

II-9-1 Introduction of IT in businesses

(1) Outline

Trends in the use of info-communications technology

According to MPT's "Communications Usage Trend Survey (Enterprise Section)," the use of information technology (IT) by companies in Japan with more than 300 employees, (excluding the agriculture, forestry, fishery and mining industries) was as follows:

1. Trends in use of communications networks at corporations (Fig. 1)

Among a variety of types of communications network, LANs were most commonly used. 83.3% of corporations said they used them, up 8.1 percentage points from the previous fiscal year.

The steepest rise was seen in use of the Intranet. Usage rose 14.9 percentage points from the previous fiscal year, to 36.3% of all corporations. Companies equipped with e-mail also increased significantly to 76.2%, up 13.5 percentage points from the previous fiscal year.

2. Spending on communications networks at corporations (Fig. 2)

Among all categories of spending on IT, rental or leasing fees were the highest at an annual average of 56.3 million yen per company, followed by personnel costs at 32.4 million yen, and spending

Fig. 1 Trends in the use of communications networks at corporations

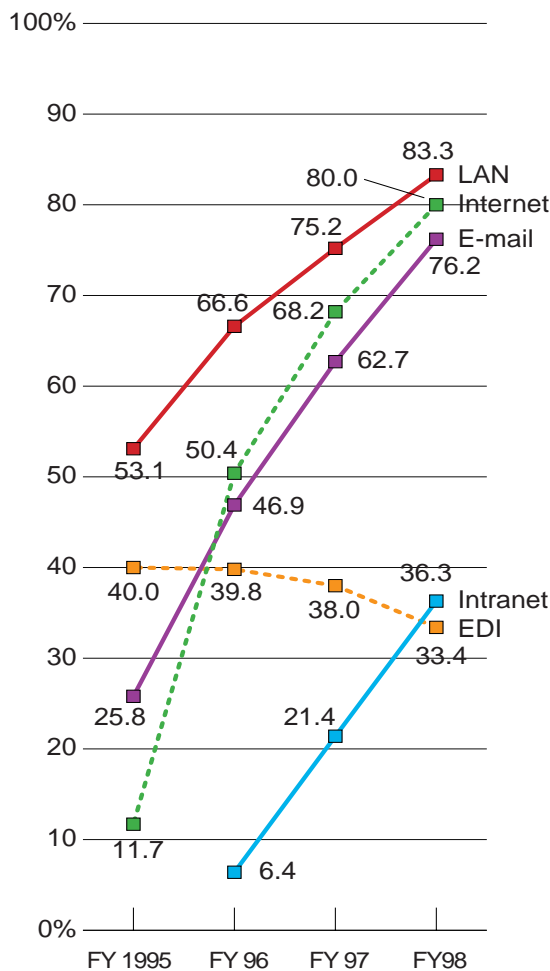
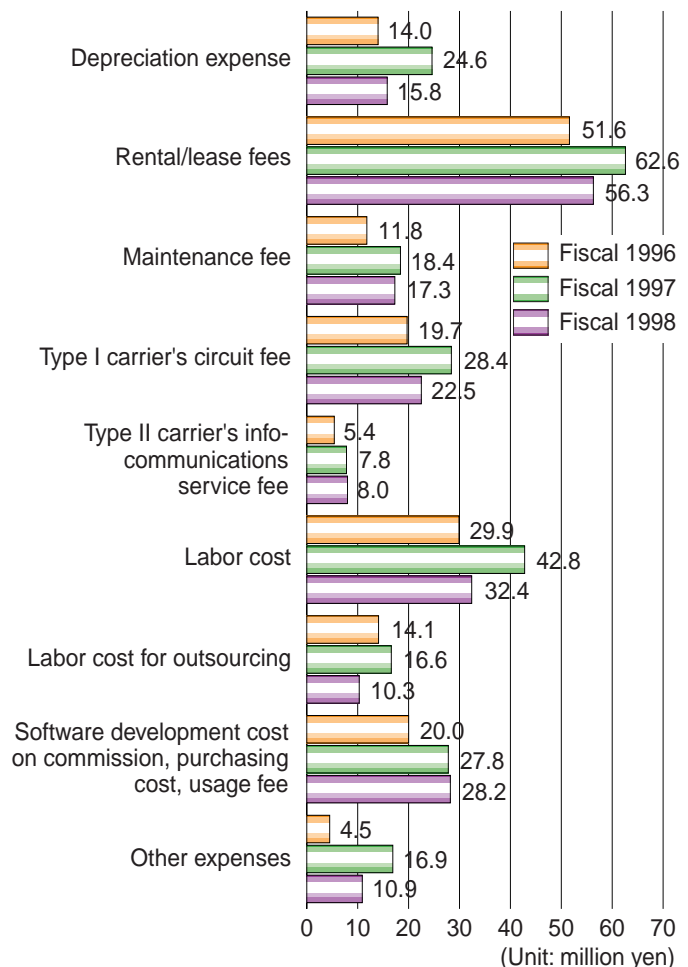


