New Communication Media in Japan**

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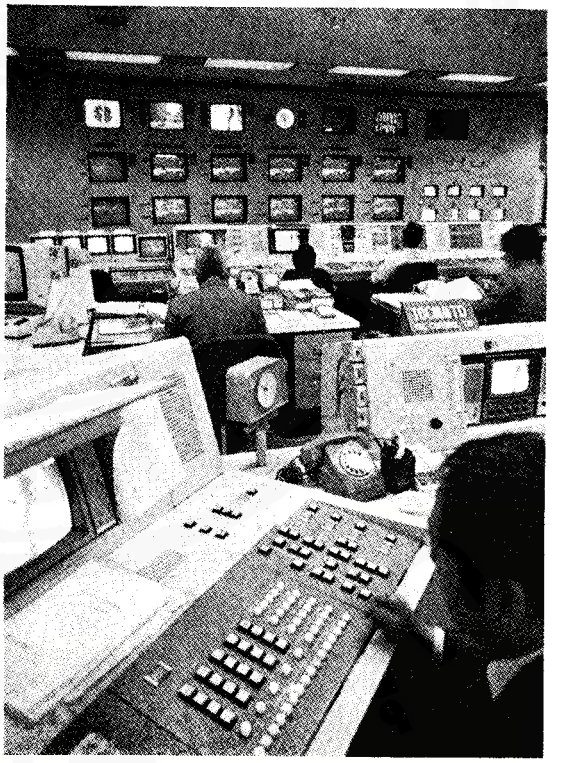
1. Introduction



In Japan, the television and printed matter are the most common mass communication media, while the telephone and mail are the representative personal communication media.

Nowadays, almost, all people have a television set and a telephone in their houses and a lot of magazines and newspapers flood the country.

However, according to the diversification of social activities and the development of telecommunication technologies, new telecommunication services have been develope. These new services do not fall into the conventional communication categories, but the new categories between conventional communication services.

These new communication services will not only transmit various information but also store and process the information in the

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various form of voice, character, still and moving pictures, etc.

It is predicted that these new communication services will change the basic industrial structure and our life in future society.

In this paper, the present status and future plan of telecommunication services in Japan are introduced and the impact of the new communication media to society is also discussed.

2. Present Status of Communication Services in Japan

2.1 Production of Communication Service

Table 2-1 shows the total amount of production of communication service in Fiscal Years 1980 and 1981.

About 60% of the product is of telephone services, and broadcasting and mail come next, 20% and 16% respectively.

The increase in rate of the mail product was quite high in 1981. This is however, due presumably to the revisions in postal rate in 1981. Among these items, data communication services showed a high increase of 18.8% to the previous year in 1981.

2.2 Domestic Communication Services

Recently, although the numbers of telephone sets, mail items and TV receiving sets are steadily increasing, the increase rate for each service is only several percent which is not considered to be high. It is said that these services have already matured, and are not expected to show a large increase in the future.

2.3 International Communication Services

Mail and telegrams have remained at almost the same level in recent year, whereas telephone and telex calls have increased remarkedly in number.

2.4 Household spending for communications

The annual spending for communications per household (mail, telegram and telephone calls, and broadcast receiving fees) in 1981 (January to December) totalled Yen 62,775, a 5.1% increase over the previous year (See Table 2-2). This rise was due to increased spending for mail, telegram and telephone calls. Household spending for communications accounts for 2.2% of the total spending for consumption. Statistics show, however, that household spending for communications has increased fourfold over the past 10 years, due mainly to the sharp increase in spending for telegram and telephone calls (an increase of 4.6 times over the past 10 years).

3. New Communication Services

3.1 Diversification of Communication Services

In parallel with progress in socio-economic activities, public needs for communication services have become complex and diver-

sified. This trend has urged a variety of new communication services to make their debut on the strength of rapidly advancing electronic and communication relation technology.

1. Spread of basic communication Services

Since early times, the postal services have played an indispensable and important role as a familiar means of communication in socio-economic activities. Even today, when the means of communication has become diversified, mail remains highly popular.

The telephone today is used widely at homes and offices throughout the country. There are no longer unfilled demands for telephones. The switching system has become automatic throughout the country. The telephone today maintains a high standard with regard to the quality of sound and reliability. The telephone not only helps make socio-economic activities efficient but also plays an indispensable role in daily life.

