JIPDEC

1994

Informatization

Quarterly

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Program for Advanced
Information Infrastructure

JIQ No. 98

JIPDEC Informatization Quarterly

1994

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No. 98

From the Editor

The Japanese economy has not yet begun to shown any signs of recovery from the ongoing recession. Politics in Japan are currently undergoing major changes, as is evidenced by the frequent changes in those holding office and the movements in recent times directed toward reorganizing the political system.

Under these circumstances, the environment surrounding informatization in Japan has also begun to gradually change as well. That is, the focus of informatization, which was previously on industry, has, since the second half of the 1980s, been shifting toward the home, local regions, and social systems. This has led to a growing awareness of the importance of transforming social systems into information systems. This trend is being seen in all nations where informatization has advanced. Many countries plan to focus on this field as a kernel strategy for promoting national informatization. The national information infrastructure (NII) concept introduced by the Clinton and Gore Administration has exerted an especially significant impact on major countries, including Japan.

Previous approaches to the informatization of social systems now is being reviewed in Japan, and a new approach is being searched for, partly because of the recent setback in the macro economy as a whole. The new approach is aimed at developing information-based social systems that meet increasingly diversified needs and implement new technical trends such as personal and multimedia technologies on the basis of previous progress in informatization.

The current trends in information technology such as downsizing, open systems, networking, and end-user computing continue to grow. "Everywhere computing," which has been proposed by the Basic Policy Subcommittee of the Information Industries Committee under the Industrial Structure Council, is becoming a reality. The problem of how to acquire the personnel who are capable of utilizing rapidly advancing information technology is growing more acute, however, and a chronic shortage of highly skilled information specialists has developed. It has therefore become extremely important to provide informatization personnel with the education and training they will need so that they can acquire advanced, specialized knowledge and technology. Given the severity of this situation, the Informatization Personnel Policy Subcommittee of the Industrial Structure Council has announced a number of specialization categories for personnel working in information-related areas. Based on this announcement, the Central Academy of Information Technology (CAIT), an organization affiliated with JIPDEC, has developed 17 new curricula for education and training.

The Japan Information-Technology Engineers Examination Center (JITEC), another affiliated organization, will begin administering examinations for information technology engineers based on the new categories starting in the fall of 1994.

Taking into account the current situation of informatization in Japan, the Information Industries Committee of the Industrial Structure Council has summarized the studies made by individual subcommittees and submitted a report in June 1993 on the various tasks that must be taken up to promote smooth informatization in our country. In response to this report, the Ministry of International Trade and Industry (MITI) announced the Program for Advanced Information Infrastructure in May 1994, which will serve as the focus for taking concrete action in implementing these tasks. The program has been highly evaluated for showing the direction which informatization should take in Japan.

The full text of this program is introduced in this issue of JIQ, and I hope that you will find this issue both useful and informative.

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Director
Research & International Affairs

Preface

1. Summary of June 1993 Report by Information Industry Committee of Industrial Structure Council, and Subsequent Developments

In June 1993, the Information Industry Committee of the Industrial Structure Council issued a report stating the following:

① In the current situation in which the principal means of generating economic value has shifted from manufacturing to intellectual activity and the value of human resources is becoming increasingly diverse, the sophistication and enhanced productivity of intellectual activities are essential to achieve further economic development and higher standards of living, while at the same time overcoming major issues such as those related to the global environment and aging of the population.

② Although the sophistication of intellectual activities and enhanced productivity are possible with the rapid development of information and communications technologies, such as progress in the fields of multimedia and networking, information technology is not being fully exploited in Japan.

③ To encourage the effective use of information technology, the government should implement various policies including (a) promoting the use of information technology in the public sector, particularly in the areas of research, education, and administration; (b) fostering an environment conducive to the dissemination of information technology led by the private sector, through the establishment of adequate security measures, standardization, and the reappraisal and modification of institutional frameworks in response to the spread of information technology; and (c) promoting the development of basic technologies forming the foundation of the advanced information system.

Since the release of the report, the government as a whole has become well aware of the importance of information technology, and policies have been noticeably redirected toward promoting such technology. In particular, MITI and other ministries and agencies involved in this area have demonstrated their commitment to the dissemination of information technology in their activities listed in the supplementary FY1993 budget and the draft FY1994 budget for specific policy in FY1994, while the Telecommunication Work Group, Administration Reform Task Force has started to review the regulatory framework for the purpose of implementing information-related policies

in a comprehensive and systematic manner. In the private sector, various efforts are being made to disseminate information technology, including experiments to integrate communications and CATV, against the backdrop of the global trend to promote such technology and government's actions for deregulation in the communications and broadcasting fields.

On a global level, various countries have also declared their commitment to the active promotion of information technology as a key to improving productivity and developing new industries, such as the National Information Infrastructure (NII) proposed in the U.S. or the Trans-European Network (TEN) Plan announced in Europe.

2. Purpose and Content of this Program

The purpose of this program is to clearly define MITI's concept of the directions that the advanced information infrastructure society should take, and to propose specific policy programs for each field in which information technology is being promoted in cooperation with the related ministries, based on the recognition that in the development of the new trend, the promotion of information technology has evolved from a simple vision to the stage of actual implementation.

Chapter 1 of this program describes specific short- and medium-term prospects for the industrial, household, and public sectors, respectively, in order to present a detailed outlook for the dis-

semination of information technology in these sectors. This is carried out on the basis of the outlook announced in the new market creation program in February 1994, which was an outcome of broad-based discussions on the advanced information society. Chapter 1 also outlines a desirable form of networking, which is necessary for the building of an advanced information systems.

Chapter 2 presents basic concepts in relation to the role of the government, as well as basic assumptions regarding policy making and specific policies for various efforts to develop an environment for the dissemination of information technology in the public sector as well as the private sector, together with an environment that can ensure a supply of high-quality information and applications. These aspects are being implemented by MITI in cooperation with the related ministries. Among them, with regard to the development of an infrastructure for the dissemination of information technology and the provision of high-quality information and applications, detailed objectives and the contents of measures currently being implemented, which are financed in the FY1993 supplementary budget and the draft budget for FY1994 in accordance with the recommendations of the Industrial Structure Council, are described.

Moreover, deregulation in the information and communications fields is considered to be a major pillar in developing an environment for the dissemination of information technology in the

private sector, and the report of the Advisory Group for Economic Structural Reform recommends that such deregulation be pursued as a priority objective. In recognition of this, the Telecommunication Working Group, Administration Reform Task Force is studying concrete measures. It is hoped that the working group will formulate recommendations that can be effectively implemented.

In addition to the measures suggested in this program, there are many other related measures to promote the dissemination of information technology such as technological development activities, but the program mainly focuses on measures on the demand side. With regard to measures for the information industry including technological development, discussions are being held by the Basic Issues Subcommittee of the Industrial Structure Council as part of a study on the prospects for industrial structures and on policy agendas.

3. Need for Comprehensive Government Program

Since measures for the promotion of information technology are related to numerous ministries and, as indicated in the report of the Advisory Group for Economic Structural Reform (Hiraiwa Report) issued in 1993, should be implemented in a comprehensive and systematic manner, an information technology promotion program such as this one needs to be planned and established with the participation of all the ministries involved.

It is hoped that this program will serve as the starting point for government-wide implementation, and that it will help to establish and implement the measures concerned by presenting a specific image of and policies for the advanced information system to both the public and the entire governmental organization.

Chapter 1 The Emerging Image of the Advanced Information Infrastructure Society

1. General

As a result of rapid technological advancements in the information and communications fields in recent years, the advanced information infrastructure society has evolved from the realm of possibility toward becoming a reality in the near future. Although drawing a clear overall image of the advanced information infrastructure society is difficult at present, the simplest definition is that the significant decrease in costs of information transmission and processing, along with major reductions in time and space constraints related to information, will allow everyone to obtain, process, and transmit information equally in the advanced information infrastructure society.

In such a society, the dissemination of information technology will progress differently in the first-generation information society, where high-speed processing of routine work and labor-saving are promoted through centralized information processing, and the second-generation information society, which will center around networking within specific groups of companies, such as vendors and buyers. It will be a new type of information environment characterized by the pervasiveness of personal computers, the merchandising of information through networking of PCs, the digitalization of all information, and the diffusion of information terminals to the general public through mass shipments of multimedia systems.

In the new information infrastructure society, anyone will ultimately be able to obtain and process information from anywhere in the world no matter where they are located, through a variety of media, and to easily transmit their own information to any point in the world. The pace of progress toward such a society, however, varies in the industrial, household, and public sectors according to the emergence of actual needs, cost trends, and development of application software.

2. Dissemination of Advanced Information Technology into Industry

The dissemination of information technology should have significant effects on business and research activities by improving work efficiency and productivity. If such technology is proved to be feasible, companies and researchers will be willing to introduce it. In particular, the introduction of advanced information systems is proceeded rapidly in the following areas.

(1) Dissemination of advanced information technology into offices

① Short-term prospects

Each worker will have a high-quality personal computer which is connected to other computers through a LAN, which, in turn, is connected to other LANs and databases. Furthermore, digitalization will enable the centralized processing of information on personal computers.

In the new information environment, the productivity of intellectual activities and non-routine work will be significantly improved through i) efficient collection and sharing of data and information, ii) efficient communication via electronic mail and other measures, and iii) efficient group work using groupware.

Access to LANs via radio will be widely available through the integration of wireless and computer technologies, this will bring about the expanded use of communications between workers on the move and their office via electronic mail, using mobile computing devices such as a portable terminals and portable personal computers. As a result, time and space restraints on office work will be substantially reduced.

(References): In the U.S., the use of personal computers in offices and the use of LANs and connection to external LANs has significantly progressed (the use of LANs as a percentage of the base of personal computers installed is 66%

in the U.S. compared to 17% in Japan), and they are widely used for searching data bases, communicating via electronic mail, groupware applications, etc.

② Medium- and long-term prospects

As the increased application of multimedia brings about greater utilization of video information, the use of video telephony, videoconferencing and electronic mail with images and sound, making use of LANs and personal computers, will be expanded and the efficiency of office work will be further improved.

(2) Advanced information technology for corporate manufacturing systems

① Short-term prospects

By connecting remote bases for production, development and sales by network, information on demand or inventories of products at each point will be distributed on a real-time basis, and managerial decisions and production planning will be carried out more efficiently.

② Medium- and long-term prospects

Utilizing the networks described above, the entire manufacturing system ranging from order processing, product development and design to production and distribution will be integrated into an intelligent manufacturing system (IMS). As production lines and process equipment are integrated under a single system, a flexible manufacturing

system capable of responding to changes in demand and other factors will be established, and the global sharing of development and production resources will be attained. This will enable efficient manufacturing and management for the entire company.

(3) Advanced information technology in business transactions and product development

① Short-term prospects

With the expanded interconnection of corporate LANs, EDI and electronic mail will be widely used and ordering and delivery of documents, which has been handled by hand delivery or mail up to now, will be performed through information networks. This will significantly reduce the time required and costs of such transactions and result in fewer errors, thereby improving corporate management. Moreover, the use of EDI for ordering will promote the simplification and enhanced efficiency of Japanese business practices, which is criticized as complicated and unclear.

(Note): EDI (Electronic Data Interchange):
Exchange of data on transactions including ordering data between companies through computer networks

② Medium- and long-term prospects

With the advancement of multimedia, the types of data transferred via networks will expand from text to image data such as design drawings and specifications. As advanced communications media such as electronic mail and videoconferencing become widely used, closer understanding of intentions and information sharing between companies will become possible and new types of business cooperation will be promoted.

(4) Advanced information technology in research

① Short-term prospects

The introduction of high-performance workstations and supercomputers that can make some simulation will improve the efficiency and sophistication of research and development.

The research sector is the leading user of Internet. With the further development of networking, communication and cooperation between researchers and information retrieval will be additionally advanced.

② Medium- and long-term prospects

Accompanying the enhancement of the functions of computers and software available to researchers, the major approach in research will shift from experimentation to analysis by computer. It is hoped that the development of information data bases and simulation techniques will bring about a significant decrease in the costs and time required for research and development activities.

3. Dissemination of Advanced Information Technology into Homes

As described above, advanced information technology will disseminate rapidly in the industrial sector following the principle of economic rationality, if the economic effects are greater than the costs involved. However, the introduction of information technology to homes is attainable only if consumers become used to the new forms of service apart from the issue of cost. If the costs are reduced, advanced utilization of information in this area will be rapidly realized, with increased demand for services providing one-way transmission of images such as video-on-demand and home shopping, or services utilizing packaged media including CD-ROM. On the other hand, for services which require high-speed and high-volume interactive data transmission such as remote medical services and remote education, a specific concept of the applications and their usefulness has still to take shape.

(1) Diversified choice of information

The promotion of information services will make diversified information meeting individual needs available at home.

① Short-term prospects

Along with the diversification of information which is currently provided via networks, some information provided via other media including paper will also be transferred to networks.

(Examples) With the spread of CATV, multichannel broadcasting will be inaugurated and various programs meeting diverse interests and concerns will be provided.

Movies, programs and games will be available at any time desired by viewers through video-on-demand and game-on-demand services.

Electronic newspaper services will be established to complement conventional newspapers and provide more detailed information.

Multimedia games and multimedia publications will increase accompanying the improvement and dissemination of digital packaged media including CD-ROM.

② Medium- and long-term prospects

While information will be mainly selected from menus offered by each information service provider in the short term, in the medium and long term each home will be able to access electronic libraries and electronic museums around the world via networks, allowing users to readily search and obtain worldwide information on books and art based on their own particular interests.

(References): In the U.S., multichannel broadcasting is already in operation and many CATV and telecommunication operators are operating video-on-demand on an experimental basis. Electronic newspapers are also already in circulation for a limited number of readers. Electronic libraries and museums are at the stage of verifying development and demand through testing.

(2) New services utilizing information networks

With the proliferation of advanced information technology, services currently provided face-to-face will be provided via networks and advanced services will be available at home.

① Short-term prospects

Services already being partly provided via telephone and television networks will become more diversified and advanced.

(Examples) Services in which consumers receive image data and respond accordingly, such as home shopping and home ticketing Home security services Remote education by one-way transmission of lectures

② Medium- and long-term prospects

Various types of new interactive services, such as medical treatment and welfare services at home and remote education and learning, will be provided via networks and consumers will be able to use these services related to daily life at home without limitations of time.

However, these new services are based on different concepts from those of the respective conventional services. For example, whether remote education available at home will have the same level of effectiveness as traditional school education or whether there is demand for such a form of education has not been verified at present. There-fore, it is necessary to place priority on the development of attractive applications and clarification of the issues involved, such as the scale of real demand and the possibility of cost reductions to encourage an expansion of demand.

(References): In the U.S., these services are being actively commercialized and home shopping has been found to have strong potential. For other services, however, particularly interactive type services, the situation is still in the phase of research into the scale of demand through test operations.

(3) Increase of information sending from home

In the advanced information infrastructure society, the cost of sending information will be very low and individuals will be able to transmit information throughout the world.