Fig. 2 Spending on communications networks at corporations



Source: "Communications Usage Trend Survey (Enterprise Section)," MPT

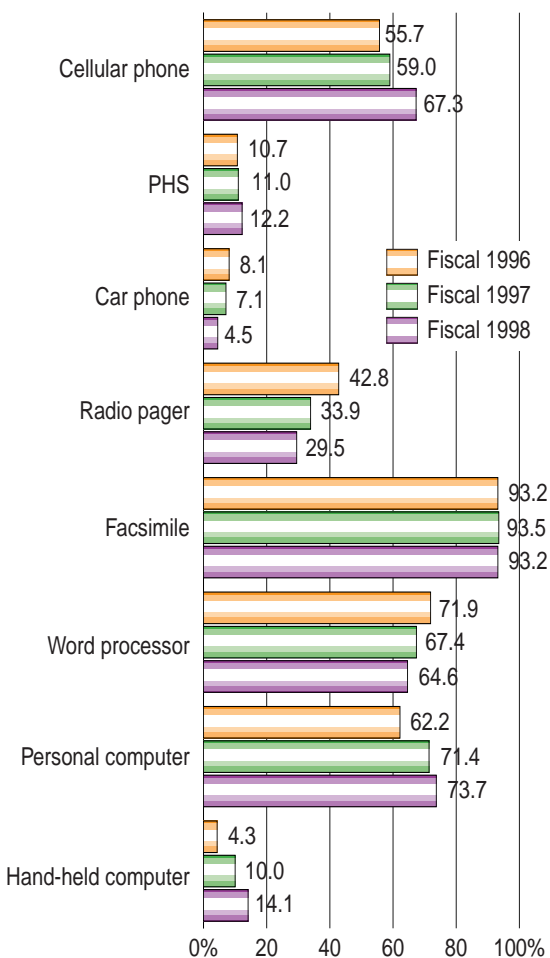
on developing, buying or using software, at 28.2 million yen.

On the other hand, according to MPT's "Communications Usage Trend Survey (Establishment Section)," the penetration rate of communications equipment at all companies with five or more employees (excluding postal services and telecommunications business) are as follows:

3. Penetration rates of info-communications equipment at businesses (Fig. 3)

The penetration rate of communications equip-

Fig. 3 Penetration rates of info-communications equipment at businesses

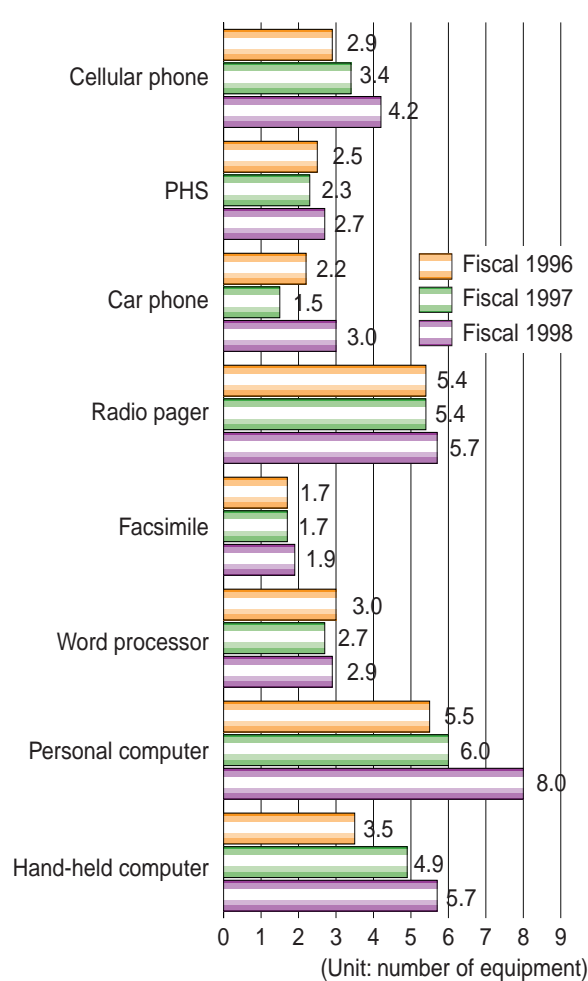


ment showed some significant changes. Usage of cellular phones rose to 67.3%, up 8.3 percentage points from the previous fiscal year, while usage of hand-held computers reached 14.4%, up 4.1 percentage points.

4. Amounts of info-communications equipment at businesses (Fig. 4)

The most remarkable change from the previous fiscal year's survey was in the average number of computers used at companies which rose to eight from six per firm.

Fig. 4 Amounts of info-communications equipment at businesses



Source: "Communications Usage Trend Survey (Establishment Section)," MPT

(2) Investment in IT

In 1997, U.S. investment in IT was more than three times that in Japan.

A comparative analysis was conducted on how much in Japan and the U.S. spent each year on IT equipment. The analysis took into account the differences in scale of the two economies.

For Japan, the figures on investment in IT were based on those given for the categories “computers and peripheral devices,” “wired communications equipment,” and “wireless communications

equipment” in data compiled on each Input-Output Tables. For the U.S., the figures used were those for the categories “computers and peripheral equipment” and “communications equipment” in the “Survey of Current Business.”

1. Trends in IT investment (Fig. 1)

The analysis showed that, in 1997, total invest-

Fig. 1 Trends in IT investment

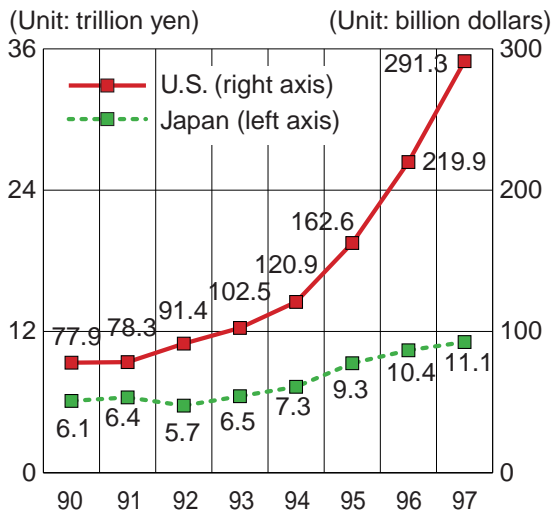


Fig. 3 IT investment as a percentage of GDP

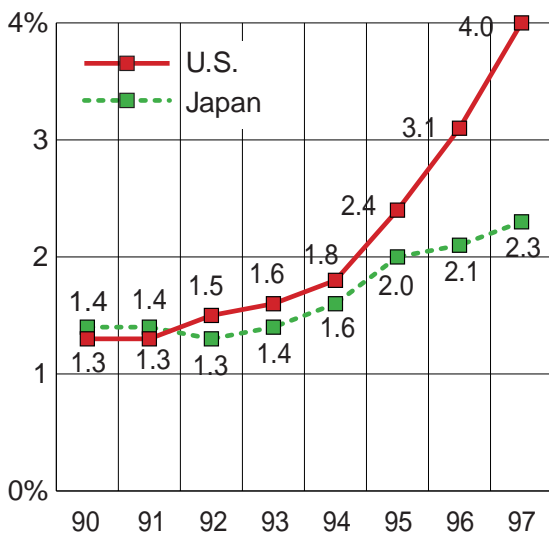


Fig. 2 Growth rates in IT investment (the 1992 value was set at 100)