Together with the press and publications, radio and television have proved to be an essential means of communication media to every corner of the country.

These basic communication media, ie. mail, telephones, television and radio, have been used widely by the people in parallel with the development of socio-economic activities and the improvement of living standards. Along with diversified public needs, rapid progress in technology has helped create and develop various communication services.

2. Changing socio-economic environment and complex and diversified public needs

In parallel with progress in socio-economic activities, public needs for communicaitons have become increasingly complex and diversified. As a result, the communication environment is undergoing a major change. Let us mention some of the main issues.

Firstly, the people's values or desires have become diversified. They seem to prefer specific and detailed information to general one. In the broadcasting industry, technology has progressed toward a diversified form, such as television sound multiplex, teletext, freeze-frame broadcasts. As request type media, videotex (CAPTAIN) and two-way CATV have been developed for practical use.

Secondly, there are needs for greater rationalization and efficiency. Through office automation (OA) featuring the use of advanced data communication, facsimile systems, word processors, and computers, and through the organic linkage of these OA equipment, corporations are trying to promote rationalization and efficiency in their offices.

Thirdly, the people's living space is expanding. As a result, their interest in mobile communications is growing. "Pocket Bell" radio paging service and train public telephone service are popularly used today. Automobile telephone service has also been opened in response to growing public needs for mobile communications.

Fourthly, a growing interest in security is evident among the people. In the area of medicine, an emergency medical information system has been developed to cover the entire nation. In the area of crime or disaster prevention, a "telecontrolling" or "telechecking" system has been widely developed for industrial use. A security system that connects a home with a security firm or a fire station has also been developed to cover many households.

Fifthly, there is marked progress in international communications. In addition to such conventional communication media as

the telephone, telegram, and telex, business firms are eager to use a variety of means, including a telephone network for facsimile and data transmission, or the formation of their own networks using leased circuits.

3. Progress in communication-related technology

There has been marked progress in communication-related technology in recent years. Such progress is based on the following factors :

(1) Element technology ranging from ICs and LSIs to VLSIs, which feature high density, high reliability and high speed;

(2) Optical fiber communication technology using optical fibers, which feature a low loss rate, a wide range, lightness and a small diameter;

(3) Satellite communication technology featuring rapid progress in increased line capacity, reliability, the extended life of satellites, and lower costs.

Along with the development of digital technology in recent years, the abovementioned technology has digitalized the communication system, which is expected to play a major role in the operation of terminal equipment and networks at lower costs and with greater efficiency, as well as in the develop ment of communication services as a whole.

4. Development of new communication services

Against the backdrop of the spread of main communication services, progress in communication related technology, and growing public needs for sophisticated and diversified media in the changing socio-economic environment, the communications industry faces a major change.

We can cite the following factors for this change :

Firstly, various new media have been created and developed though the fusion of the conventional media. Secondly, the fusion of communication and data processing technologies has produced various new media capable of providing sophisticated and diversified services using their storing or simultaneously reporting function.

(A) Fusion of communication media

The fusion of communication media has the following features :

(a) The fusion between telecommunication and non-telecommunication media and mail, or between telecommunication media and newspapers, has produced electronic mail or electronic newspapers.

(b) The fusion between personal type media and mass type media has opened the way for two-way communications. (The mass type media feature one way communication). As a result, videotex and two-way CATV have been produced in response to public needs.

(B) Sophisticated and diversifled functions

The fusion between communication technology and computer technology has replaced the conventional form of transmitting information from one place to another with data communication by which information can be processed in the course of transmission in accordance with programmed steps. It is also possible for such systems to store information temporarily and transmit it when necessary or transmit information at an appropriate time and simultaneously to

more than one receiver who needs it, or transmit information between different types of media. These systems take a variety of forms ranging from an advanced telegraphic or telephone system to something similar to a broadcasting system.

3.2 New Communication Services

(1) Mobile Communication

A shift in public demand from 'fixed' to 'mobile' telephones is now taking place. The public is anxiously awaiting a practical and economical mobile communications system that will enable communication at any time and any place. Some of the new mobile communications services are :

(a) Pocket bell (radio paging) service in 1968 and acquired more than 1.4 million subscribers by 1982. In the summer of 1978, a new frequency band (250 MHz) was added, making it possible to adopt a smaller, lighter pocket bell unit with an improved longer life battery.