① Short-term prospects

Until now, the amount of information sent by individuals from their homes has been far less than that sent by companies. However, along with the spread of personal computers at home, the opinions and views of individuals will be readily transmitted from home to the world using Internet and personal computer communications.

(References): In the U.S., Internet and personal computer communications have already been widely introduced in homes and are in active use.

② Medium- and long-term prospects

Information sent from homes will be mostly limited to text information in the short term, but with the development of multimedia, the opinions and views of individuals will be clearly expressed on personal computers at home using image, sound and text. This will unleash a wide range of communications, such as individuals producing video software and transmitting it to the world.

4. Dissemination of Advanced Information Technology into Public Sector

Since the government is an important element of the economy and society, and public services provided by the government are essential for daily life, the dissemination of information systems in the public sector serves as a basis for the same process in the overall society. From an international point of view, the adoption of information technology by the public sector in Japan lags far behind and there is an urgent need for development in this field. The promotion of advanced information systems in the public sector should contribute to improvements in public service in terms of efficiency and effectiveness. The following are expected developments of the advanced information technology in the public sector. (Details are discussed in Chapter 2.)

(1) Education

The scope of education and learning will be extended beyond conventional teaching in classes, with students becoming able to access information from throughout the world. Remote education, joint learning with schools around the world and learning through imaginary experiences with interactive simulation will be available. As a result, more advanced and active styles of education will be realized on a practical level.

(2) Research

In national research institutions, accompanying the introduction of performance computers such as supercomputers, establishment of LANs, progress of high-speed research networks to connect them and upgrading research data bases both the efficiency of research and the level of technology will be improved.

(3) Medical and welfare services

Accompanying the development of networks between hospitals and medical data bases, doctors based in local communities will be able to examine and treat patients at hospitals and homes with the support and advice of specialists in the field. As welfare services at home using these networks become widely provided and the social participation of elderly people increases, a social environment will be created which makes the lives of elderly people easier.

(4) Public administration

A larger volume of publicly released administrative information such as sta-

tistics will be available through data bases and will be widely used by the private sector. Administrative management will be more efficient and advanced and administrative services will be automated with paperless work. As a result, administrative services will be higher in quality and more efficient.

(5) Libraries

Electronic data processing of documents in libraries and the global connection of libraries via networks will form an electronic library system in which documents are provided through networks. Users of the library will be able to use intellectual properties stored in different locations throughout the world.

5. Impact of Disseminating Advanced Information Systems

The transformation to an advanced information infrastructure society should bring about significant changes in all industries and economic activities as well as in people's daily lives.

That is, many new businesses will emerge in the information and communications industries as well as other existing industries (see References), and both quality and productivity will be upgraded in all industries through improved productivity in intellectual activities.

Moreover, as limitations on information in terms of time and distance will be substantially reduced, disparities in the sending and receiving of information between urban and local areas should be corrected and the revitalization of rural areas should be promoted. At home, the volume of information that individuals can receive and send will increase noticeably and this will make a major contribution to the promotion of a society filled with life-enriching resources.

(References) : Prospects for Information- and Communications-Related Industries in New Market Creation Program

Industry	1990		2000	
	Finance and Insurance	Automobiles	Information and Communication	
Market Scale	31.3	40.0	61~70	(trillion yen)
Domestic Production Value	871.6		1194.3	(trillion yen)
Share	3.6%	4.6%	5.1~5.9%	

(Note1) Figures for 1990 are quoted from the Inter-Industry Relations Table (Bulletin).
(Note2) Domestic production in the year 2000 is estimated assuming an average annual growth rate up to that year of 3.2% (estimate of real economic growth rate by Industrial Structure Council).

6. Networks for Advanced Information Infrastructure Society

(1) General

Networks consist of devices connected through infrastructure such as computers and software. In the advanced information society, networks should have the following characteristics.

① Networks formed by integrated telecommunications infrastructures to meet diversified needs and technological innovations

As described in this chapter, in the advanced information society it is expected that various applications will become available in each area, and that various types of information from text to images will be distributed and processed in a variety of forms. Therefore, the telecommunications infrastructures that form the basis for information distribution must meet diverse needs in terms of mobility, bandwidth (volume of transmissions and their scalability), direction (one-way or two-way), cost, and so on (Table 1).

On the providers' side, on the other hand, it will be technically feasible to provide various telecommunications infrastructures having specific characteristics in line with the rapid development of information and telecommunications technology. It is not a matter of one telecommunications infrastructure being superior to others in all respects; rather, they will evolve through functional sharing and competition to meet various needs of users (Figure 1).

The choice of telecommunications infrastructures that meet the needs of users will be further diversified by the advancement of application technologies, and this will stimulate competition between them.

(Examples)
With the development of video compression technology, the bandwidth needed for a telecommunications infrastructure will become narrower. As a result, users will be able to choose the level of compression and telecommunications infrastructure according to the costs involved and functions provided (Figure 2).

As materialized in Internet, user-owned devices such as computers will partly serve as the transmission and switching functions offered by telecommunications operators. As a result, users will be able to choose the combination of transmission functions offered by telecommunications operators and the users' own computers according to costs and functions.

In the advanced information infrastructure society, it is desirable that an integrated environment be developed where various telecommunications infrastructures with specific characteristics are available and competing with each other, and where users can choose the one which meets their needs. Such an environment will be fostered through the development of telecommunications infrastructures, which will be realized through technological innovations made

Network	Application	Specific Utilization	Users Needs						Possible Telecommunications Infrastructures
			Broadband	Scalability of Bandwidth*	Mobility	Interactivity	Transmission Capability	Simultaneous Transmission	
Networks for Business	Internal LAN and WAN	Sharing of database (text data)	○			○	△		N-ISDN, frame relay, private leased line
		Sharing of database (multimedia)	◎			○	△		B-ISDN, private leased line
		Electronic mail, file transfer			△	○	○	△	telephone, ISDN, private leased line, cellular telephone, PHS, FPLMTS
		Video mail	◎	△		○	○	△	B-ISDN, Private leased line, large-capacity satellite communication, HDSL
		Information support for sales staff			○	○	○	△	cellular telephone, mobile data communication, PHS, FPLMTS, satellite telephone
Networks for Homes	Video Transmission	Multichannel video transmission (30 channels)	○					○	satellite broadcasting, multichannel CATV
		Multichannel video transmission (150 channels)	◎					○	digital satellite broadcasting, digital CATV, radio cellular CATV
		Video on demand	○				○	△	digital CATV, ADSL, B-ISDN
	PC Based Communications	Retrieval and broadcast of personal and community information (text data)			△	○	○		ISDN, telephone, mobile telephone, HDSL
		Retrieval and broadcast of personal and community information (multimedia)	○		△	○	○		B-ISDN, N-ISDN, HDSL
Networks for Public Services	Distant Learning	Interactive video communications	○			○	△		B-ISDN, private leased line, HDSL
		One-way video transmission	○			△	△	○	CATV, satellite broadcasting, terrestrial broadcasting, wireless cellular CATV, ADSL
	Telemedicine	Pathologic diagnosis (telepathology)	◎			△	△		private leased line, large-capacity satellite communications, B-ISDN
		Medical picture transmission	○			△	△		private leased line, N-ISDN, frame relay
		Computer analysis of medical information (e.g., artificial bone structure, etc.)	○	△		○	△		private leased line, N-ISDN, frame relay, B-ISDN, HDSL
		Emergency medical support through picture transmission	○		○	○	△		large-capacity satellite communications

Table 1. Examples of telecommunications infrastructure for various applications * Also necessary where several types of media (image and text information, etc.) are used.

Symmetrical (Two-way)

Broadband

ATM

Large-capacity
geostationary satellite

Private leased line

SMDS
Frame-
relay
Packet

I
S
D
N

H
D
S
L

Communication
satellite

LEO

P H S

FPLMTS

POT

Cellular
Phone

Fixed

Narrowband

Mobile

Narrowband

Data broadcasting

A
D
S
L

Terrestrial TV and radio

Satellite
broadcasting

C
A
T
V

Terrestrial digital TV

Digital satellite broadcasting

Multichannel
digital
CATV

Wireless CATV
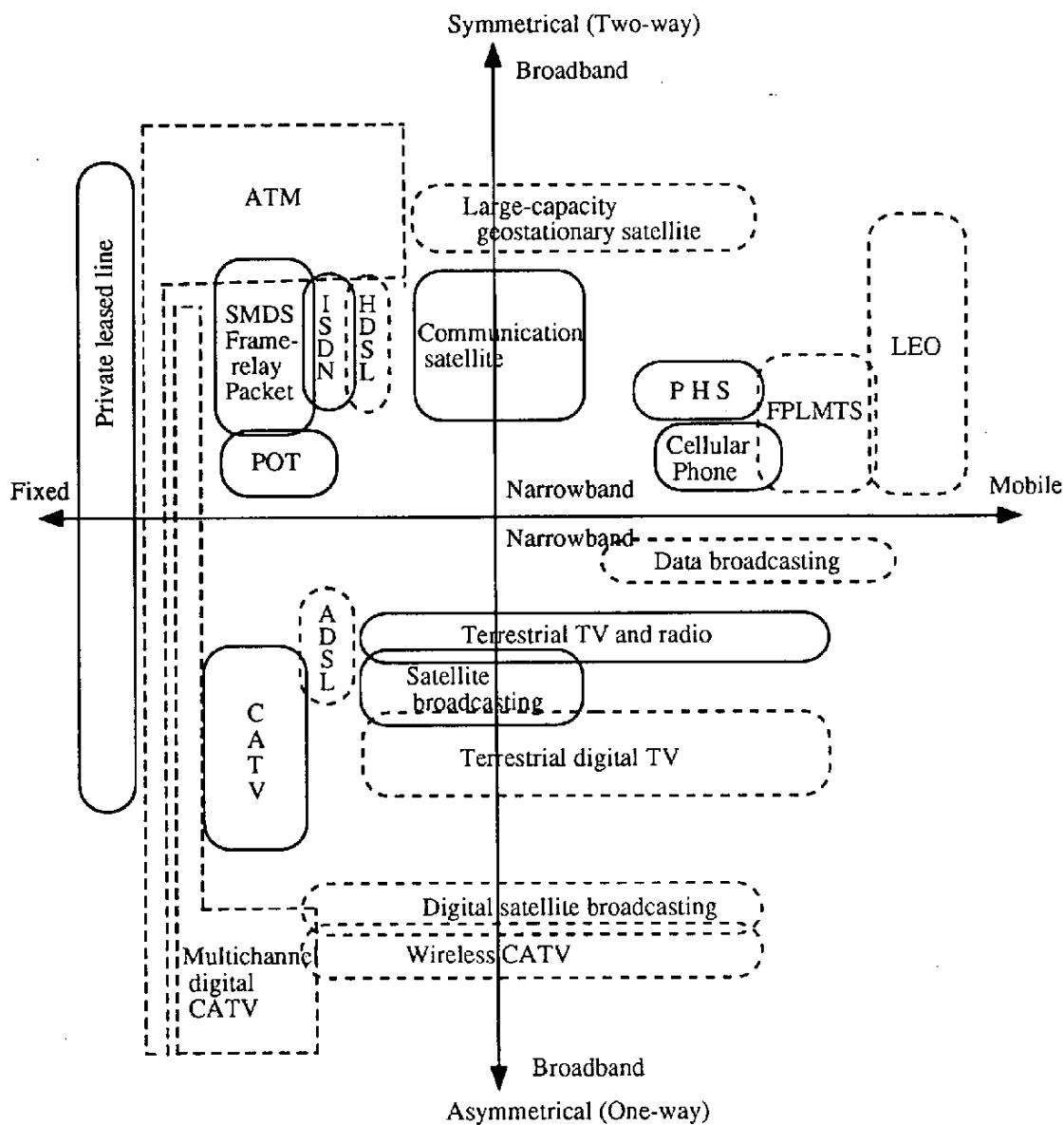
Broadband

Asymmetrical (One-way)

Figure 1. Future development of network infrastructures

by private companies in continuous competition with each other over charges and functions (Figure 3, Source: OECD "Telecommunications and Broadcasting (1992)").

② Seamless network

Seamlessness means the ability of users to be connected to all other users around the world and to share all information through the network without any obstruction due to differences in telecommunications infrastructure or connected devices. Seamlessness is therefore a highly important concept, and represents an essential characteristic of the network.

Until now, the primary role of the network has been to ensure that telecommunications infrastructures could be connected with each other and that signals could be transmitted smoothly between different infrastructures.