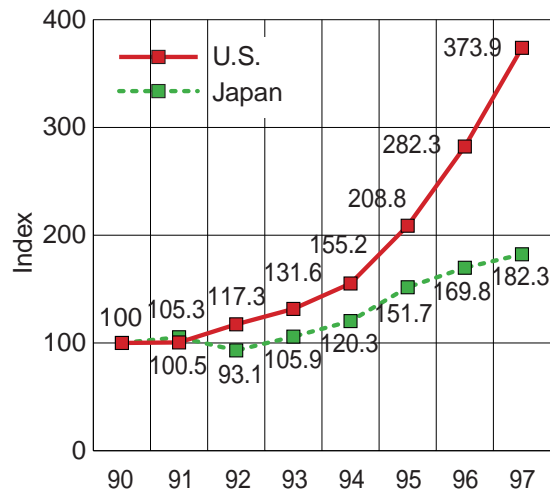
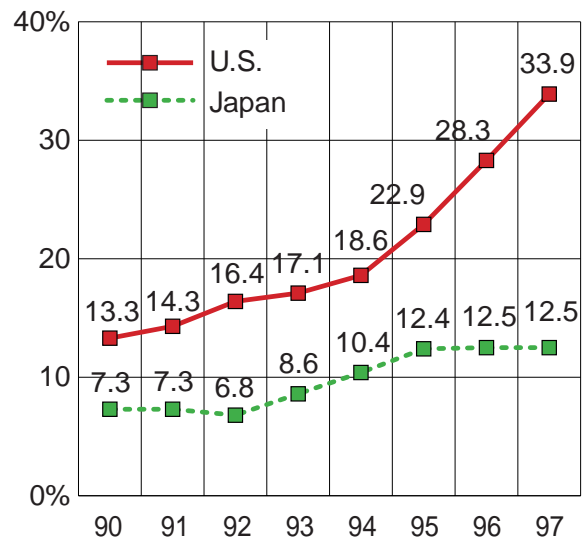


Fig. 4 IT investment as a percentage of total private-sector capital investment



Sources: MPT; “Input-Output Tables,” Management and Coordination Agency; “Input-Output Tables (linked tables),” MITI; “Annual Report on National Accounts (New SNA),” Economic Planning Agency; “Survey of Current Business,” U.S. Department of Commerce

ment in IT by the U.S. was 35.0 trillion yen (based on an exchange rate of \$1.00 = 120 yen), or more than three times the Japanese figure of 11.1 trillion yen.

2. Growth rates in IT investment (Fig. 2)

With the amount of investment in IT in 1990 set as 100, the index for the U.S. and Japan in 1997 recorded 373.9 and 182.3 respectively. In other words, U.S. investment increased at more than double the rate seen in Japan during the period. Since 1995 especially, the U.S. growth rate in IT investment has far surpassed that of Japan.

3. Ratio of investment in IT (Figs. 3 and 4)

In terms of IT investment as a percentage of GDP, there were no significant differences between the U.S. and Japan until 1994. However, since 1995, the gap between the two countries has been expanding year by year as U.S. forge ahead with their use of IT.

In addition, looking at investment in IT in relation to total private-sector investment in facilities and equipment, the U.S. figures surpassed those of Japan throughout the surveyed period, and again the gap has been widening since 1995.

These analyses show that, even when the differences in scale of the two countries' economies are considered, Japan's investment in IT is lagging far behind the level in the U.S.