However, the present pocket bell service does not inform a holder who is calling (what the calling telephone number is) and the purpose of the call. A super bell service is being developed that will enable a holder to dial a specific number at a nearby telephone and contact the caller directly.

(b) Domestic maritime mobile radio telephone service has been playing an important role in terms of navigational safety, efficient use of harbor facilities, security of commercial cargo, etc. In March 1979, a new system using a new frequency band (250 MHz) was introduced, that provided direct long-distance dialling service for upto 30,000 ships. The number of domestic maritime mobile radio-telephone subscribers reached 11,000 at the end of March 1982, and the service area covered nearly all of Japan's coastal waters.

(c) Train public radio-telephone is currently available on the high speed railroad line running from Tokyo to Kyushu. This service have been recently expanded to the new high-speed lines that run from Tokyo to Aomori and from Tokyo to Niigata.

(d) Automobile radio-telephone service was initiated in Tokyo in December 1979, and in Osaka in November 1980. There are now (1982) about 20,000 subscribers in 14 areas, and measures have been taken for nationwide expansion. This service will be indispensable not only for ordinary calls but also urgent calls between drivers when traffic conditions are unfavourable. Therfore, it is necessary to provide this valuable service to the general public as well as to commercial users.

(2) Data Communication Services

Today, computers affect most social activities. In Japan, on-line systems were first established in 1984, For ticket sales, and reservations for the Japan National Railways and recording the Tokyo Olympiad performance record. A few years later, full scale on-line systems became operational with banks in the forefront, and gradually spreaded to other businesses.

Looked at year by year, although there were slight fluctuations, an average 25% growth was achieved, leading to 830% increase in the number of computers in use over a ten-year period. However, computer costs increased only 370% over that period with

a yearly increase of 17%. These trends are the result of improved computer cost performance as well as the great increase in the number of mini computers and micro computers in use. Breaking down, utilization figures according to size of computer, in 1970 the proportion of large scale machines of all computers in use was 9.8%, with medium scale computers making up 23.4%. However, by 1980, these figures had changed to 3.7% for large scale, 10.8% for medium scale computers, 29.9% for mini computers and 55.6% for micro computers.

(3) Visual Communication Services

In human social activities, information represented visually receives the highest priority. As in the shift of emphasis from radio to television, the weight is shifting in telecommunications transmission from an oral–aural to a visual basis. As a means to meet this changing social demand, non–telephone services are being introduced, beginning with facsimile and including visual and data communications.

Non–telephone services have already been in use some time in the from of telegram, telex and facsimile. However, future non–telephone services will be a giant step beyond these, and will be leaps into whole new fields. These services will not only involve the transmission of information. Rather, they will also entail the more complex and sophisticated tasks of storage and processing. They will make it possible for information media to occupy a whole further dimension beyond that which telephones made possible.

(a) Facsimile Communications

Facsimile service is particularly useful in Japan because the writing system employs ideographs and other complex symbols. As economic activities increased in intensity, and the need for rapid transmission of large volumes of accurate information also increased, the role facsimile should play in public telecommunication came to be reevaluated. It came to be seen that facsimile had many advantages over telephones, such as the fact that any type of figures or other graphics could be sent even when a receiver was absent.

Facsimile communications in Japan, mainly those using public telephone networks, have rapidly developed since 1972.

Domestic facsimile communications have become increasingly diversified using not only leased circuits or public telephone networks but also Facsimile Network Service and Public Fax Service. Particularly, the facsimile on network service, which was opened in September 1981, is provided by means of an exclusive network for facsimile communications, which offers, lower rates for medium and long distance communications than those for the public telephone networks. It also has such service functions as simultaneous transmission and others. The Mini Fax is a facsimile equipment for A–5 size paper, which is lower in costs, smaller in size and easier in operation.

(b) Videotex

Videotex is a new tele–communication medium capable of transmitting patterns in a conversation style by connecting a TV set with the computer center, using public telephone networks. The CAPTAIN system, jointly developed by the Ministry, NTT and other organizations, provided Phase I of its

test service to 1,000 monitors in Tokyo's 23 Wards from December 1979 to March 1981. In Phase II of its test service from August 1981, the number of monitors was increased to 2,000, and that of stored display frames to about 200,000 pages. Moreover, the input, and retrieval functions of information, and display functions of equipment were further improved. The service function was also improved through the closed user group service and the order entry service, as well as through the development of a simplified hard copy printer.