In the advanced information society, however, the network will go beyond the mere smoothing of signal transmissions. As materialized in Internet, which connects 2 million host computers around the world, users will be able to command an array of computers through their own computers, or computers connected by a telecommunications infrastructure will work together to process information. That is, a
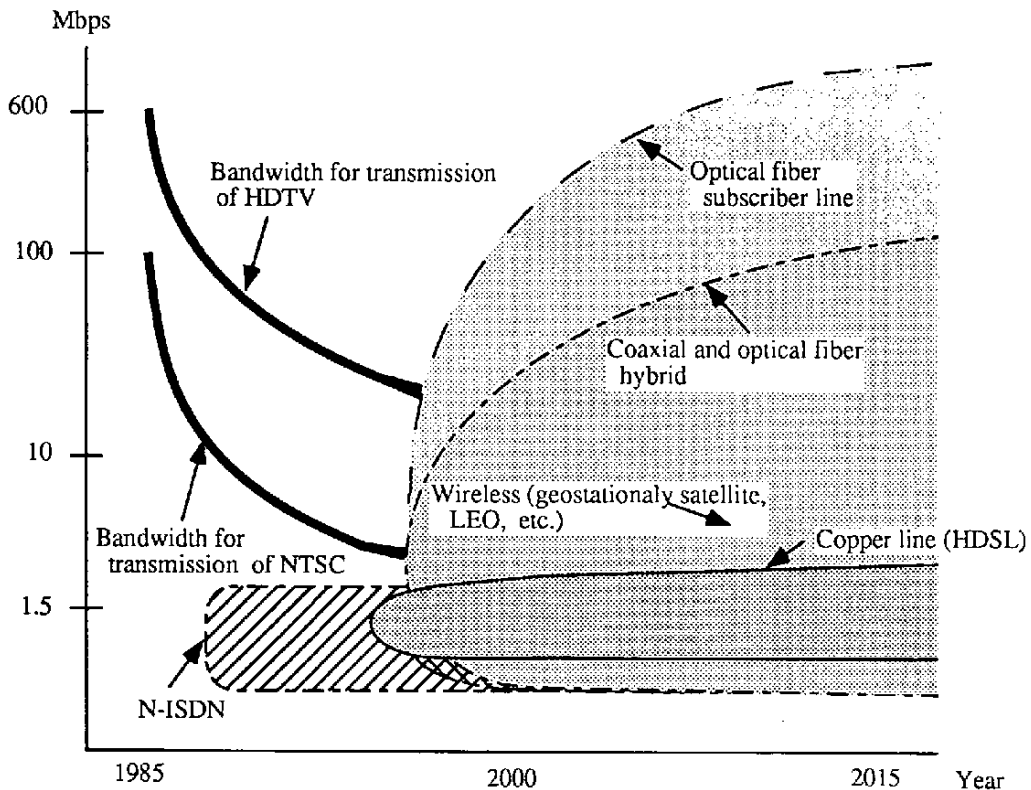
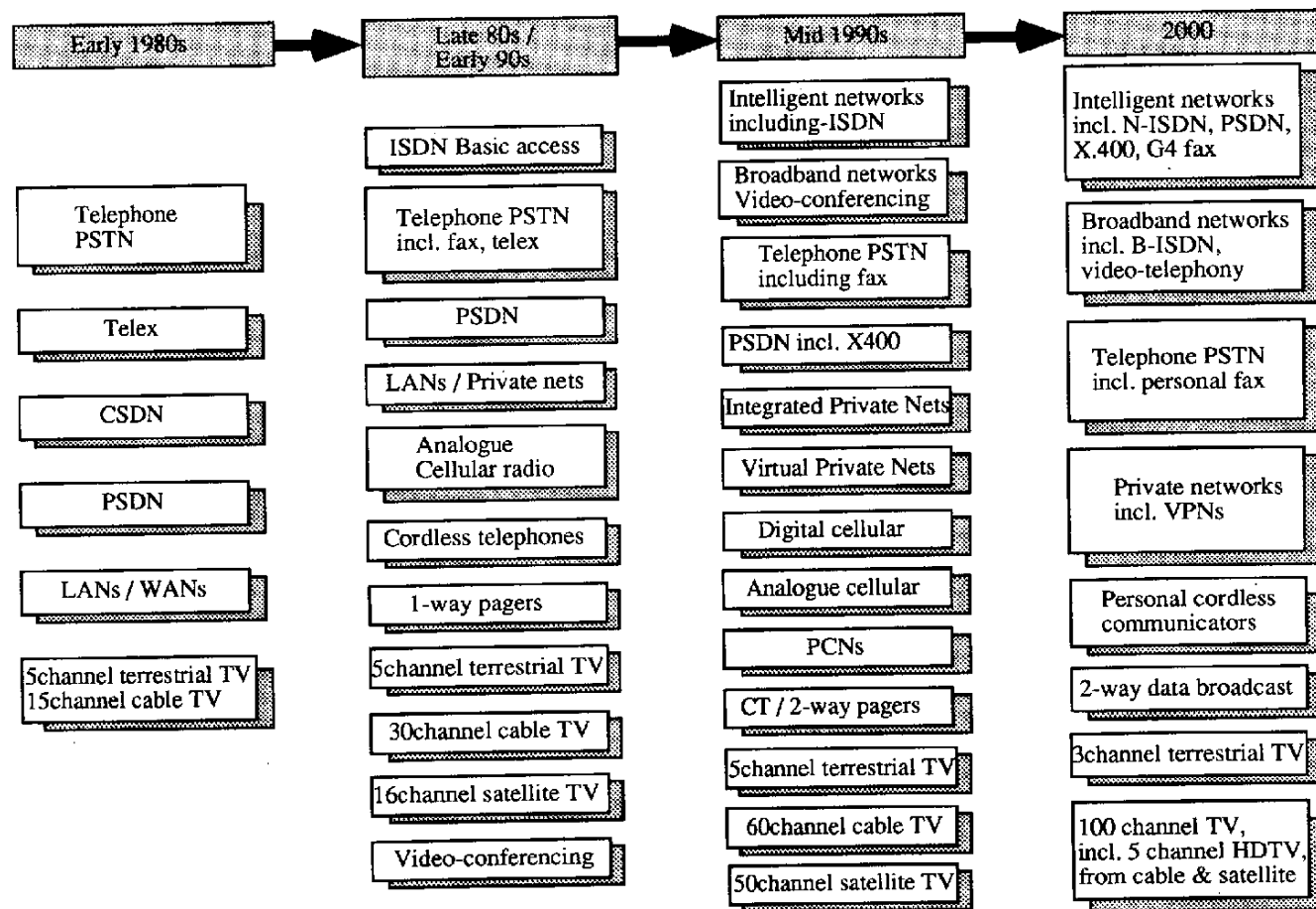Figure 2. Video compression and telecommunications technology

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Early 1980s	Late 80s / Early 90s	Mid 1990s	2000
		Intelligent networks including-ISDN	Intelligent networks incl. N-ISDN, PSDN, X.400, G4 fax
	ISDN Basic access	Broadband networks Video-conferencing	Broadband networks incl. B-ISDN, video-telephony
Telephone PSTN	Telephone PSTN incl. fax, telex	Telephone PSTN including fax	
Telex	PSDN	PSDN incl. X400	Telephone PSTN incl. personal fax
CSDN	LANs / Private nets	Integrated Private Nets	
PSDN	Analogue Cellular radio	Virtual Private Nets	Private networks incl. VPNs
LANs / WANs	Cordless telephones	Digital cellular	
	1-way pagers	Analogue cellular	Personal cordless communicators
5channel terrestrial TV 15channel cable TV	5channel terrestrial TV	PCNs	2-way data broadcast
	30channel cable TV	CT / 2-way pagers	3channel terrestrial TV
	16channel satellite TV	5channel terrestrial TV	100 channel TV, incl. 5 channel HDTV, from cable & satellite
	Video-conferencing	60channel cable TV	
		50channel satellite TV	

Figure 3. A 1990s vision of network evolution towards diversity
(Source : OECD "Telecommunications and Broadcasting (1992)")

number of separate computers will work as if they were a single unit.

As various types of information (i.e., contents) such as publications, video, data, etc. are transformed into digital data and stored, such information will be accessible through networks as described above and shared by all people around the world.

To establish a seamless network, in addition to the connection of telecommunications infrastructures it is necessary to convert the information into interoperable digital data and to realized advanced mutual operation in which different types of computers work together to process information.

Supplement: Concept of Infrastructures for Broadband Telecommunications

Based on the foregoing discussion, this section examines the current status and prospects of infrastructures for broadband telecommunications, which are increasing in importance.

① Technical development of telecommunications infrastructures

Infrastructures for broadband telecommunications are divided into those for two-way telecommunications (symmetrical broadband telecommunications infrastructures) and those for one-way telecommunications (asymmetrical broadband telecommunications infrastructures). Technologies for each

type of infrastructure are being developed as follows.

a. Infrastructures for two-way broadband telecommunications (Symmetrical broadband telecommunications infrastructure)

Among the infrastructures for two-way broadband telecommunications, B-ISDN, which consists of subscriber optical lines (optical fiber lines from the switching device to the subscriber) and ATM switching devices, is the most technically feasible. However, it should be understood that the following uncertain factors are associated with the field of B-ISDN.

With the future development of video compression technology it is expected that the bandwidths required for transmission will become smaller, thus allowing many applications to be transmitted by copper wire and radio.

Installation costs are expected to be significantly reduced (Figure 4).

The most appropriate form of telecommunications infrastructure from the switching station to the subscriber may vary in line with cost reductions or the purpose of telecommunications (Table 2).

Depending on the future directions of technical development, the economic effects of B-ISDN and video transmission networks using the same optical fiber lines or separate lines may vary (Table 3).
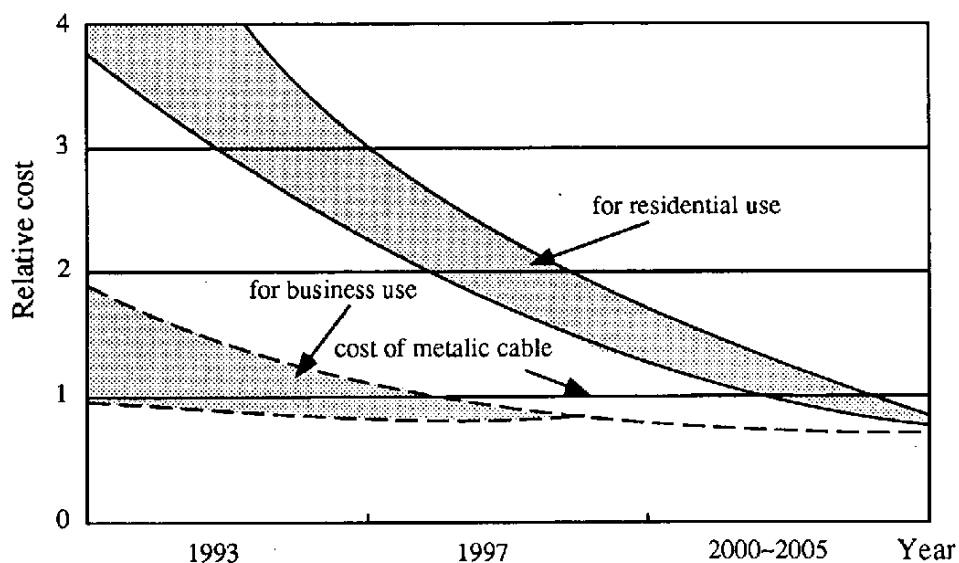
Figure 4. Economic trend in optical networks (targets)
Source: "Basic Plan of NTT toward Multimedia Era"

Optical fiber wiring system	Image	Cost of cable	Cost of devices	Bandwidth
Passive double star		Medium	High~Medium (Can be varied with reduction in cost of optical distributer)	Medium
Single star		High	Low	High
Active double star		Medium	High~Medium (Can be varied with reduction in cost of optical-electronic converter)	Medium

Table 2. Types of installation for optical fiber subscriber line

Types	Image	Cost of optical fiber	Cost of devices
Multiplexing by ATM	ATM switching — Optical fiber — Computer, Transmission of multiplexed ATM cell — Video distribution — TV	Medium	High (Enhancement of ATM switching capability is essential!)
Optical wavelength multiplexing	ATM switching — WDM — Optical fiber — WDM — Computer, Video distribution — Multiple transmission by single fiber — TV	Medium	High~Medium (Depends on reduction in costs of optical wavelength multiplexing and devices)
Separate wiring of optical fiber	ATM switching — Optical fiber — Separate wiring — Computer, Video distribution — Optical fiber — TV	High	Low

Table 3. Sharing of optical subscriber line by B-ISDN and video distribution

With the future development of radio technology, two-way broadband telecommunications infrastructures using the subscriber wireless network may have economic advantages over those using the subscriber optical fiber network.

b. Infrastructures for one-way broadband telecommunications infrastructures (Asymmetrical broadband telecommunications infrastructure)

Although infrastructures for one-way broadband telecommunications can be built with B-ISDN using the subscriber optical fiber network and ATM switching devices that are employed for two-way broadband telecommunications infrastructures, the following telecom-munications infrastructures can also be applied. The advantages of each infrastructure may vary depending on future technical development and other factors.
- Digital CATV
- Digital satellite broadcasting
- Wireless cellular video transmission using microwave
- Video transmission through advanced use of copper wire telephone networks

② Demand for and future development of telecommunications infrastructures

Based on the technical developments discussed above, the demand for and development of broadband telecommu-nications infrastructures in the indus-

trial and household sectors can be described as follows.

a. Industrial sector

(a) Demand for telecommunications infrastructures

The demand for broadband telecommunications infrastructures in the industrial sector is expected to increase substantially in the following areas.
- Connection of internal and external LANs
  For videoconferencing using PCs, video electronic mail, high-speed transmission of high-volume data such as design drawings, database searches, etc.
- Remote access to supercomputers for research, design, etc.

(b) Future development of telecommunications infrastructures

In the areas mentioned above, it is necessary to build telecommunications infrastructures which can handle the two-way transmission of high-volume data at high speeds, and which allow data of various speeds (image data, text data, etc.) to be transmitted. At present, broadband ISDN using the subscriber optical fiber network and ATM switching devices is the most feasible technology in terms of providing both the features of broadband and scalability of transmission volume. However, private leased line services can also take advantage of such an infrastructure depending on the scale of transmission and user charges. Therefore, private operators should take the initiative in

the competitive development of broadband ISDN on the basis of a wide range of considerations, such as changes in demand, technical advancements, and competition with other telecommunications infrastructures.

b. Household sector

Demand for broadband telecommunications infrastructures in the household sector is expected to occur in various areas. These areas are classified into two major categories; namely, demand for one-way broadband telecommunications from information providers to home users, and demand for two-way broadband telecommunications in which video can also be transmitted from homes.

(a) Demand for one-way broadband telecommunications infrastructures (Asymmetrical broadband telecommunications infrastructure)

The following are examples of applications for one-way broadband telecommunications infrastructures:
- Multichannel TV broadcasting
- Video-on-demand
- Games-on-demand
- Home shopping
- Home ticketing
- Electronic museums

The demand for these applications will significantly increase if they are offered at reasonable charges.

All of these applications require the function of transmitting video information and signals for the selection of

video information from information providers to homes (Asymmetrical bandwidth).

(b) Demand for two-way broadband telecommunications infrastructures (Symmetrical broadband telecommunications infrastructure)

The following are examples of applications requiring two-way broadband telecommunications infrastructures:
- Remote education using video
- Medical treatment at home using video
- High-quality video telephony
- Transmission of multimedia works expressing the opinions of individuals

Among these applications, education and medical treatment are services that have been provided on a person-to-person basis so far, and the level of demand and other factors when they are provided through telecommunications systems have not been evaluated in detail. For high-quality video telephony and the transmission of multimedia information from homes, although demand can be expected in certain homes it is uncertain whether volume demand exists.

(c) Development of telecommunications infrastructures

As described above, in the household sector there is expected to be some demand for one-way broadband telecommunications infrastructures, but demand for two-way broadband telecommunications has not yet been verified.

Also, considering the uncertainties regarding the direction of technologies for two-way broadband telecommunications infrastructures, the expected reductions in installation and maintenance costs, and the diversification of one-way broadband telecommunications infrastructures, it is difficult to determine the most appropriate telecommunications infrastructures and the timing of their development. Private companies should therefore build broadband telecommunications infrastructures with the technology and timing which are the most suitable for each assumed area of demand (Table 4).

c. Public sector

(a) Demand for telecommunications infrastructures

The following are examples of applications which may require broadband telecommunications infrastructures in the public sector:
- Remote diagnosis by medical specialists using real-time high-definition video
- Super-high-speed research networks
- Remote education using video (school education, lifelong education)
- Provision of data including administrative information using video

Since these applications are still at the testing or planning phase, specific demand for each of them has not been verified. In the same manner as for the industrial and household sectors, the demand for telecommunications infrastructures in terms of bands, directions (one-way or two-way), scalability, etc.