Table 1 Trends in IT investment in Japan

(Unit: billion yen)

Japan (price in 1990)	Real GDP	Total real capital investment by the private sector	Total real investment in IT by the private sector	Index (1990 = 100)	Ratio of IT investment to GDP (%)	Ratio of IT investment to total private-sector capital investment (%)
1990	429,985.5	83,080.7	6,101	100	1.4	7.3
1991	446,315.1	88,337.8	6,424	105.3	1.4	7.3
1992	450,876.5	83,384.8	5,682	93.1	1.3	6.8
1993	452,281.5	74,840.3	6,460	105.9	1.4	8.6
1994	455,197.3	70,838.6	7,342	120.3	1.6	10.4
1995	461,893.5	74,517.0	9,256	151.7	2.0	12.4
1996	485,219.0	82,943.1	10,361	169.8	2.1	12.5
1997	492,141.9	88,818.3	11,125	182.3	2.3	12.5

Table 2 Trends in IT investment in the U.S.

(Unit: billion dollars)

U.S. (price in 1992)	Real GDP	Total real capital investment by the private sector	Total real investment in IT by the private sector	Index (1990 = 100)	Ratio of IT investment to GDP (%)	Ratio of IT investment to total private-sector capital investment (%)
1990	6,136.3	585.2	77.89	100	1.3	13.3
1991	6,079.4	547.7	78.29	100.5	1.3	14.3
1992	6,244.4	557.9	91.38	117.3	1.5	16.4
1993	6,389.6	600.2	102.51	131.6	1.6	17.1
1994	6,610.7	648.4	120.86	155.2	1.8	18.6
1995	6,761.7	710.6	162.64	208.8	2.4	22.9
1996	6,994.8	776.6	219.86	282.3	3.1	28.3
1997	7,269.8	859.4	291.26	373.9	4.0	33.9

Sources: MPT; "Input-Output Tables," Management and Coordination Agency; "Input-Output Tables (linked tables)," MITI; "Annual Report on National Accounts (New SNA)," Economic Planning Agency; "Survey of Current Business," U.S. Department of Commerce

II-9-2 Household use of IT

(1) Outline

More than half the households in Japan use cellular telephones.

MPT's "Communications Usage Trend Survey (Household Section)," shows that the penetration rate of info-communications equipment in each household in Japan has been rising in recent years, as well as the subscription rate for communications

services. The household penetration rate of cellular telephone in particular has been increasing rapidly. In fiscal 1998, the rate reached 57.7%. One out of two households have at least one cellular phone.

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Fig. 1 Percentage of Japanese households using info-communications equipment