(4) Broadcasting

Increasingly complex and diversified socio-economic activities and the people's diversified values and attitudes have urged public demand for information to grow, as well as demand that the content of information and the form of services should be diversified. In the area of broadcasting, this trend demands higher quality and diversification in both programming and the viewing/listening form, that is (1) specialization of services, such as full time stations broadcasting news, music or motion pictures, (2) diversification of services enabling the consumer to obtain and record necessary information at any time, (3) pictures and sounds of better quality, and(4) effective use of broadcasting functions in such specific areas as the Broascating University, welfare, traffic, prevention of disasters.

(a) Teletext broadcast

This system is designed to display necessary information on the screen whenever the viewer wants it or print it on paper as a hard copy by attaching a recording device to the receiving set. This system features a combination of speedy reporting and recording functions.

Usable for this system are two formulas, that is, the pattern and the code. There is also a third formula, which is a hybrid from the above mentioned two. These formulas are now under study.

The uses of teletext broadcast include such supplementary ways as captioned broadcast for the aurally handicapped, cooking menus, and radio and TV schedules related to main television programs, and such independent way as news, weather reports, and various quides not directly related to main programmes.

(b) Facsimile broadcast

This system is designed to record and store information on paper as a hard copy by attaching a facsimile device to the television set. This system resembles teletext in that it transmits letters and figures. However, it can transmit much more information per frame and receive it direct on paper, not on the screen. Photographs can also be transmitted. Because of these features, this system is expected to be used as an "electronic newspaper."

This system can be used to transmit detailed information such as news commentaries and living guides, as well as specialized information such as economic on medical news. This system is now reached by the Radio Wave Technology Council.

(c) High definition television broadcast

This system is designed to create a finer and clearer picture than that of conventional television. Using a large,

rectangular screen, this system is able to give viewers a vivid impression and great impact. This system is expected to be used effectively for the broadcast of the theatrical films and the live broadcast of sports events. Basic technology is now being reached.

(d) Satellite broadcast

This system is designed to receive TV signals direct from a satellite by attaching a receiving antenna and an adapter to the TV set. Frequencies for 8 channels of TV broadcast have been internationally allocated to Japan.

This system is expected to be used to remove reception difficulties, to secure a broadcasting network in an emergency and to make PCM sound and high-definition television broadcasts.

4. New Communication Technologies and INS

4.1 New Communications Technologies

The realization of the abovementioned new communication services are largely due to the remarkable development of new communication technologies, such as satellite communication technology, optical fiber transmission system, VLSI and data processing technology.

(a) Satellite Communication Technology

Remarkable progress in space exploration in recent years has made possible various uses of outer space for communications and broadcasting, and has put space communications into practical use.

Space communication is a new system that covers a wide area by radio waves via satellite. This system is resistant to disasters, can overcome various difficulties caused by topographical conditions or high rise buildings, and can form a wide band, high quality, long distance transmission route and a wide area network speedily and economically.

In Japan, research was started on space communications in the early part of the decade, beginning in 1965. Using the medium capacity, communication satellite (CS "Sakura") and the medium size broadcasting satellite (BS "Yuri"), various tests have been conducted to obtain basic data for space communication.

In order to further promote practical use of space communication on the basis of the results of the test conducted through CS "Sakura" and BS "Yuri", Japan's first practical satellites CS-2a and CS-2b were launched in February 1983 and in August 1983 respectively. CS-2 will be used to facilitate contacts in an emergency as a backup system, (2) to improve and/or expand services for remote islands and (3) to provide live transmission services at the scenes of events of accidents.

Japan's first practical broadcasting satellites BS-2a and BS-2b are scheduled to be launched in February 1984 and in August 1985 respectively. These satellites are expected to resolve the problem of reception difficulties on NHK-TV, as well as secure a broadcasting network in an emergency.

The basic concept of satellite communications and broacasting systems are shown in Figure 4-1 and Figure 4-2 respectively.

(b) Optical Fiber Transmission Technology

The optical fiber transmission system is comprised by light emitting device, optical fiber and light receiving device.

Electrical signal drives the light emitting device directly and the signal is converted to the intensity of light. The emitted light is transmitted to the receiving device through the optical fiber. The light receiving device re-converts the light signal to the electrical signal again.