Application Sector	Direction	Form of Transmission	Applications	Prospects for Practical Use	Applicable Broadband Networks
Industry	One-way (Asymmetrical) video transmission applications	————	————	————	————
	Two-way (Symmetrical) communications applicaitons	Broadband for both up-link and down-link	- Connection of high-speed LANs - Remote use of supercomputers for designing and other purposes	Near future	- Subscriber optical fiber network and ATM switching (*) - Coaxial wire and optical fiber hybrid network - HDSL (cable) - Large capacity geostationary satellite - Private leased lines
Household	One-way (Asymmetrical) video transmission applications	Broadband for down-link and mainly narrowband for up-link	- Video-on-demand - Multichannel broadcasting - Home shopping - Video databse retrieval	Near futer (Cost reductions required.)	- Digital CATV - Digital satellite broadcasting - Subscriber optical fiber network and ATM switching (*) - Wireless CATV - Coaxial wire and optical fiber hybrid network - ADSL (cable)
	Two-way (Symmetrical) communications applicaitons	Broadband for both up-link and down-link	- Advanced remote diagnosis - High-quality video telephony - Distant learning - Transmitting multimedia works	Uncertain (Verification of usefulness of application required.)	- Subscriber optical fiber network and ATM switching (*) - Coaxial wire and optical fiber hybrid network - HDSL (cable)

(Note) Down-link : from center to subscriber   Up-link : from subscriber to center
(*) Not an established future technology

Table 4. Applications Using Broadband Network and Their Applicable Networks

differs according to each application. Therefore, the form of telecommunications infrastructures required can be expected to vary depending on the applications selected by schools, hospitals, administrative agencies, etc.

(b) Development of telecommunications infrastructures

Based on the above considerations, in the public sector it is important to verify the demand for various applications and to determine the directions in which advanced information systems will be promoted, and then, as a pioneering user, to select the most appropriate telecommunications infrastructures for each application from the various telecommunications services provided by private operators.

The promotion of advanced information systems in the public sector is expected to contribute to the development of telecommunications infrastructures through the pioneering application of advanced telecommunications systems.

Chapter 2 Desirable Basic Policy Directions for Realizing the Advanced Information Infrastructure Society

1. General

(1) Expected role of government

Moves toward the advanced information infrastructure society should be led by the private sector as clearly stated in the National Information Infrastructure (NII) plan, while the role played by the government will be to supplement and reinforce the initiatives taken by the private sector. In other words, the advanced information infrastructure society will basically be materialized by users making active efforts to promote the introduction of information systems and by information-related industries supplying advanced products and services, in a diverse, advanced, and seamless network environment prepared by the private sector. Consequently, it is important that the government make efforts to promote the introduction of information systems in the public sector as one of the users of such systems, while at the same time making improvements to the environment so that the ingenuity and vitality of the private sector can be actualized to the maximum extent. With policies toward the realization of advanced information systems being promoted in various regions including the United States, Europe, and Asia, Japan should also push forward

with such policies through international cooperation as occasion demands.

① Promotion of information systems in the public sector

The public sector is a sphere where the government is one of the users of information systems, and at the same time is expected to make positive efforts to promote the introduction of information systems for the following reasons.

a. Promotion of information systems in the public sector is expected to have a major effect on the upgrading of education and research and the improvement of administrative services. However, this sector greatly lags behind in the introduction of advanced information systems compared with private sector.

b. With the dawn of the advanced information infrastructure society, high-quality contents including data bases and advanced services will need to be provided through information systems. The government possesses vast information resources including administration-related data and bibliotheca in libraries, and at the same time is the main body for furnishing such essential services as education, medical and welfare services. Thus the government is expected to play an important

role as a supplier of contents and services in the information society.

c. Since the public sector has a many-faceted relationship with the activities of the private sector, the introduction of information systems in the public sector will have a major impact on the introduction of such systems in the private sector. (For example, promoting paperless applications, etc. through the promotion of advanced information systems in the administrative area will serve as a strong driving force for the realization of a paperless environment in the private sector.)

② Improvement of environment for promotion of information systems in the private sector

The government is expected to actively tackle improvement of the environment to allow the ingenuity and vitality of the private sector to be actualized toward promoting the introduction of information systems. The main areas involved are as follows:
a. Computer security measures
b. Promotion of standardization
c. Review of various systems in response to the progressive introduction of information systems
d. Protection of intellectual property rights and facilitating reuse of intellectual properties

③ Improvement of environment for providing high-grade contents and applications

Needless to say, the government is not the only body providing contents and applications for the information society. The supply of a diverse assortment of contents and applications based on the ingenuity and innovativeness of the private sector is also important, and improvement of the environment for this purpose is a crucial political task to be performed by the government.

④ Improvement of environment including deregulation for enhancement of telecommunications infrastructures

As mentioned earlier, it is desirable that a compound telecommunications infrastructure environment be materialized where a variety of telecommunications infrastructures making maximum use of the fruits of technical innovation are provided to users, in a situation of constant competition over functions and costs in response to diverse needs in each area of the industrial and household sectors. For this purpose, it is considered to be of the greatest importance that the government, through deregulation in telecommunications, broadcasting, and other areas, create an environment in which private enterprises improve telecommunications infrastructures in a competitive situation. (Concrete steps toward deregulation are currently being studied by the Administrative Reform Promotion Headquarters and the Telecommunications Council.)

(2) Necessity of integrated and systematic policy development

The policies mentioned in (1) above in-

volve various ministries and agencies. Hence, for the integrated and systematic implementation of such policies, it is necessary that the related ministries and agencies together formulate a nonpartisan integrated political plan regarding the promotion of information systems in Japan, and that a structure be established in which each ministry and agency pushes forward these policies through mutual cooperation in line with this plan.

2. Information Technology in Five Public Sectors

As already mentioned, the promotion of information systems in the public sector is of great significance in realizing the advanced information society in Japan.

This is a sphere in which the government, as the so-called mainstay of the introduction of information systems, should make active efforts from a long-term viewpoint. At present, a concrete action program formulated taking the future outlook into account is being carried out in five areas: education, research, medical and welfare services, administration, and electronic libraries. This program, with funding from the supplementary FY1993 budget for specific policy in FY1994, is being implemented through close cooperation among the National Diet Library, the Management and Coordination Agency, the Science and Technology Agency, the Ministry of Education, the Ministry of Health and Welfare, and other ministries and agencies.

The following is a detailed description of the future outlook and concrete steps which are being taken in each area.

[1] Education

(1) Outlook

The rapid progress of information technology, such as the advancements made in computer technology represented by multimedia, and the development of networking has the potential to open up new prospects for education and learning beyond the traditional framework.

① Realization of active study

By taking maximum advantage of the advanced functions of computer software and networks, such learning activities as identifying and analyzing subjects to study and expressing the results may become more advanced and active, and the capabilities of learners including their creative, intellectual, and expressive powers may be dramatically enhanced.

a. Realization of advanced intellectual activities
Through the use of advanced tools including computer software which can visually display complicated simulations and groupware which effectively supports collaborative work, great progress can be realized in educational and learning activities.

b. Realization of advanced styles of expression
The ability to freely use advanced in-

formation technology will allow easy handling of various types of information including static and moving images, computer graphics, music, voice, character data, etc., making it possible to express the fruits of education and study employing a variety of techniques as well as to dispatch information more widely via networks.

② Realization of education and study transcending restrictions imposed by traditional classroom teaching

The substantial improvement in information processing, gathering and dispatching capacities through computers and networks will permit the following new developments in education and study, transcending the various restrictions imposed by traditional teaching in classrooms.

a. Access to worldwide information
Access to electronic libraries, electronic art galleries, electronic museums, statistical data bases, and news information sources located throughout the world will be accomplished, and in a similar manner to teaching materials currently at hand, desired information will be able to be searched, retrieved, and used as materials for study.

b. Real-time access
Real-time observation and experience of natural and social phenomena throughout the world will be made possible, and intellectual experiences will be available as if the user were actually present at the scene.

c. Remote education

Two-way telecommunications will permit education to be offered even outside the classroom, or so-called remote education. In other words, it will be possible to attend lectures delivered in different locations and there will be a remarkable increase in educational opportunities for students in various learning environments. This, in turn, will offer chances for a wide range of lifelong studies.
In addition, discussions on social and economic problems, language practice, joint experimental events, and the holding of joint events will become possible through direct telecommunications with schools and students throughout the world.

d. Virtual experiential study
Advanced computer software will allow the realization of education and study based on virtual experiences including, for example, historical experiences, virtual social experiences by simulation, and experiences of future trip such as tours inside the human body and space trips.

(2) The status quo and direction of concrete measures

In the United States, the National Research and Education Network (NREN) program is being promoted through mutual cooperation among federal agencies as a plan for the improvement of computer networks in the areas of research and education, based on the High Performance Computing (HPC) Act. The necessity of improving networks and developing related technology in the areas of research and educa-

tion, as well as the development and dissemination of applications, is also stated in the NII initiative. In this way, efforts are being made to open up new opportunities for education and study beyond the traditional framework of teaching in classrooms and to realize active study.

① Realization of active education and study

<The status quo>
In order to accomplish advanced intellectual activities and expressions by students, efforts should be made to develop and supply high-quality educational computer software and to foster the information processing capabilities of teachers. In Japan, full-scale education in the information field has recently been inaugurated through the introduction of new courses of study announced in 1989.

a. The intensive introduction of computers in primary schools and junior and senior high schools has been carried out in accordance with a 5-year plan from 1990 established by the Ministries of Education and the Ministry of Home Affairs. At present, while the number of students per computer averages 19.2 in the United States (as of the end of 1991, according to a survey conducted by Dun & Bradstreet), the equivalent figure in Japan is 38.6 (as of the end of 1992, according to a survey conducted by the Ministry of Education).

b. While the volume of educational software existing in the United States to-tals 15,000 titles, Japan has a dramatically lower volume of 2,500 titles (according to a survey conducted by the Center for Educational Computing), and the advanced functions of computers are underutilized.

c. Although efforts have been made to improve the information processing capabilities of teachers through teacher training activities carried out by the Ministry of Education, etc., the ratio of teachers who can provide instruction on computers is still only 11.3% at present, and especially in primary schools this figure drops to 5.9% (as of the end of 1992, according to a survey conducted by the Ministry of Education).

As described above, Japan lags behind in the preparation of an environment suitable for carrying out education using computers, and the fruits of information technology development are not being sufficiently utilized in the education field.

<Concrete measures for FY1994>

The Ministry of International Trade and Industry will set up the "Educational Software Development and Utilization Center" in the Information-Technology Promotion Agency (IPA), and will take the following measures in order to develop and provide high-quality software needed for the purpose of realizing active education and study.

(a) Development and supply of software to support intellectual activities

At the center, such advanced computer software as following will be developed and compiled into data bases so that software developers, teachers and students may extensively retrieve and take maximum advantage of such resources.
- Advanced computer software to allow interactive study
- Computer software with user interfaces that can be easily used in educational facilities
- Computer software which enables more advanced intellectual activities through so-called groupware, supporting collaborative study and decision-making and various types of simulation
- Computer software to handle and analyze diverse types of information

(b) Development of software for presentations using computers

Computer software (authoring tools) permitting editing and manipulation of video images, photos, word-processed data, and graphics will be developed for a wide range of users, from beginners to advanced users. Authoring booths will be set up and made widely available where a variety of materials including those stored in the center can be edited and manipulated, allowing desired teaching materials and data to be freely prepared by taking maximum advantage of the software resources.

The Ministry of International Trade and Industry in its turn will actively cooperate in the following measures taken by the Ministries of Education and Home Affairs.

(a) Promotion of allocation of educa-

tional computers based on new plan
The Ministries of Education and Home Affairs will carry out the systematic introduction of computers by rental or leasing arrangements, with the aim of allocating 22 computers per primary school, 42 computers per junior high school, 8 computers per school of special education, and 42 computers per senior high school offering general courses, over a period of roughly six years up to 1999.
The Ministry of International Trade and Industry will cooperate in promoting the allocation of these computers through the low-interest loan system of the Japan Development Bank to educational computer rental businesses.

(b) System to assign information technology engineers to prefectural boards of education

The Ministries of Education and Home Affairs will implement a system in 1994 to assign information technology engineers as temporary lecturers for the training of teachers to prefectural boards of education, as a means of promoting information-related education. The Ministry of International Trade and Industry will cooperate in the smooth execution of this system by providing information concerning information technology engineers to prefectural boards of education through the Center for Educational Computing.

② Realization of education and study transcending restrictions imposed by conventional classroom teaching

<The status quo>
In the United states, an educational

program called K-12 (kindergarten through 12th grade) utilizing computers and networks, intended for children attending kindergarten through primary school, junior high school, and senior high school, is being developed across the country. For example, activities under The Boulder Valley Internet Project have been implemented since 1993 for an initial period of three years by the University of Colorado in cooperation with schools in the Boulder Valley district. In this project, new educational methods taking maximum advantage of Internet are being studied and educational curricula are being created accordingly.

In addition, various other initiatives and experimental projects are being carried out. Such projects include real-time information exchanges between the Nile Expedition and schools; supply of data about historic books stored in museums through Internet; access to information such as real-time pictures of the ocean depths taken by remote-control submarine, organized by the Montley Aquarium; and videos of lectures provided via network by the California State Institute of Technology, which can be watched at home (Virtual University).

In Japan on the other hand, although the introduction of computers in schools has been steadily promoted according to the computer allocation plan of the Ministry of Education, connections outside schools utilizing the computer network have only been executed for experimental purposes in a very limited number of schools.

<Concrete measures for FY1994>

The Ministry of International Trade and Industry, in cooperation with the Ministry of Education, will carry out the following model operations in the "Educational Software Development and Utilization Center" to demonstrate the feasibility of realizing new educational and study methods as a result of the progress of information technology.

a. Creation of model environment for education and study using computer networks
A technical environment which enables education, study and interchanges taking maximum advantage of networks will be provided in roughly 100 educational institutions such as primary schools and junior and senior high schools. This will involve the installation of workstations and personal computers in these institutions which will be linked with the center via a network, allowing access to the data bases of the center and the reciprocal circulation of information between schools mutually connected via the network. Furthermore, these institutions will be able to gain access to and dispatch information throughout the world.
The ministry will also support plans independently made by individual schools using such a network.

b. Development and supply of necessary software for computers for educational use
Software with user interfaces that allow easy searching and retrieval as well as dispatch of information through international networks will be developed.

In addition, the center will compile materials which can be used in the production of teaching materials and other data into data bases, and will make these data bases widely available.

[2] Research

(1) Outlook

The following new developments in research will be targeted in an environment where the promotion of information systems in the research area has progressed in the future, through the establishment of centers with strong computing capabilities, enhancement of distributed processing capacity in which these centers tackle problems in cooperation with each other, and the construction of high-speed networks which allow a wide range of researchers to gain access to the centers.

① Upgrading of research through ultra-high-performance computers

Accompanying the progress of computer technology, methods of conducting research have evolved from activities centering around tests by trial and error to activities consisting of modeling and simulation on computers.