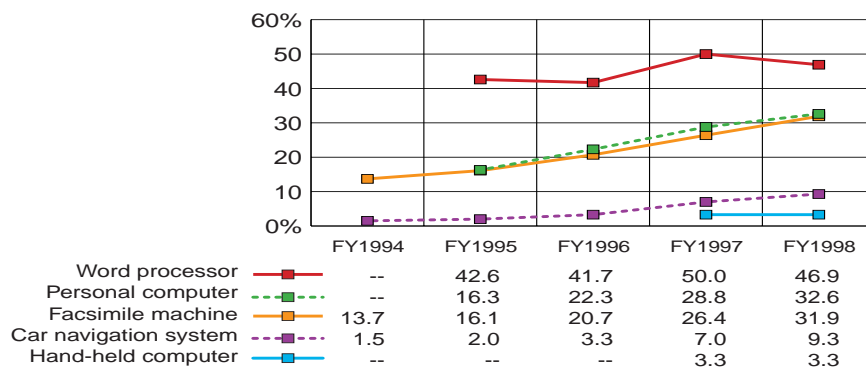
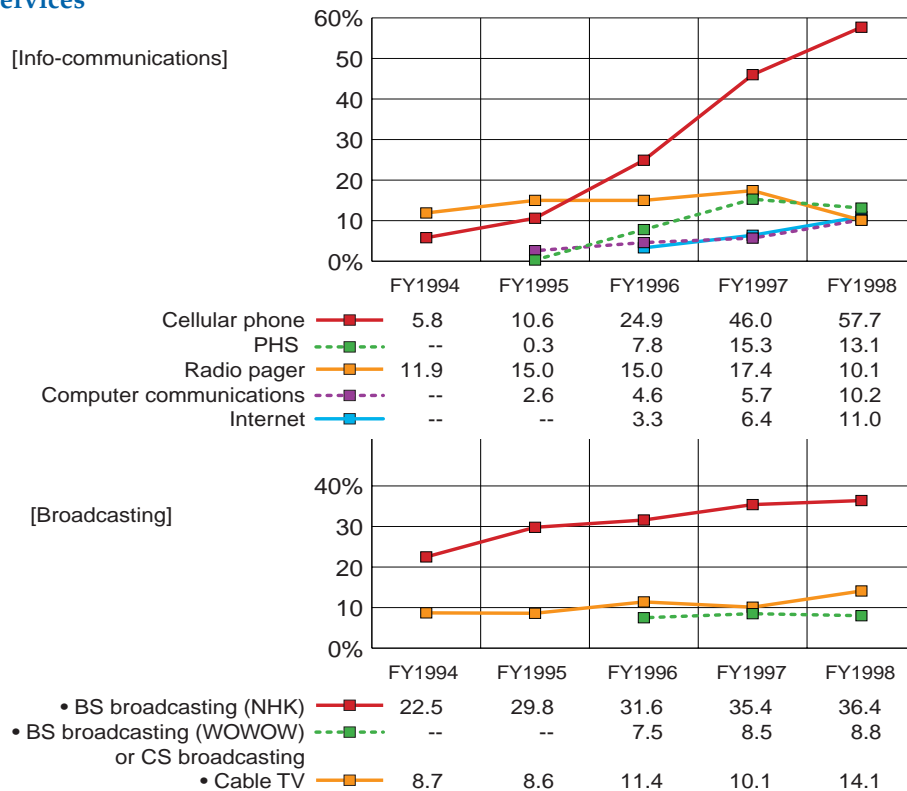


Fig. 2 Percentage of Japanese households subscribing to communications services



Source: "Communications Usage Trend Survey (Household Section)," MPT

Related site: "Communications Usage Trend Survey (Household Section)" (<http://www.zaimu.mpt.go.jp/tokei/>)

(2) Household spending on info-communications

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Use of info-communications technology

The average annual expenditures for subscriber telephones decreased in fiscal 1998 from the previous fiscal year.

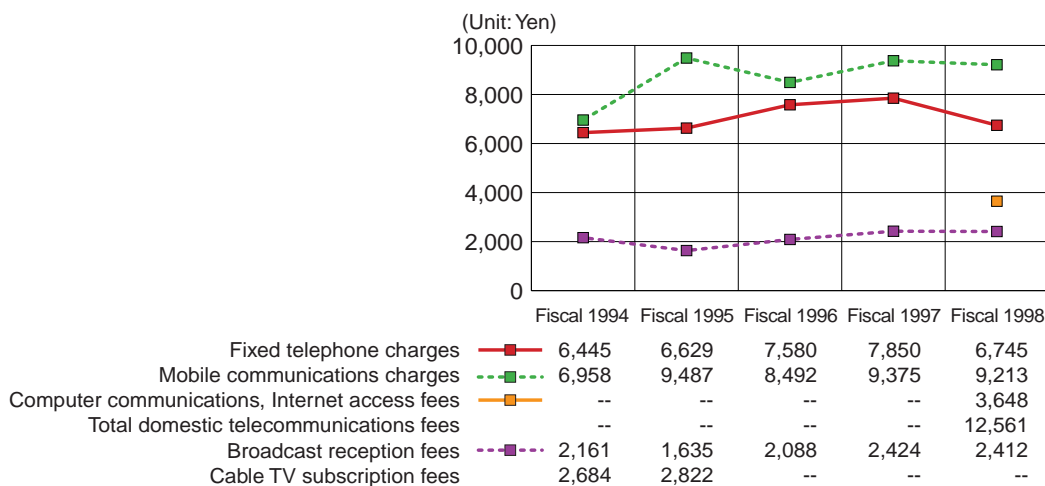
According to MPT's "Communications Usage Trend Survey (Household Section)," the average annual spending on communications and broadcasting services by Japanese households has remained at a similar overall level for several years (Fig. 1).