The advantages of optical fiber transmission system compared to the conventional copper cable systems are as follows :

(1) extremely low loss
(2) wide frequency band or large channel capacity
(3) free from electrical conduction or lightning
(4) good flexibility
(5) small diameter
(6) light weight
(7) large amount of resource

Because of the above mentioned advantages, the optical fiber transmission system is expected to be used widely from long distance transmission cables to local subscriber cables in future telecommunication networks.

(c) Very Large Scale Integrated Circuits

The Integrated Circuit (IC) have been evolved to Large Scale Integrated Circuit (LSI) and recently Very Large Scale Integrated Circuit (VLSI).

With the development of this technology, both the cost of communication equipment as well as the size of the equipment have been remarkably reduced.

Nowadays, LSI or VLSI are used not only for communication equipment, or computer but also for calculators, wrist watches, and various housekeeping machines such as rice cooker, sewing machines washing machine etc.

4.2 Information Network System (INS)

(a) Network digitalization

Three public telecommunication networks have long existed in Japan—those for telephone, telex and telegraph. These three networks, though sharing some of the same transmission facilities, were developed independently. They do not share exchange switches not interconnect with each other.

Since the late 1960s and early 1970s, when facsimile and data communication services were first introduced in Japan, the analog telephone network or leased analog circuits have been used for these purposes. This approach meant that digital information was converted into analog signals and then, after transmission, re-converted into digital form. Such an approach was necessary because the greater part of the traffic conveyed in the telecommunication network was ordinary voice communications via telephone. Corres-pondingly, there was not yet any strong demand for transmission of digital information. In addition, digital technology was not sufficiently developed to make it possible to construct economical digital communication facilities.

By the beginning of the 1980s, the increasing demand for data communi-

cations, in which computers are connected to telecommunication circuits, has caused a rapid expansion in digital information traffic. At the same time semiconductor technology and digital signal processing technology have made remarkable progress. These trends have led to expectation that an integrated digital network can be constructed. Furthermore, it is expected that an integrated digital network will be able to transmit both audio and video signals more economically than separate analog networks.

(b) Basic Concept of INS

INS will consist of Business Telecommunications Centres (BTC). Home Telecommunications Centres (HIC) and Information Processing Centres (IPC) connected to sophisticated digital telecommunication networks. The systems concept in illustrated in Figure 4.3

The user's premises will be equipped with various terminals providing some combination of the four basic functions, i.e. telephone facsimile, data and video. Terminal connecting equipment must allow even an amateur to control the terminals easily. This means that different types of terminal connecting equipment will have to be developed for varying configurations and uses. Business Tele-communication Centres incorporating office automation systems and home telecommunication centres willbe connected to telecommunication network.

Information processing centres will primarily perform general processing functions such as conventional algebraic computation using large scale computers.

They will also provide data base related information services such as information guides and retrieval, including still and moving pictures.

'Network' in INS refers to the upper part of the terminal connecting equipment installed on the user's premises. It will perform such functions as information transmission, storage, and transformation. In the network, the terminal-connecting equipment will be linked with subscriber communications processing centres through broadband high speed digital transmission links. These digital links will permit telephone, facsimile, data and video services to be made available simultaneously. Optical fiber cables for subscriber loops will be introduced sometime around 1985, beginning with subscriber links with large traffic volumes.

There will be two types of communications processing centres according to office rank : subscriber communications processing centres (corresponding to local offices) and transit communications processing centres (corresponding to toll offices). They will be capable of both conventional switching with digital switches and communications processing functions such as temporary storage of information, speed conversion, size conversion, and media conversion. This is due to their ability to renew and memorize the functions of terminal equipment at the users'end. These processing functions will significantly increase user convenience by, for example, enabling data terminals with different processing speeds to communicate with each other (speed conversion)and making output signals from data terminal equipment compatible with inputs for facsimile terminal equipment (media conversion).

The subscriber and transit communications processing centres will be connected through very high speed digital transmission links by optical fiber cables and communications satellites, as well as by existing coaxial cables and microwave links.

A further element of the network, a portable telephone, will be developed in the future. This will make various kinds of mobile communications services, including the automobile radio telephone, available to subscribers through the subscriber communications processing centres.