It is well known that the method of measuring the impact of air resistance on aircraft and automobiles in motion has changed from the traditional types of tests, involving placing clay models inside a wind tunnel, to computerized modeling and simulation. Massively parallel computers and other leading-edge technologies appearing today will break through the limits of computing performance which traditional computers have been subject to, and will allow activities that have been impossible up to now using traditional research techniques. These will include predicting the physical properties of compounds by simulating their behavior on an atomic or molecular level, designing the optimum conditions for nuclear fusion, and elucidating the causes of diseases through analyses of various types of genetic code.

② Enhancing the efficiency of research by sharing intellectual stock

The improvement of data bases containing the results of research activities, including test results and information on chemical properties, gene, etc., and the upgrading of retrieval methods, will allow researchers to share intellectual stock and greatly improve the efficiency of research.

At the same time, data from large-scale tests such as data sent from earth observation satellites will be widely accessible to researchers via high-speed networks. This will expand the possibility of new discoveries, compared to the present situation in which analyses are performed by only a limited number of researchers. It is also expected to become feasible for researchers in remote locations to gain access to large-scale facilities for researching space and nuclear physics, particle accelerators, and so on, allowing them to conduct remote tests and make analyses of the results at pultra-high-performance computer bases.

③ Acceleration of progress of computer technology

Researchers are sophisticated computer users who employ this technology freely in the most advanced manner. For a number of years now, mainly American researchers have indicated directions for the development of computer technology and promoted its progress as pioneering users of computers. In Japan as well, it is hoped that the promotion of information systems in the field of research will accelerate the development of computer network technology, and that the upgrading of information systems will be achieved throughout the country.

(2) The status quo and direction of concrete measures

In the United States, the introduction of information systems in research has been promoted under the High Performance Computing & Communication (HPCC) plan, which is being implemented with the mutual cooperation of many agencies and state organizations including the Departments of Defense, Energy, and Commerce; the Environmental Protection Agency (EPA); the National Science Foundation (NSF); the National Aeronautics and Space Administration (NASA); and the National Institutes of Health (NIH). This plan is advancing the development and utilization of ultra-high-performance computers, the promotion of technical development activities related to networks, and the improvement of infrastructures for gaining access to these networks.

① Research and introduction of ultra-high-performance computers

<The status quo>
In the United States, the establishment of supercomputer centers has been promoted for some time now with the financial cooperation of NSF. Furthermore, under the HPCC plan, research on the most advanced ultra-high-performance computers has been promoted by the Department of Defense, NSF, etc., resulting in the introduction of ultra-high-performance models including massively parallel computers at the Departments of Defense and Energy, EPA, NASA, NIH, and so on. These computers are intended to be used for research of basic software and simulation, etc. in research fields as molecular biology, energy, aviation and space, environmental issues, and so on. In the United States, research activities taking maximum advantage of computer simulations, etc. are already established in the field of computational science.

In Japan on the other hand, as pointed out in the previous report of the Industrial Structure Council, the number of organizations in which supercomputers had been introduced was very limited at that time; for example, only eight universities (10 machines) among the country's 98 national universities. Thus, it has been fairly difficult to challenge innovative scientific technologies by freely using advanced software.

Ultra-high-performance computers will be the key to new research and development in the future. With the ap-

pearance of various types of such computers, including the vector type, the massively parallel type, and the cluster type in which multiple computers are linked, it is necessary to systematically create an environment where they can be utilized without restriction.

It is also necessary to actively develop advanced software so as to enable such computers to be freely used. For this purpose, ultra-high-performance computers such as supercomputers should be allocated to as many research institutes as possible in a large number of ministries and agencies.

<Concrete measures for FY1994>

a. Appropriations were approved in the supplementary budget for fiscal 1993 for the introduction of 11 supercomputers, of which three cases concerned the Ministry of International Trade and Industry (one supercomputer allocated to the Research Information Processing System (RIPS) Center of the Agency of Industrial Science and Technology, and two allocated to the Angstrom Technology Partnership). Moreover, in six of the 11 cases, massively parallel computers, a new type of computer permitting easy future expansion of computing capacity, will be introduced for the first time in national organizations.

b. In 1994, 10 supercomputers are scheduled to be introduced in eight national organizations. At that time, such machines will have already been introduced in 14 national universities, and 18 machines in organizations for the joint use of universities.

c. In addition, the development of ultra-high-performance computers and software for the future is planned under the Real World Computing Program being undertaken by the Ministry of International Trade and Industry.

② Networks for research

<The status quo>
With regard to research information networks in the United States, NSF net (currently NREN) and Internet have shown remarkable growth and the United States is far more advanced than Japan in terms of the speed of trunk networks and management structure. At the same time, a study of gigabit-class networks required for remote tests and access to ultra-high-performance computer centers is under way at five centers: AUROLA, BLANCA, CASA, NECTAR and VISTANET. In these centers, research and development is being conducted on access to supercomputers, protocols for ultra-high-speed networks, switching technologies including ATM, interconnection with local area networks, advanced image processing, simulation software, and so on.

Japan lags far behind in the area of networks for research, even in the construction of megabit-class networks. At the time when the previous report was issued by the Industrial Structure Council, closed networks between research institutes, vertically divided according to individual ministries, were being operated separately. Moreover, the speed of telecommunications lines was extremely slow, ranging from sev-

eral tenths to several hundredths the speeds available in the United States. And with regard to LANs in research institutes, basic networks had been set up in only five of the country's 98 national universities.

Furthermore, almost no studies had been conducted on ultra-high-speed networks of the gigabit class.

In order that papers and research data can be circulated freely to increase the efficiency of research, institutional measures should be taken to allow free access to state-owned data bases and at the same time, the construction of data bases and improvement of data base search and retrieval software such as MOSAIC (University of Illinois) and GOPHER (University of Minnesota) should be promoted.

<Concrete measures for FY1994>

a. A research information network discussion group has been inaugurated under the auspices of the Scientific Technology Conference Policy Planning Committee and cooperation has been realized regarding the networks of research-related agencies, mainly centering around the Science and Technology Agency, with participation also by the Ministry of International Trade and Industry. Based on a proposal of this discussion group, an appropriation request has been included in the national budget bill for fiscal 1994 to promote an "Inter-Ministerial Research Information Network," which will connect research institutes beyond the boundaries of research domains, min-

istries and agencies, and even countries.

With the realization of a trunk line having a maximum transmission speed of 6 Mbps in this "Inter-Ministerial Research Information Network", as well as a trunk line of the same speed in the "Science Information Network" to be financed in the 1994 budget, circuits of a speed roughly one digit higher than in the past will be established for research networks.

b. Regarding LANs in research institutes, as of the beginning of 1993 there were five universities in Japan equipped with LANs. Upon the completion of improvements financed by the supplementary budget for fiscal 1993 and the national budget bill for 1994, LANs will have been set up in 97 national universities and 10 organizations for the joint use of universities. This will cover all national universities except one and all organizations for the joint use of universities except four, which are planning to relocate their facilities. In other research institutes, progress has been made in improving LANs funded by appropriations in the supplementary budget for fiscal 1993, including a gigabit-class LAN linking research institutes in the Tsukuba Science City area under the jurisdiction of the Ministry of International Trade and Industry's Agency of Industrial Science and Technology, and a LAN linking research institutes under the jurisdiction of the Science and Technology Agency.

c. For research in fields where gigabit-class networks and computer technol-

	Principal Research Participants and Collaborating Telecommunications Carriers	Network Technologies	Application Technologies
A U R O R A	MIT BELLCORE BELL ATLANTIC MCI IBM	Network architecture ATM technology, Packet technology High-speed protocols	Multimedia information Distributed processing technology Remote conferencing

B L A N C A	U. Illinois
	U. Wisconsin
	U. California at
	  Berkeley
	ATT
	BELL ATLANTIC
	PACIFIC BELL
	NCSA
	Cray
		Asynchronous combined
		  control
		
		B-ISDN architecture
		
		Realization of high
		  throughput with multiple
		  switches
			Remote visualization
			 technology
			Remote simulation
			Radio astronomy imaging
			Multimedia digital libraries
			Medical image processing

C A S A	UCLA
	CALTECH
	PACIFIC BELL
	MCI
	UC WEST
	San Diego Super-
	  computer Center
	Los Alamos National
	  Laboratory
		HIPPI
		SONET criteria
		HIPPI/SONET interface
		Local connection with
		  high-speed protocols
			Chemical reaction dynamics
			Diastrophic analysis based
			 on data from satellites
			Integration of atmospheric
			 and ocean models
			Software environment for
			 using different parallel
			 computers

N E C T A R	Carnegie-Mellon U. BELLCORE BELL ATLANTIC Pittsburgh Super- computer Center	Large-scale crossbar switches Processors for network use	Control, design, and operation of chemical plants Large-scale optimization issues
V I S T A N E T	U. North Carolina North Carolina State U. BELL SOUTH Microelectronics Center	SONET HIPPI ATM technology	Three-dimensional image processing of medical information on cancer, etc.

Table 5. Gigabit testbeds in the United States

ogy such as supercomputers are organically connected, the Ultra-highspeed Network and Computer Technology Laboratories has been established with investments by the Japan Key Technology Center and the private sector, and has recently begun research activities.

[3] Medical and welfare services

(1) Computerization of medical services

① Outlook

The computerization of medical services plays a highly important role in providing people with high-grade medical treatment corresponding to changes in the medical care environment, represented by people's increasing medical needs and the aging of the population. The services and systems described below have already reached a technically feasible level and may be realized shortly. For the future, the development of new applications is expected in which mass super-fine medical images will be transmitted and treatments will be provided based on three-dimensional analyses of medical data by doctors in cooperation with technicians stationed at computer centers, accompanying the progress of high-speed bulk transmission technology.

a. Mutual exchange of medical information via networks
Technically, the mutual exchange of medical information such as image information on patients' examination data, computerized axial tomography has been made possible between medical institutions through the current communication infrastructure. As a result, people throughout the country will have universal access to high-level treatment in local hospitals or at their home through the cooperation between local doctors and medical specialists in advanced urban hospitals with a system which enables the expertise of such specialists to be effectively utilized.

In addition, the realization of advanced medical services is expected in which information and medical images related to individual case and histories are integrally stocked and managed historically, making full use of various media including IC cards, optical cards, and magneto-optical disks. In such a situation, the appropriate therapies can also be provided in different hospitals using these media. (Field tests using magneto-optical disks have been conducted at the National Cancer Center.)

b. Remote health care at home
It is becoming possible for basic health data on individuals, including their body temperature and pulse rate, to be automatically transmitted to hospitals via a network so that doctors can be aware of their patients' health conditions and can provide remote health counseling as required without the need for patients to visit hospital. (At Seitetsu Kinen Hospital in Kamaishi City, individual health data are transmitted to the hospital and doctors make examinations utilizing the CATV network). The dissemination of these systems will further activate the progress

of preventive medical treatment.

c. Improvements in therapy support systems

More advanced medical services will materialize with the improvement of advanced medical databases and the development and dissemination of systems, including expert systems, that support doctors' diagnoses.

As the importance of controlling information on pharmaceuticals will increase in the future, databases to prevent side effects and reciprocal actions of medicines are expected to be constructed and used by dispensing pharmacies in various areas.

② The status quo and direction of concrete measures

a. Mutual exchange of medical information via networks

<The status quo>
In the United States, a system is being established in which, by transmitting charts and X-ray images between hospitals, local doctors can consult medical specialists and provide medical treatment making use of the latest expertise and technology.

In addition, there are cases where for the prescription of drugs, an examination can be made concerning those medicines combined use of which is prohibited, etc. using a database on the side effects of medicines.

In Japan, however, the transmission of medical information is only conducted for experimental purposes in some ar-

eas, and measures should therefore be taken to disseminate this practice. The current Medical service law and other regulations interpret that medical image information, including computerized axial tomography, should basically be preserved in its original form. Provided that appropriate security can be maintained, however, the storage of such information by means of electronic media is permitted and systematic improvements for the exchange of medical information are under way. In the future, it will be necessary to execute model operations, to ensure compatibility and the standardization of transmission methods so as to allow the exchange of information between different information systems.

<Concrete measures for FY1994>

(a) Model operations in which medical image information is exchanged using high-definition satellite communications, etc. have been undertaken in cooperation with the Ministry of Health and Welfare since 1993. (In 1993, such operations were implemented at the Aomori Prefectural Chuo Hospital, the Aomori Prefecture Kokuho Ohma Hospital, and the Mutsu City Polyclinic.)

(b) Model operations in which medical image information is exchanged between hospitals using exclusive line will be undertaken in cooperation with the Ministry of Health and Welfare from 1994.

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b. Remote health care at home

<The status quo>

In the United States, it is already possible to receive medical treatment and health counseling at home by means of interactive TV, etc. A system has been established in which health care data are automatically sent from households to hospitals on a periodic basis, and advice is automatically provided when the condition of a disease may possibly be deteriorating.

In Japan, there are some examples of experiments on telemedicine having been conducted in some areas, but no measures have been taken to verify the reliability of such systems nor to disseminate them. Hence, measures should be taken in the future to diffuse such systems after confirming their reliability, etc.

c. Improvements in therapy support systems

<The status quo>
In the United States, advanced medical databases have been prepared and therapy support systems have also been constructed, in which possible diseases can be indicated in the order of probability by inputting information on patient's medical conditions. It is expected that these systems will be used as clinical and medical education system in the future.

In Japan, no such system has been realized yet on a practical level. As a result, it is necessary to tackle various issues so as to develop these systems, including improving medical databases, conducting verification tests of such systems, and introducing them at medi-

cal treatment sites. Meanwhile, improvements have been gradually made to databases for pharmaceuticals, and efforts should be made to further upgrade their contents and to provide them to medical treatment sites.

<Concrete measures for FY1994>

Databases both for those medicines combined use of which is prohibited and for general drugs will be improved in cooperation with the Ministry of Health and Welfare, and to construct a system that can provide widely to medical treatment field through personal computer network hosted by the Medical Information System Development Center from 1994.

(2) **Computerization of welfare services**

① Outlook

It is considered that in the future, it will become increasingly important to create environments in which both aged people in sound health as well as physically handicapped people can actively participate in society and lead a vital life, and also to establish a structure where those aged and physically handicapped people who are found to require nursing may be given satisfactory nursing at home. In particular, with a predicted decline in home nursing capacity owing to such factors as a decrease in population of productive age, an expansion of small families, and an increase in the number of working women, mitigating the burden of nursing will be a serious issue. As described

below, it is expected that information processing technology will be used in response to these issues.

a. Telecommuting welfare services using networks
As a result of the improvement of networks to be established between various types of local welfare facilities and households, it will become possible to catch the psychological and physical condition of the aged by carrying on frequent dialogues with them taking advantage of interactive communications including video, without the need for a specialist to visit their home. Thus, carefully prepared telecommuting welfare services, not limited to physical nursing, will be realized.

b. Safe and comfortable residences for the aged
The dissemination of residences with built-in advanced nursing equipment will enable those who need nursing to live a life in which they receive the least nursing possible, and will greatly mitigate the burden on those who are responsible for nursing. In addition, emergency reporting systems providing automatic communications in an emergency will be diffused to assure the safety of aged people receiving telecommuting nursing.

c. Helping the aged to actively participate in society
Even aged people who have difficulty in going out will be able to join various community activities and hobby circles through personal computer networks that is easy for the aged to use. In this way, it will become possible for many aged people to actively participate in society and to live a meaningful life.

