overwhelmingly superior to that of households and individuals.

However, this scenario is now changing. The strong desires of household and individual users for "better connections" are becoming increasingly sophisticated and the ICT industry is exerting its utmost to meet such needs. The prices of optical fiber cable access services at 100 Mbps have already been reduced to a level accessible by a great number of individual users.

There is no end to the development of higher performance functions for Internet access with cellular phones. Functions that until recently could only be used in the limited applications of corporate systems such as digital image/video transmissions, electronic money functions and GPS functions, can now be disseminated quite easily as supported by a potential market exceeding 70 million people.

With the appearance of low-cost multifunctional machines, the use of color printers and scanners has become rather ordinary in many households. Watching TVs and using video phones via mobile networks are becoming the essential functions of mobile PCs as well as cellular phones. With the prices of storage devices becoming lower, storage capacity is almost limitless.

In contrast, with recent investments kept low, corporate information systems have continued to be pressured by cost reductions and improvements of development speed. The ability of Japanese companies to operate information systems has steadily been improved in the course of addressing various issues, such as utilizing Chinese resources as bases for outsourcing and system development, responding to frequent consolidations and company breakups and ensuring business continuity in an emergency. However, under the pretext of improving the security level and/or protecting privacy, user convenience has frequently been sacrificed, and there has been a tendency to neglect user-side features.

In light of such a comparison, although it might be a short-lived phenomenon, there is a possibility that the ICT utilization environment of household users/consumers, in which the progress of technology is more directly reflected, is becoming better than that of companies/industries that face many restrictions. As a matter of fact, how many corporate systems have an environment connecting consumers that permits wired Internet access at 100 Mbps and wireless Internet access at 2.4 Mbps, provides storage capacity with almost no limitation, allows free use of moving-picture video transmissions and enables color printing and the use of a video phone at any time?

Ubiquitous networking will further accelerate this "industry-consumer reversal" trend if companies do not act to prevent such acceleration. Consumers will be increasingly "better connected," and their ICT utilization will be increasingly sophisticated. This trend might invite a situation where consumers' (customers') systems are superior to the systems of companies that sell goods and services to customers.

The management executives and CIOs of existing large companies need to fully understand the meaning of this "industry-consumer reversal" phenomenon. Of course, as is usually the case when encountering changes in the management environment, this phenomenon could be considered a threat or, conversely, bring about major opportunities depending on what stance is taken by management.

Existing large companies are equipped with a wealth of management resources to embark on the new business evolution as a ubiquitous service integrator. However, if they overlook the changes that are taking place on the outside with their attention diverted to the heavy pressure on corporate systems, they might also overlook their own business opportunities. Conversely, this "industry-consumer reversal" situation is expected to bring the once-in-a-lifetime opportunity that gives rise to new businesses that can link industry and consumers for venture firms, spin-off companies, and exclusive outsourcing companies that have few restraining burdens.

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