INS will :

1. Make it possible to provide every kind of service economically through a single communications network

2. Allow users access to the network with any terminal at any time through terminal–connecting equipment

3. Make possible communication between different kinds of equipment providing the same service, and inter–service communications e.g. between telex and facsimile, through a combination of communications processing and transmission functions

4. Provide users with access to all information services availble. primarily from those in the information industry such as data base service supplies

5. Make available inexpensive leased circuits and leased network services such as CATV.

6. Provide telemetering and telecontrol services

7. Enable the establishment of a new rational tariff structure based on the volume of transmitted information, which should lead to international agreement on issues concerning interconnection and tariff structure.

(c) INS Model System

To make INS a reality, it is necessary to gain the full awareness and approval of the public. Because of revolutionary nature of INS, accomplishing this task will require the clear understanding of the public on the new services to be derived from INS and actually have opportunities to use them.

NTT is now constructing INS Model System in Mushashino/Mitaka areas to confirm the technical feasibility of each digital telecommunication equipment as well as to provide an opportunity for the public to use the new telecommunication services.

(d) Impact of INS to Society

More than simply transmitting information, each Home Telecommunication Centre (home terminal) will help satisfy basic needs for learning, self–enlightenment, and amusement, thus serving as an interface between one's social and private life. Users will be able to select from the various services available, the optimum configuration for them and use it efficiently and reasonably.

Such a Home Telecommunications Centre could have at least four kinds of terminal equipment. The first is telephone equipment. Several types of telephones will be installed and will facilitate communication through such additional features as caretaker, auto matic all transmission, and call–waiting services. The second is a facsimile terminal for sending or receiving written or

printed matter. Facsimile service is fast and easy to use. It provides the receiver with a written record without having to send the actual document. The third is a data terminal with typewriter–like output equipment. It prints out the various information received and has a keyboard for data input into the computer. This terminal can even be operated by young children. The fourth is a video terminal utilizing a cathode ray tube. It is designed for temporary information display when no hard copies are needed. Two examples are amusement and information guide services.

These terminals are representative of those to be found in private homes in the future. A suitable combination of them will enable customers to be offered a wide range of services, including tele–shopping, travel or entertainment guides, entertainment such as TV games, and remote medical treatment and education through computers. They must be easily operable (through simply pushing a button), requiring that a micro processor be utilized in the terminal connecting equipment. At this stage, advising home owners on the use of terminals and helping them determine the optimum terminal combination for their particular family will become an important area of activity in the telecommunications field.

Security at home is expected to be greatly enhanced by utilizing the network as an automatic surveillance and warning system for occurences like crime, fires, or gas leaks. For example, doors can be locked from outside by tele–control.

Business Telecommunication Centres will accommodate a large number of terminals for facsimile, data and visual communications, as well as for functions like controlling interphones. They will contribute greatly to revolutionizing office procedures and may even make it possible for business people to work at home without going to the office, working in combination with Home Telecommunication Centres. As more people work at home, society will need to allocate less of its energy resources for transportation. Home Telecommunications Centres will increase the amount of free time each person has at his or her own disposal, thereby enhancing the quality of life in our society.

Productivity in the office will rise as telecommunications is combined with office automation. Workers will save time by cutting down on the number of face–to–face communications required; and reductions in daily commuting time for business purposes will free workers for more productive activities.

Similarly, inasmuch as the delivery and receipt of information constitutes a great part of government activity, the combining of telecommunications and office automation will increase the efficiency of information exchange and simplify administrative procedures. The introduction of statistical and other data bases may lead to the creation of public information services. Services like electronic voting and an interactive video service will make it possible to express opinions on community issues from the comfort of our homes, encouraging greater community participation in public affairs. Regional information

systems and motor traffic control systems adapted to meet the particular needs of each region concerned, will contribute to the enrichment of local societies.

Thus, INS will come to be considered one of the key elements in the social and economic infrastructure of post-industrial society. It will contribute toward increasing productivity, intensifying knowledge, and saving energy. It has great potential to help resolve conflicts between industry and society, and it will play a role in improving education, dealing with the problems of elderly citizens, and promoting better international cooperation.