② The status quo and direction of concrete measures

<The status quo>
In Japan, only limited efforts to promote computerization of welfare services are done and no advanced nursing system has yet been realized on a practical level. Moreover, the issue of helping aged and physically handicapped people to participate in society using information systems is only being tackled for experimental purposes by some self-governing bodies.

It is considered necessary in the future to implement research and development as well as model operations so as realize an advanced system on a practical level, and also to make efforts to disseminate these systems.

<Concrete measures for FY1994>

a. Helping the aged to participate in society
A "Mellow Society Plan" has been promoted to make the most of information systems, from the viewpoint of aiming at the active participation of aged people in society and the utilization of their accumulated experience and knowledge. In concrete terms, the following activities are being conducted:
 - Surveys and research on information apparatus which may be easily operated even by aged people who are unfamiliar with such equipment.
 - Surveys and research aimed at establishing model information sys-

tems in local communities, including such systems to help the aged participate in local communities through serving as volunteers and handing down traditional culture to young people.
- Operation of a personal computer network named "Mellow Net" designed for the aged.
- Dissemination and education by means of sponsoring symposiums and awarding commendations to enterprises for the development of information apparatus designed for the aged.

b. Research and development of advanced telecommuting nursing equipment system

In aiming at the improvement of telecommuting nursing, it is important not only to conform to regional characteristics and meet users' needs appropriately, but also to implement research and development of an advanced and comprehensive telecommuting nursing equipment system, taking the reciprocal interface of nursing equipment to be used into consideration. For this purpose, under the 3rd supplementary budget for 1993 FY, improvements will be realized for the "Welfare technohouse," comprising research facilities where the study of a comprehensive system will be promoted.

[4] Administrative services

(1) Outlook

Computerization of the administrative area covers not only high-volume and fixed-form processing type jobs, but also a wide range of administrative office work and service areas. In the future, a situation as described below will evolve whereby the upgrading of administrative office work and services, not limited to merely increasing the efficiency of administrative work, will become possible in various administrative areas by using advanced information processing technology.

① Access to public administrative information

Vast amounts of public information released by the government, including various white papers, statistics, reports, and public relations data, will be compiled into databases in a manner that facilitates easy retrieval. People will be able to gain easy access to public administrative information via networks without restrictions of time or place.

② Efficient and advanced administration

In administrative agencies, not only the automation of administrative office work but also various other improvements will be realized, including the upgrading and expansion of databases, upgrading of business support systems including expert systems and groupware, and further upgrading of individual information systems which process high-volume routine work such as licenses. In addition, the integrated use of these systems via networks will make possible the development of an efficient and advanced administration system.

③ Paperless and automated administrative services

Applications for various types of approvals, licenses, and benefits will be made electronically, thus reducing the burden of work and reducing the time involved in the processing of various types of applications. Terminals that automatically accept such electronic administrative procedures will be installed in public facilities, railway stations, shopping districts, etc. and application procedures will be simplified under a one-stop service system, while people will be able to access these services via networks from his/her home. In this way, an environment in which people can receive administrative services whenever and wherever they want will be realized.

(2) The status quo and direction of concrete measures

As described below, Japan lags greatly behind in promoting the computerization of administrative services. For this reason, the government has decided to establish a 5-year "plan to promote administrative computerization" (tentative) in the 1994 basic principles of administrative reform, with the aim of systematically undertaking the computerization of administrative services in the medium term. Drafting work is now under way, implemented mainly by the Management and Coordination Agency.

The Ministry of International Trade and Industry is scheduled to take concrete measures as described below, with the expectation that these measures will contribute to the promotion of computerization of administrative services in the entire government under "the 5-year plan".

① Access to public administrative information

<The status quo>
In the United States, public administrative information possessed by the federal government is promptly and widely made available through such networks as Internet. For example, a press release from the White House can be obtained throughout the world on the same day via Internet, and the proceedings of Congressional public hearings compiled into databases are also available via networks.

Furthermore, the Government Printing Office, which is responsible for printing data for official publication by administrative agencies, is obligated by law to provide these data electronically.

With regard to government databases, such large-scale databases as those of NASA and the National Library of Medicine (NLM), which have been established since the 1960s, have been opened to the public, while more than 2,500 databases have been prepared by the National Technology Information Service of the Department of Commerce, providing scientific and technological information on a widespread scale to the public. In such a manner, considerable progress has been made in opening administrative information databases to the public.

In Japan, although there are some cases in which certain governmental agencies furnish public relations data, etc. via personal computer communications, only a limited portion of the vast volume of administrative information released to the public is obtainable through various types of network. Moreover, the preparation of databases by administrative agencies is not sufficient and at the present time, only a little administrative information databases being provided to networks.

(Reference) Comparison between Japan and United States of public availability of administrative information by electronic means

	United States	Japan
Number of databases possessed by government	7,782	307
Number of such databases which may be furnished to the private sector	n.a. (note)	96

(Source) Survey conducted by U.S. General Accounting Office (1987);
Survey conducted by Management and Coordination Agency of Japan (1991)
(Note) No survey has been conducted on the total number of databases possessed by the government that are available to the public in the United States. However, almost all the databases possessed by the government are provided to the private sector, and about 20% of databases in the private sector are derived from governmental databases possessed by the government. (Survey conducted by Technical Survey Agency, 1989)

<Concrete measures for FY1994>

The Ministry of International Trade and Industry, in cooperation with related ministries and agencies, will establish a "New Industry Creation database Center" within the Information-Technology Promotion Agency (IPA) and will promote the compilation of administrative information into databases and their supply to the public.

a. Improvement of administrative information databases

(a) Improvement of governmental statistics databases
Wide-ranging use of governmental statistics in the private sector will be aimed at by compiling statistics that are classified and provided at present in units of city, town and village into databases with more detailed classifications (on a "chome" (city block or section) and "aza" (village section) basis), and making them available.
(Statistics covered)
 - Statistics possessed by the Ministry of International Trade and Industry statistics, etc.)
 - Statistics possessed by other ministries and agencies that will cooperate with MITI.

(b) Improvement of governmental bibliographic databases, etc.

- Bibliographic information released by the government to the public will be extensively compiled into databases in cooperation with related ministries and agencies.

(Literature covered)
- White papers
- Governmental publications
- Reports of major councils
- Japan Industrial Standards

- A structure for the compilation of white papers and other governmental publications to be issued in the future into databases will be built in cooperation with related ministries and agencies, by developing a system to convert electronic data for printing purposes into that for public relation purposes.

- When compiling white papers, etc. into databases, priority will be given to the use of the SGML method, which is considered to be the data system that will become a future international standard for describing the structure of documents.

b. Supply via networks

Databases that have been built will be extensively furnished to the public through commercial value-added networks (VANs), public networks, Internet, etc.

② Efficient and advanced administration

<The status quo>
Strong efforts have been made in the United States toward the computeriza-

tion of administrative services, as seen in the passage of legislation mandating the reduction of paperwork through introduction of the administrative document processing system, the active introduction of computers into government operations, and targeted improvements in budgets and personnel levels in information-related areas. Japan, however, can be said to have lagged considerably behind in efforts toward computerization aimed at materializing efficient and advanced administration.

<Concrete measures for FY1994>

a. Efforts to improve local area networks (LANs) and respective ADP systems in each ministry and agency, including the Ministry of International Trade and Industry, showed great progress with the 1993 supplementary budgets.

b. It will be necessary in the future to build a structure in which each member of government staff has a computer connected to a LAN, the respective LANs in each ministry and agency are mutually linked, and integrated usage of information is realized among government organizations. For this purpose, the Ministry of International Trade and Industry will, under the plan to promote administrative computerization, introduce the information system which may serve as a model for other ministries and agencies, and will move forward to the computerization of administrative services.

③ Paperless and automated adminis-

trative services

<The status quo>
In the United States, the system has been introduced on practical level in Hawaii and California, through which residents can directly obtain various types of information concerning local administrative services from terminals so called electronic kiosks, installed in shopping malls, etc. In addition, the system which allows residents to apply for child allowances via terminals installed inside government buildings is in actual operation.

In the meanwhile, it has also been proposed at the federal government level that social security, unemployment insurance, food stamps, etc. should be made available electronically via the National Information Infrastructure (NII).

In Japan, at the level of local self-governing bodies, an increase has been seen in the number of such bodies that have set up machines for automatically issuing residency certificates and certificates of personal seal impressions. These machines are installed not only inside local government buildings but also in public buildings such as libraries. In this way, measures have gradually been taken for the upgrading and automation of administrative services. With regard to the realization of paperless administrative services, advanced cases include the paperless application system to the Japan Patent Office and a similar system for import procedures.

<Concrete measures for FY1994>

The Ministry of International Trade and Industry has prepared advanced systems including the paperless patent application system, and by improving these systems will further build a structure which may serve as a model of computerization for other ministry and agency.

[5] Libraries (Electronic libraries)

(1) Outlook

Although a vast and diverse range of intellectual resources exist in the world, people have not been able to easily access them as common resources of mankind because such resources have traditionally been collected and stored in libraries in various locations in the form of books, etc.

However, with the construction of electronic libraries having the functions described below, thanks to the recent progress in information processing technology and network technology, it is now technically feasible to create an environment in which all of the intellectual resources distributed around the world may be used as a base of knowledge for individual use.

① Access to libraries around the world via networks

Information (literature, picture, video, sound recordings, etc.) will be electronically stored, and users will be permitted to gain access from their home or

school, etc. to such information stored in libraries throughout the world.

② Advanced retrieval functions

Users will be able to obtain information easily by means of advanced retrieval techniques, which allow retrieval even with ambiguous instructions or when it is unknown in which library the required literature, etc. is located.

③ Storage of wide range of personal creative works and their supply to the public

Works created by individuals, which it has not been possible to publish so far due to financial or other reasons, will be able to be stored and supplied to the public.

(2) The status quo and direction of concrete measures

① Construction of library networks

<The status quo>
In order to retrieve literature, etc. via network in an electronic library, first it is necessary for information on the bibliography and location of each library's bibliotheca to already be in circulation. In the United States, networks such as OCLC (Online Computer Library Center), RLG (Research Libraries Group) and WLN (Western Library Network) have been constructed. Almost all of the country's public and university libraries are connected through these networks, allowing the retrieval of information on the bibliog-

raphy and location of each library's bibliotheca. In Japan, more than 300 libraries, mainly belonging to universities, are connected to the National Center for Science Information Systems with the aim of building an integrated national list of scientific literature and making inter-library loans more efficient, and information on bibliographies and locations is in circulation. But with regard to networks linking public libraries in various locations, however, no national network has yet been constructed although local networks have been built in some areas.

The primary causes for this situation include delays in introducing computers to libraries and the fact that no integration of bibliographic information prepared by individual libraries has been realized, so that as a result, no base for the circulation of information on bibliographies and locations has been established yet. (In the United States, US MARC is universally used, while in Japan, there are JAPAN MARC, private MARC, etc. so bibliographic information databases have been constructed by respective libraries in a manner not permitting common reciprocal use.)

<Concrete measures for FY1994--Promotion of integrated bibliography networking>

The Ministry of International Trade and Industry will carry out "pilot electronic library system operations" within the Information-Technology Promotion Agency, Japan (IPA) in cooperation with the National Diet Library, the

Ministry of Education, Science and Culture, the Ministry of Home Affairs, and the Science and Technology Agency, in consideration of the National Diet Library's plan to construct full-scale electronic libraries in the early 21st century and on the premise of the electronic library functions mentioned above.

As a part of this project, the following operations will be undertaken to circulate information on bibliographies.

- Operations will be undertaken to allow circulation of information on bibliographies and locations as the first step toward building a system in which libraries across the country will be connected via network, thus making on-line access possible.
- Determination of a common format for information on the bibliography and location of public libraries on a national level.
- By compiling information on bibliographies and locations into a database based on this format and connecting libraries with each other, a pilot operation will be undertaken to create an environment where data can be integrally retrieved regarding in which library desired information can be found.
  (Participating and cooperating libraries)

More than 20 libraries including the National Diet Library, the Chiba Prefectural Seibu Library, the Tokyo Municipal Central Library, the Kanagawa Prefectural Library, the Aichi Prefectural Library in the Aichi Art and Cultural Center, etc.

② Construction of electronic library system

<The status quo>
For the purpose of realizing an electronic library, it is essential not only to achieve networking of libraries but also to upgrade storage and retrieval functions by means of technological development and field tests concerning the storage and retrieval of literature, etc.

At present in the United States, as an experiment for actualizing an electronic library, the University of California is conducting tests at its nine campuses (Berkeley, UCLA, UCSF, etc.) to circulate the contents of electronically stored literature via network. In addition, a study of retrieval techniques is under way in the CORE project, which is mainly being conducted by Cornell University, and the Mercury project of Carnegie-Mellon University.

In Japan, trial research and development of an electronic library, including the construction of databases, is under way at the National Center for Science Information Systems. In addition, the National Diet Library and other institutions are promoting a basic survey and research on the functions of electronic libraries. Further such studies will be required in an attempt to build an electric library system.

<Concrete measures for FY1994--Construction of pilot electronic library system>

As a part of the "pilot electronic library system operations," a pilot electronic library system which may serve as a model for a future electronic library will be built and the following operations will be undertaken.

a. Pilot operations for electronic storage of literature, etc. and access via network

Pilot operations to compile literature, etc. into databases after rendering them into electronic form and then to supply them both domestically and overseas will be realized to identify and solve demand-related and technical problems.

(Literature to be rendered into electronic form)

Literature, etc. possessed by the National Diet Library (books published in the Meiji era (1867-1912), materials on constitutional issues, rare classical books), magazines for which consent of the appropriate persons including publishing companies can be obtained, out-of-print books, etc.

b. Actual proof of use, retrieval and supply of data of electronic libraries

Research on user interfaces and field tests on conducting easy and effective retrieval and perusal using existing technologies will be carried out, and advanced technical development which allows more advanced retrieval and document processing will also be implemented as follows:

- Advanced retrieval technology
  Semantic retrieval (technology to analyze the meaning of retrieved words and retrieve literature containing synonyms and similar words)

Fuzzy retrieval (technology to retrieve the desired literature corresponding to fuzzy expressions input by the retriever)
- Document processing technology
  Automatic indexation (technology to automatically prepare an index from chapters and sections in literature)
- Display technology
  High-speed browsing technology (technology to allow high-speed turning of the pages of books indicated on the display)

3. Improvement of Environment for Realizing Advanced Information Society

[1] Security measures

In an advanced information society, malfunctions occurring in an information system including a computer system breakdown would have a social impact incomparably more serious than at present. For this reason, in order to realize such an advanced information society, both the government and the private sector are required to positively tackle security measures and to ensure the security and reliability of information systems. Particularly in an advanced information society, numerous computers are linked to networks. As a result, it is important to take measures against network-related invasions including attacks by hackers and computer viruses. Reflecting concerns that such damage may expand on an international scale through networks, OECD has already formulated information system security guidelines. It is neces-

sary to continue to promote security measures through international cooperation.