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Table 2–1 Production of Communication Service

(Unit : Y100 million)

Classification	*Fiscal 1980*		*Fiscal 1981*		*Increase on decrease (%)*	*Remarks*
Mail		8.540	10.838 (16%) (US$4.7 b)		26.9	Income from postal services in Postal Services Special Account
Domestic telephones	35.257	36.148	37.477 (57%) (US$16.3b)	3.2	3.7	Income from NTT's telephone services
Wire broadcasting telephones	180			1.1		Total income from services in enterprises concerned
International telephones	711			26.2		Income from KDD's telephone services
Domestic tetegraph	640	1.270	1.224 (1.9%) (US$0.53b)	3.9	3.6	Income from NTT's telegraph services
International telegraph	630			3.3		Income from KDD's telegraph services
Domestic leased circuits	915	1.008	1.011 (1.5%) (US$0.44b)	2.7	0.3	Income from NTT leased circuits (excluding income from data communication
International leased circuits	93			23.4		Income from KDD leased circuits (including part of the revenue from data communications)
Domestic data communications						
Domestic data communication facilities	817	1.600	1.900 (2.8%) (US$0.83b)	18.5	18.8	Income from NTT's data communication services
Domestic data communication circuits	783			19.0		
Other international services		47	73 (US$0.3 m)		55.3	KDD's other income
NHK	2.650	12.513	13.294 (20%) (US$5.8 b)	3.4	6.2	Income from subscriptions and subsidies
Commercial broadcasting						Income of commercial broadcasting
Radio	1.334			6.8		companies from radio
						Income of commercial broadcasting
TV	8.529			7.0		companies from TV
Total		61.126	65.817 (US$28.6 b)		7.7	
Reference						
GNP		2.391.548	2.515.326 (US$1094 b)		5.2	In nominal terms
Final private consumption expenditure		1.387.812	1.462.137 (US$636 b)		5.4	In nominal terms

Notes : 1. Sources by Ministry of Posts & Telecommunications (MPT). NTT, KDD. NHK, and others
2. Sources by Economic Planning Agency regarding GNP and final private consumption expenditure
3. US $ 1=¥230

Table 2-2 Household Spending for Communication and Information Services

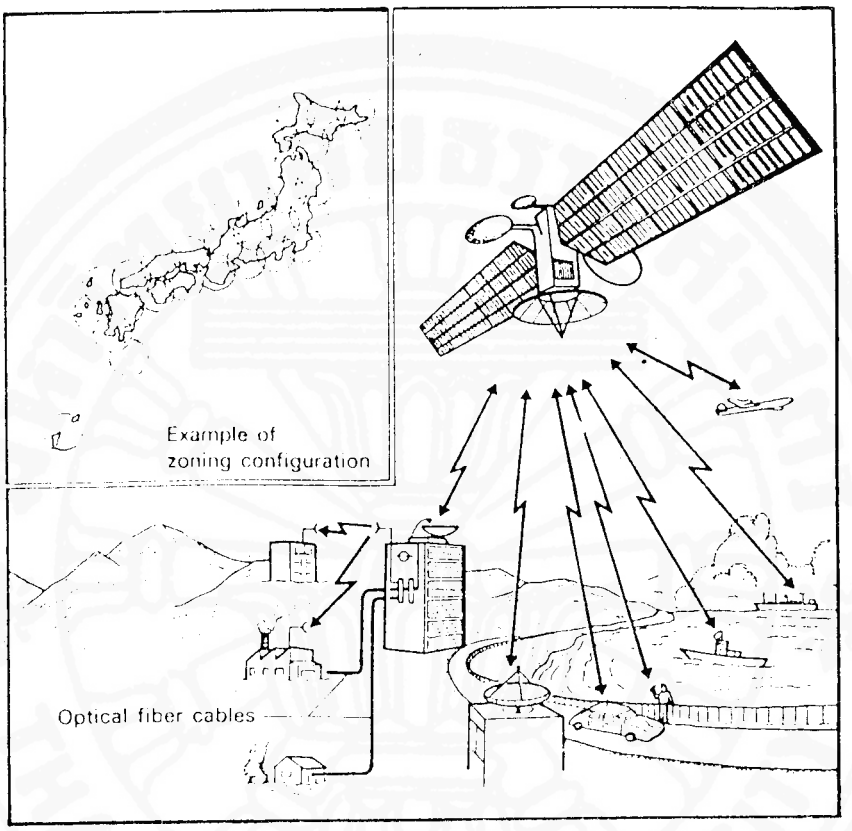
Classification	1971		1981		
	Actual spending	Ratio to total spending for consumption	Actual spending	Increase rate to 1917	Ratio to total spending for comsumption
	(Yen)	(%)	(Yen)	(%)	(%)
Mail	1,251	0.1	4,790	282	0.2
Telegram and Telephone Calls	11,036	1.1	50,355	356	1.7
Broadcasting	3,340	0.3	7,630	128	0.3
Spending for Communications	15,627	1.5	62,775	302	2.2
Tuitions and others	24,081	2.3	82,517	243	2.9
Transportation	19,083	1.8	56,271	195	2.0
Printed Matter	10,003	1.0	23,644	136	0.8
Newspapers	8,703	0.8	25,652	195	0.9
Total spending for consumption	1,049,699	—	2,880,163	174	—