(1) Implementation of measures to improve the security and reliability of information systems

<Concrete measures for FY1994>

① So far, efforts have been made to improve the security of information systems by determining security measure standards for computer systems which can serve as a guideline for security measures taken by users of information systems, as well as by authorizing offices for providing security measures to operators of information processing services, and by diffusing system audits through the determination of system audit standards.

② It will also be necessary from now on to strive for the dissemination and promulgation of such security measure standards more extensively, in response to the further expansion of social strata using information systems.

(2) Implementation of computer virus countermeasures

<Concrete measures for FY1994>

① The Ministry of International Trade and Industry has taken the following computer virus countermeasures:

a. Determination and dissemination of computer virus countermeasures
The Ministry has worked hard to formulate and disseminate respective guidelines for information system users, system administrators, and software development administrators on what measures they can take both to prevent computer viruses and to deal with infection by a computer virus.

b. Computer virus damage report system
Efforts have been made to prevent the expansion of damage caused by computer viruses whereby the Information-Technology Promotion Agency (IPA), on receiving a report of such damage, identifies the damage and provides information to assist in recovering from the damage and preventing a recurrence.

c. Research and development
IPA has been continuing research and development of a system to detect the invasion of computer viruses and prevent infection, no matter what the type of virus, and of vaccine software to identify and remove computer viruses as well as to analyze their composition.

d. International cooperation
As a member of the European Institute for Computer Anti-virus Research (EICAR), an international anti-computer virus body composed of European and American enterprises, universities, and state organizations, IPA has been participating in exchanges of information on new types of computer viruses, exchanges of vaccine software, and studies of computer virus countermeasures.

② In the future, these measures will be further promoted and international cooperation will be encouraged in research and development as required.

(3) Responses based on criminal legislation against hackers and input of computer viruses

① In line with the changing modes of criminal acts through the use of computers, accompanying the progress of computerized information processing, a partial revision was made to the Criminal Law Act in 1987 which added provisions specifying punishments for the following new criminal acts related to computers:
  a. Illegal creation or destruction of magnetic records
  b. Interference in the execution of duties by damaging computers, etc.
  c. Fraud carried out by means of computer

② Although a significant portion of unauthorized access to computer systems and the input of computer viruses can be controlled by the criminal legislation described above, some categories of acts still exist to which such legislation may not be applicable. Regarding these acts, it is indispensable to conduct numerous detailed studies from various angles including what types of deterrent measures can be counted on, such as security measures other than punishment; from what perspective grounds for criminal punishment should be identified; and the actual circumstances of illegality in establishing criminal legislation.

[2] Promotion of standardization in the area of information

In order for an advanced information society to be realized, it is necessary to create an environment where information apparatus is linked to networks so that users may freely exchange and retrieve any information using them, and also where information processing is possible using linked multiple computers.

For this purpose, information apparatus should be linked to networks to enable the interchange of signals and in addition, various forms of standardization to secure the mutual operability of information systems on each level are required. These include standardization in relation to data contents such as numeric, character, image, and voice data (represented by Electric Data Interchange: EDI); standardization in relation to necessary data formats for accessing databases and exchanging data; and standardization of the interface of the operating system (OS) of computers connected for combined information processing. Internet has diffused worldwide by ensuring mutual operability of information systems on most of the necessary levels, not limiting itself to the mere exchange of signals.

When promoting standardization in the area of information, excessive govern-

mental intervention in the market may hinder technical progress attainable through competition among enterprises. However, in cases where too many specifications exist compared to the differences in functions due to competition for market share, users may suffer from disadvantages and voluntary standardization among vendors may become difficult owing to the lack of mutual operability. In such cases, the government should create a structure for standardization and provide incentives for standardizing activities.

Information technology has been developing so rapidly that Japan should also actively participate in the establishment of international standards, considering the movements of Europe and the United States which are trying to build up new standards by themselves through de facto standards.

<Concrete measures for FY1994>

In March 1993, the Ministry of International Trade and Industry made a general presentation of items requiring standardization to the Open System Environmental Improvements Commission and other interested parties, in order to promote efforts toward standardization in the private sector, and has moved forward with standardization under EDI and OSI in conjunction with the Japan Information Processing Development Center. The Ministry will newly undertake a study of detailed items requiring standardization for the realization of an advanced information society in the future and of what concrete forms of governmental

intervention are appropriate, taking recent domestic and overseas developments related to standardization into account.

[3] Review of various systems in response to the development of computerization

The progress of information and communications technologies is generating unforeseen changes, including the development of a paperless and the fact that activities traditionally conducted face-to-face may now be carried out using networks. As illustrated below, a wide variety of existing systems do not presuppose this type of situation. As a result, a review of existing systems is deemed necessary so as to adapt them to an advanced information infrastructure society, for the purpose of developing computerization in the future. (At present, a study is being conducted by the Telecommunication Working Group, Administration Reform Task Force.)

(Reference) Examples of existing systems to be studied toward advanced information infrastructure society

(1) Allowing paperless accounting records for business transactions

According to the current tax laws document in accounting evidence, such as account books must be physically preserved for seven years. However, their preservation via electronic data media, including magnetic tapes and floppy

disks, is not permitted due to the risk of data alteration and from the viewpoint of executing smooth tax inspections. On the other hand, business transactions produce a yearly volume of accounting records that must be preserved reportedly totaling 300 million sheets in the case of a major chain store, 15 million sheets for a large-scale manufacturer, and 5 million sheets even for a small or medium-sized manufacturer, thus imposing a major burden on enterprises.

Although they have different environments from Japan with respect to enforcement (the burden of proof, for example), some Western countries allow enterprises that meet specific conditions to preserve such account books via electronic data media, in order to harmonize the development of computerization while securing the reliability of records required for the taxation system. The conditions are that enterprises may be subjected to an audit of their system as well as their accounts, and that they will convert electronic data records into document form within an acceptable period when the tax authorities are to conduct an inspection, etc.

(2) Realization of paperless applications to government and public offices

Allowing applications to government and public offices to be made on-line or via electronic data media is essential not only to improve the convenience of applicants, but also to promote the computerization of administrative services.

From this point of view, the Patent Office has realized paperless patent applications and compiled patent-related information into databases since December 1990. During this time it has been making maximum use of computers in performing patent processing office work, from applications through to examinations, judgments, and registrations, as well as efficiently providing information to the private sector. At present, electronic applications account for 95% of the total patent application procedures. In other agencies, such as those dealing with customs clearance operations, Nippon Automated Cargo Clearance System called NACCS has been built by linking terminals of the customs and private operators on-line. This enables applications for import and export declarations to be made on-line, thereby speeding up customs clearance procedures. There are several other advanced examples of paperless applications, although generally speaking such applications are limited to very small areas so far.

(3) Medical treatment

Under the current laws, prescriptions required for dispensing drugs outside hospitals must bear a doctor's seal and the issuance of prescriptions on-line is not permitted. Some advanced hospitals in the United States are promoting the use of electronic charts, but in Japan, since charts are required to be preserved in their original form for technical reasons, the advantages of preparing charts electronically are not being utilized.

As the current laws are based on face-to-face treatment, diagnostic acts via communication between remote locations are not clearly positioned in the medical fee system except for medical counseling over the telephone by family doctors. Advanced medical services, in which advice from medical specialists of other hospitals may be provided through an information network, are not regarded as diagnostic acts for the purposes of the medical fee system.

(4) Sales

The Installment Sales Law stipulate the delivery of a document in which the contents of a contract are set forth. This document must be written on paper and delivery via network, including personal computer communications, is not permitted.

[4] Protection of intellectual property rights and facilitating reuse of intellectual property

To cope with the realization of multimedia and digitalization, the following matters must be dealt with in an attempt to protect intellectual property rights in a proper manner and to facilitate the reuse of intellectual property.

(1) Study of how rights related to software should be protected in response to realization of multimedia

① Facilitating use of existing works

With the progress made in realizing multimedia technology, it has become technically feasible to develop new multimedia software by processing and combining digitalized existing works including videos. This method of utilizing existing videos, etc. as materials may often be very useful for enhancing the efficiency of high-grade multimedia software development. As a consequence, it is necessary to protect the rights to existing videos, etc. properly and to facilitate their use at the same time.

In concrete terms, it is necessary to clarify the ownership of the rights to existing works which are to be used as materials, to establish rules for handling the rights to reuse works, and to set up a centralized rights management structure.

<Concrete measures for FY1994>

With regard to these issues, a policy has already been formulated whereby a concrete study will be conducted by a council to be set up within the Ministry of Education, with participation by related organizations of rightholders and producers, and the Ministry of International Trade and Industry will cooperate in the establishment and administration of this council.

② Clarification of how multimedia software rights should be protected

Since multimedia software may often be produced by combining multiple works, as stated above, while at the same time it has combined attributes of works such as computer programs,

videos, and music which are treated differently for the purposes of the Copyright Law, discussions should be held to clarify how to treat such software for the purposes of the Copyright Law.

<Concrete measures for FY1994>

A study to clarify how to protect multimedia software rights began in June 1992 in the Copyright Council of the Ministry of Education. The Ministry of International Trade and Industry will endeavor in its turn to encourage open discussions by a broad range of interested people, and to reflect these in the discussions of the Copyright Council.

(2) Prevention of illegal duplication of software

① Despite being protected under the Copyright Law, software is illegally duplicated due to the characteristic of digital property that duplication does not cause a deterioration in quality. This situation is causing problems. Illegal duplication is not only an infringement of the Copyright Law, but it also violates the rightful benefits of software developers and thus impedes their will to develop software. Therefore, the prevention of illegal duplication is an important issue in providing good-quality software.

② To prevent unlawful duplication, strict enforcement of the Copyright Law is necessary, as well as raising the awareness of all users regarding this issue, and proper management of software by enterprises and others so as to prevent illicit duplication by employees, etc.

<Concrete measures for FY1994>

From the standpoint of aiming at the sound growth of the computer software market, the Ministry of International Trade and Industry will continue dissemination and educational activities targeted at users, and at the same time will study effective measures including the formulation of guidelines on software management methods which can serve as an index when institutional users, including enterprises, themselves tackle the prevention of illicit duplication.

③ Incidentally, it is stipulated by law that auditors of stock companies, except those capitalized at less than 1 billion yen, when submitting an auditor's report according to Article 281-3 of the Commercial Law, shall make known the facts should any "unlawful act or serious contravention of the laws and ordinances or the articles of association regarding the performance of duties by directors" be found. If illegal duplication is conducted by employees in relation to a company's business, the company shall also assume criminal responsibility under the Copyright Law. As a result, the existence of such illegal duplication is considered a "serious contravention" under the said Article.

4. Improvement of Environment for Providing High-Grade Contents and Ap-

plications

In order for an advanced information society to be created, not only hardware including communications infrastructures and computers but also a variety of high-grade contents (information resources such as databases) and applications meeting the needs of various people are an important requirement. However, Japan has a problem in that up to now, contents and applications have not been adequately supplied as commodities in comparison with hardware. As a result, the preparation of an environment where contents and applications may be provided to the market to a sufficient degree is an essential future political task for realizing an advanced information society.

[1] Multimedia software

(1) Significance of multimedia software

Multimedia software possesses highly effective powers of expression, appealing to the human senses of vision and hearing through voice and video. It therefore constitutes a highly important form of support for contents and applications in an advanced information society. Since multimedia software uses both sound and image, promoting the use and supply of such software involves the following issues which are different from the case of ordinary computer software.

① Supply of advanced equipment and images serving as materials

For the creation and editing of multimedia software, studios and editing equipments with advanced functions are sometimes required and the construction of such equipments by the private sector itself is often difficult in circumstances where the market for multimedia software has not been fully established. Moreover, since images for use as materials have not been sufficiently stored yet, improvements in this area will be necessary from now on.

② Fostering of creative personnel

Multimedia software offers a multitude of expressions combining images and sound with the help of the information technology. For the creation of such software, the fostering of personnel having creative ability of expression and a certain level of image information processing skill is important.

③ Handling with respect to intellectual property rights system

As mentioned earlier, multimedia software is often produced by combining existing image, sound, and other data, while at the same time its attributes as literary works are treated differently for the purposes of the Copyright Act, including computer programs, image, sound, etc. Therefore, some new form of handling will be required in the intellectual property rights system.

④ Cultivation of image information literacy

Since multimedia software is expected to also constitute a highly useful method for members of the general population to express themselves and dispatch information, individuals will need to become familiar with methods of using the new technologies and with skills of expression through images.

From the above standpoint, the promotion of various measures including the creation of "inter-media factory cities" as the core for production and dispatch of information and "information parks" in local communities were proposed by the New Visual Industry Discussion Group (presided over by the director of the Industrial Policy Bureau of the Ministry of International Trade and Industry) in March 1994 to enhance the capacity to supply multimedia software. Taking these proposals into account, the integrated development of the following measures will be promoted. (Refer to chapter 3 section [4] regarding the matter of intellectual property rights.)

<Concrete measures for FY1994>

a. Establishment of the Multimedia Centers (Marukomachi, Nagano Prefecture)

The Multimedia Center will be established by means of investments in the Information-Technology Promotion Agency (IPA). These centers will be equipped with production and editing facilities that will enable the processing of database and digital image information required for the production of multimedia software. In these centers,

the following operations will be undertaken in concrete terms.

(a) Provision of opportunities to produce multimedia software and foster personnel
 - Image-related enterprises will work together to produce and test advanced multimedia software including virtual reality software, and will endeavor to upgrade the skills of multimedia producers.
 - Opportunities to produce multimedia software will be offered to multimedia producers consisting of students, young members of society, etc., to improve their skills. (Producers from the University of South Carolina and UCLA in the United States are scheduled to be accepted.)

(b) Construction of databases of multimedia materials
 - Multimedia software databases will be prepared in order to allow image and sound information serving as materials for multimedia software production to be freely searched and retrieved, as well as storing produced software and making it available to others.

(c) Support for the Regional Multimedia Centers, etc.
 - In order that the Regional Multimedia Centers (see below) and other multimedia-related facilities may fully perform their functions, image and sound information and multimedia software will be provided by Multimedia Center (situated in Marukomachi), and the training of managing staff as well as technical

guidance will be provided in regional centers.

b. The Regional Multimedia Centers

Subsidies will be provided for the establishment of the Multimedia Centers operated by local self-governing bodies (in six locations throughout the country). These centers will endeavor to encourage the expanded use of multimedia and to promote multimedia on a regional basis by setting up facilities where local residents and enterprises, etc. may easily edit and produce multimedia software.

The actual operations carried out will be those that take maximum advantage of the unique capabilities of each local self-governing body. For example:
- A Regional Multimedia Center will be set up on the campus of a prefectural university (University of Aizu Fukushima Prefecture), and its utilization by university students, researchers and local enterprises will be promoted.
- A Regional Multimedia Center will be established in a prefectural museum (Gifu Museum), where hypermedia descriptions of the natural features of the region (descrip-

tions of the natural features of the region using multimedia software) and educational multimedia software will be produced.

c. Regional promotion of information systems through multimedia information systems

The Ministry of Agriculture, Forestry and Fisheries is scheduled to construct multimedia information systems in farming, mountain and fishing village regions as part of its agricultural structural reform activities. The Ministry of International Trade and Industry will cooperate through the development of software, etc.

d. Strengthening of bases for producing other multimedia software

In order to open up new frontiers of multimedia software, the private sector will be commissioned to produce interactive multimedia software in which computer graphics, etc. and large-sized high-definition images including "Hi-Vision" are linked.

In addition, opportunities to produce images will be offered to young people who will become leading figures in software production; image software locally

Main Operating Body and Location of the Regional Multimedia Centers

[Main Operating Body]	[Location]
Chitose Municipal Government, Hokkaido	In Chitose Airport terminal building
Fukushima Prefectural Government	On campus of Prefectural University of Aizu
Ueda Municipal Government, Nagano Prefecture	Ueda City Multimedia Center to be newly constructed
Shizuoka Prefectural Government	In Hamanako institute of cooperation
Gifu Prefectural Government	In Gifu Museum
Toyama Prefectural Government	In Toyama General Information Center

planned according to the specific industries, technologies, and culture of each region will be produced in an attempt to foster personnel; and produced software will be compiled into databases to be used in the production of other software.

[2] Software

(1) The status quo in Japan

In Japan, there is a lack of high quality software corresponding to advanced users' needs and of original software. The following can be listed as primary reasons for this situation.

① Awareness of the merits of software has been insufficient in Japan. In addition to delays in the introduction of computers as a whole, the software market has been underdeveloped and insufficient resources including personnel, funding, and technology have been allocated to this field.

② Creativity and an entrepreneurial spirit are considered to be necessary for the development of superior software. In Japan, however, there are various problems including the fact that generally speaking, it is difficult to foster creative personnel and difficult to successfully establish venture businesses. In the United States, on the other hand, there are many cases of original software being developed through a process whereby the creative ideas of researchers are embodied as original software, after which the soft-

ware is evaluated and improved extensively by third parties and then commercialized. This type of environment has not been created in Japan.

(2) Concrete measures

For these reasons, the following measures will be comprehensively implemented to deal with such issues, and an environment will be created in which software incorporating abundant creativity can be provided.

① Improvement of market environment

To heighten the motivation of software companies to develop products and ensure a supply of high-quality software that meets users' needs, basic market conditions should be established clarifying contractual relationships for the development of software and pricing policies should be formulated in which the merits of software products are rationally evaluated. From this point of view, a basic approach has recently been presented concerning appropriate contractual arrangements and prices for the development of software by the Information Industry Committee of the Industrial Structure Council. Taking the report of the committee into consideration, the following measures will be implemented.

<Concrete measures for FY1994>

a. A list of "main items to be included in software development contracts" embodying the contents of this report has recently been released and will be

disseminated from now on.

b. In order to ensure the transparency of the software business, "Software Life Cycle Process - Japan Frame '94" as a common framework for system development business, which will serve as a standard for classifying system development processes and defining job descriptions that have varied with each vendor and user in the past, has recently been formulated and will be disseminated from now on.

c. To promote the introduction of a comprehensive bid evaluation system for governmental procurement of information systems and software, an evaluation standard will be determined by the end of 1994FY.

② Training of advanced information technology engineers

The development of superior software will indispensably require information technology engineers possessing advanced and professional knowledge capable of coping with new needs and technologies.

The Ministry of International Trade and Industry will implement the following measures to foster personnel who can promote the introduction of information systems, in response to the criteria for new personnel in this field formulated in the report of the Human Resources for Information-Oriented Society Subcommittee of the Industrial Structure Council's Information Industry Committee in May last year.

<Concrete measures for FY1994>

a. The Central Academy of Information Technology of the Japan Information Processing Development Center has created 17 standard curricula for fostering personnel conforming to the above criteria (in January this year).

b. The Ministry of International Trade and Industry has revised its information technology engineers examination system to evaluate ability in conformance with the above criteria, establishing an examination system in which the traditional five categories are further specialized into 11 categories. (Examinations based on the new system will be held from this autumn.)

c. The Central Academy of Information Technology of the Japan Information Processing Development Center and regional software centers will provide training in line with the standard curricula mentioned above, in place of the traditional training. (This training will be offered from the current fiscal year.)

d. Among courses of study in organizations providing education in information technology (professional schools, etc.), superior courses conforming to the standard curriculums mentioned above will be approved. (This will be implemented from the current fiscal year.)

From now, efforts will be made to cultivate and secure high-level information technology engineers who are capable of producing superior software through the steady implementation of these new

examination and training systems.

③ Improvement of environment for the development of original and creative software

The development of original and highly creative software will require improvements in the environment as stated above, and the following measures will be taken accordingly.

<Concrete measures for FY1994>

Through the activities of IPA to promote creative and original information technology, the development of original software by researchers of venture businesses and universities having technological seeds will be supported, and improvement and dissemination of the results of these efforts will be carried out by releasing such results to researchers, etc.

④ Other improvements of the environment

In addition to the above, promotion of the following measures will be continued to encourage the supply of high-quality packaged software and information systems.

<Concrete measures for FY1994>

a. Promotion of the development of packaged software through the advanced program development activities of IPA.

b. Implementation of tax measures including a general-purpose program de-velopment reserve fund system to cope with the burden of packaged software development and maintenance costs.

[3] Databases

(1) The status quo in Japan

The sales of databases in Japan total roughly 214 billion yen, no more than about one-sixth of the amount of sales in the United States, and around two-thirds of the databases circulating in Japan are created in foreign countries. In addition, there is an overwhelming gap between Japan and the United States in the number of database distributors and builders.

The reasons why databases are so underdeveloped in Japan seem to lie in the following.

① As neither the government nor the private sector actively releases the information it possesses, database businesses have experienced difficulty in obtaining useful information. (For example, in the United States there are many cases in which the government not only releases information in its possession, but also actively makes data available for sale to database businesses.)

② In Japan, since databases have been distributed only by the businesses who have built them, users have not been able to gain extensive access to databases through a single distributor. (In the United States, database builders and distributors are generally different companies. Conse-

quently, users may be supplied with extensive databases through access to one distributor.)

③ As a result of the failure to supply sufficient database services conforming to users' needs, a vicious circle has been created where the use of databases by users has been delayed, which in turn has hindered the development of database services.

(2) Concrete measures

To cope with the above problems, efforts will be made to prepare an environment so that users may be provided with more advanced databases, through the integrated promotion of the following measures.

<Concrete measures for FY1994>

① Promotion of compilation of socially useful data into databases
- Compilation of socially useful data possessed by private bodies, etc. into databases will be promoted through feasibility studies conducted by the government on the demand for the building of such databases and their economic efficiency.
- As a part of the activities of the IPA's "New Industry Creation database Center," a variety of administrative information will be converted into electronic form and provided through database businesses.
- At the same time as the compilation of technological information into

databases is being promoted, the Technomart Foundation will refine a system for the integrated collection, control and supply of technological information, in order to secure extensive access to such databases.

② Facilitating of access to databases

- As a part of the above-mentioned center's operations, users' access to databases will be facilitated by improving the contents of information stored therein and access methods when building and providing databases.
- Methods of preparing databases will be studied so that, through the network interconnections of database businesses, users may access an extensive range of databases by accessing the network of only a single database supplier.

③ Other measures taken to support construction of databases

In view of the expanding number of users resulting from the supply of useful databases by private database businesses, the following measures are being taken.
- A tax incentive for database reserve fund system to cover the expenses of building databases, including developing upgraded versions.
- A low-interest financing system to cover the funds necessary for building databases.

Current News

* Six personal computer firms show signs of shipment recovery

Six leading personal computer companies announced the actual fiscal 1993 shipment forecast for domestic personal computers and their fiscal 1994 shipment plans. According to the announcement of the top six firms — NEC, Apple, Fujitsu, IBM Japan, Seiko-Epson, and Toshiba, which form 90 percent of domestic market share — the actual fiscal 1993 shipment forecast is 2.48 million units, up by 13.5 percent over the preceding year. The actual shipment forecast turned out to be a positive increase for the first time in two years. Moreover, a large increase in the shipment is being predicted in the fiscal 1994 plan — some 3.14 million units, which is up by 26.6 percent over the preceding year. Apple and IBM Japan in particular have declared a target of more than 70 percent over the preceding year in their plans for fiscal 1994. Apple is aiming to achieve its target mainly with a Macintosh model incorporating a RISC processor, the Power PC and with a Performer model for volume sales, and IBM Japan is going ahead with a DOS/V machine, the PS/V Vision.

Among domestic manufacturers, Fujitsu is beefing up its personal computer LAN business mainly with its DOS/V machine, the FMV, which is directed at an increase in the market share. The company has settled on the bullish plan of a 32 percent increase over the preceding year. In comparison, NEC, which has the majority of the domestic market share, is aiming at the shipment of more than 1.5 million units in fiscal 1994. The sales of its most successful product, the PC98, set the top record — some 440 thousand units in the period from January to March in fiscal 1994. It plans to improve the multimedia function of its most influential product model and to eliminate the challenge of rival companies.

A great improvement in the cost performance of products since the beginning of 1993 pumped up the demand in the overall market. Signs of a business recovery are beginning to be seen and a full-scale recovery seems to be well on the way in the personal computer field, somewhat ahead of other fields. The profits seem to be stayed almost flat, however, even though the rate of growth in shipments has reached more than ten percent. It also seems that the severe price competition will continue into the foreseeable future.

* NTT starts inviting participants to join in a joint-use multimedia experiment

NTT has set up concrete conditions for multimedia communications, which is being planned, and has announced the start of invitations for the participation in a joint-use multimedia experiment.

The experiment includes the following three tests: (1) high-speed computer communications and (2) multimedia communications, both using the gigabit-class B-ISDN network which the firm has constructed, intended for general users, in applications such as electronic mail and electronic newspapers; and (3) a test integrating communications and broadcast subject to metropolitan CATV companies with the optical fibers being provided by NTT. The firm also plans to determine the outlook for participants by the beginning of July 1994 and to start high-speed computer communications experiments in use from the end of September and other experiments in use from the spring of 1995.

Among the experiments involving the use of B-ISDN, the high-speed computer communications experiments are intended for ten areas including Tokyo, Osaka, Fukuoka and their environs where terminal station devices are installed. A user network interface with a speed of 156 megabits per second, with such applications as communication between high-speed LANs and large-capacity file transfer, is to be used in the high-tech experiment. The number of enterprises and public research institutes expected to take part in the joint experiments is about 10. The network cost is being shouldered by NTT and the computer cost will be borne by the other participants. The period of the experiment is expected to be from the end of September 1994 to the end of March 1997.

In the multimedia communications applications intended for general users, the servers of the information provider, such as electronic mail, and B-ISDN are connected to make up an experiment assuming actual general use. The intended participants are service providers who supply information and who are aiming to develop applications over a period from the spring of 1995 to March 1997.

Moreover, in the integration test involving communications and broadcasting, experiments in the combined use of CATV image transfer, video-on-demand, and telephones using optical fibers are being undertaken. One to three metropolitan CATV companies have been invited to participate and the experiments will involve 300 to 500 households in a region. The series will run from the spring of 1995 to March 1997.

* The IPA will cooperate in researching the verification of the compatibility of Esprit's open system

Japan's Information-technology Promotion Agency (IPA) is making available the results of its research on the development of a verification system for the open system undertaken by the information and communications develop-

ment strategy "Esprit" being promoted by the European Union.

This project, which is called Deploy, and X/Open, which is an organization established for the standardization of open systems, will be responsible for the technological negotiations between Esprit and the IPA.

The Esprit promotes the Deploy project based on test technology conforming to the open system concept in a basic software technology project tackled by the IPA as a four-year project and under way since 1992. At present, an open system verification system subject to application software is being developed on the basis of the description language ADL in open system specifications whose prototype has already been completed, plus an automatic generation system for a verification system based on it.

X/Open has made available to manufacturers hardware compatibility verification and authorization programs, but this time the object of the verification is application compatibility.

The system is planned for completion in 1996 and licensing will provided to the individual software houses at cost. Esprit's main activities thus far have involved basic research and investigations, but it will undertake the development of practical technology from this point on.

* NTT DATA receives an order for a postal savings

system from China

NTT DATA Communications Co. recently received an order for an on-line system to deliver postal savings operations from the Chinese Ministry of Posts and Telecommunications. The region to be served will be Beijing, and the project will be carried out in cooperation with Hitachi, Ltd. and Sumitomo Corporation.

The details of the order received include the construction of a system at the operation processing center where a host computer is installed and the installation of counter terminals and automatic teller machines (ATMs) at some 200 post offices which currently handle the savings operations in Beijing, together with the implementation of an overall online system. A Hitachi-manufactured general-purpose machine is expected to be used for the host computer. The system is slated to go into partial operation in 1994.

The balance of the postal deposits in China has been increasing rapidly since the start of the postal savings service in 1986. It had reached about 70 billion yuan as of March 1994, but the implementation of an online system at the post offices dealing with postal savings services has made no progress at all. Therefore, the Chinese Ministry of Posts and Telecommunications has decided to put into place the implementation of an online system for the postal savings service which it has named the Green Card Project — a top-priority project in the 8th and 9th 5-year plans.

It is planning to construct a trunk network connecting 50 cities by the end of 1996 and to extend the network to the remaining cities and more than 10,000 main towns and villages to complete a nationwide network. This will be the first time for NTT DATA to receive an order from overseas, excluding orders from Japanese enterprises.

* The Electronics Industries of Japan and the U.S. will cooperate technically in the Information Highway

Information and electronics equipment manufacturers associations in Japan and the U.S. have agreed to promote cooperation between the two countries in the technological development of the Information Super Highway plan which is being promoted by the Clinton Administration.

The organizations involved are the Japan Electronic Industry Development Association (JEIDA) and the Computer and Business Equipment Manufacturers Association (CBEMA). The representatives of the secretariat for the two associations took part in examining some of the subjects that manufacturers in Japan and the U.S. have in common in making the Information Highway plan a reality.

The U.S. Department of Commerce has announced that the Information Highway plan will be carried out mainly by private enterprises, not by the U.S. government. Associations in Japan and the U.S. have come to the understanding that it will be beneficial to both sides to work together in the development of the required technology. JEIDA and CBEMA will be holding a meeting in Tokyo in September 1994 to examine the details of the technical fields involved.

JEIDA and CBEMA have also agreed to expand the cooperative relationship in a similar way to Europe. They plan to construct an exchange base for Japan, the U.S., and Europe at an industrial level to realize the Information Highway plan.

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