Source : "Annual Report on Household Spending" (Statistics Bureau, Prime Minister's Office)

Notes : 1. Spending for each item denotes spending per household per year (January–December)

2. Printed matter includes school texts, reference books for studies, magazines, weekly magazines, dictionaries, books and other publications, as specified in "Annual Report on Household Spending."

Figure 4–1
Future satellite communications system



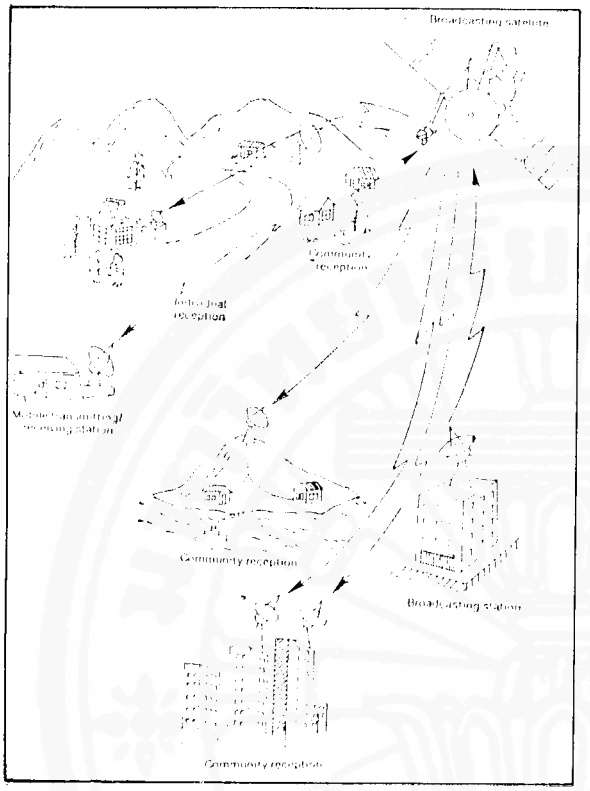


Figure 4–2
Concept of Broadcasting Satellite System

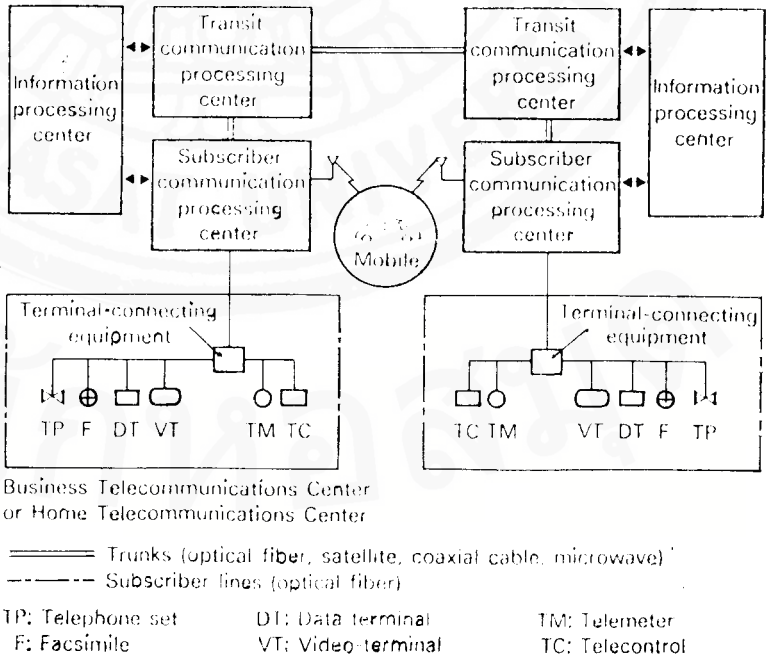


Figure 4–3
Concept of INS