The most expensive communications charges are for mobile communications, and they fluctuated around 9,000 yen a month, following a rapid rise

between fiscal 1994 and fiscal 1995. After hitting a peak in fiscal 1997, there was a fall in average spending per household on subscriber telephone services, amid increasing market competition.

According to MPT's "Surveys on the Use of Telecommunications Equipment," users for non-NTT carriers' subscriber telephone services exceeded 60% (Fig. 2).

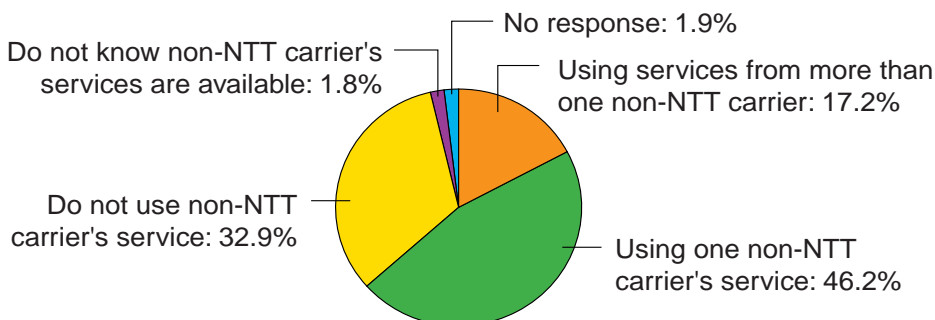
Fig. 1 Average monthly spending on telecommunications and broadcasting services



- Notes: 1. Figures indicate expenditures in the month just before the survey, divided with the number of user households.
- 2. Figures for the mobile communications fees consist of call and usage fees (excluding initial subscription fee):
 Fiscal 1994-1995: cellular telephones/car phones and radio pagers,
 Fiscal 1996-1998: cellular telephones/car phones, PHS and radio pager.
- 3. Figures for computer communications and Internet access fees indicate monthly basic fee (excluding call fees).
- 4. Figures for broadcast reception fees are as follows:
 Fiscal 1994-1995: reception fees charged by NHK and by satellite broadcasting companies (excluding cable TV subscription fees)
 Fiscal 1996-1998 reception fees charged by NHK, by satellite broadcasting companies, and by cable TV companies.

Source: "Communications Usage Trend Survey (Household Section)," MPT

Fig. 2 Percentage of Japanese households using non-NTT services for subscriber telephones (fiscal 1998)



Source: "Survey on the Use of Telecommunications Equipment," MPT

(3) Relation between IT spending and total household expenditure

Despite the economic gloom, spending on communications has maintained its share of Japanese household spending.

The following is an analysis, based on the "Family Income and Expenditure Survey" by the Management and Coordination Agency, on trends in expenditures on info-communications (Refer to Endnote 19) among each household living expenditures, aimed at clarifying the relationship between recent economic conditions and expenditures on info-communications:

The survey showed that, during 1994, shortly after the burst of Japan's "bubble economy," household spending continued to rise on both info-communications and in total. From 1995 overall household spending remained at the same level or fell, as Japan entered the current recession with its de-

pressed consumption figures (Fig. 1). However, over the same period, household spending on info-communications expanded, despite the recession.

Since 1994, the ratio of spending on info-communications among total household living expenses has been increasing, even in years when total spending dropped. In 1998, the ratio reached 3.6% (Fig. 2).

It should be noted that the increase since 1995 in expenditure on info-communications can be attributed to an increase in spending on mobile telephone services amid the rapid expansion of cellular phone subscriptions (Fig. 3).

Fig. 1 Trends in household spending on info-communications and total living expenses (average for each quarter, with the first quarter of 1994 =100)

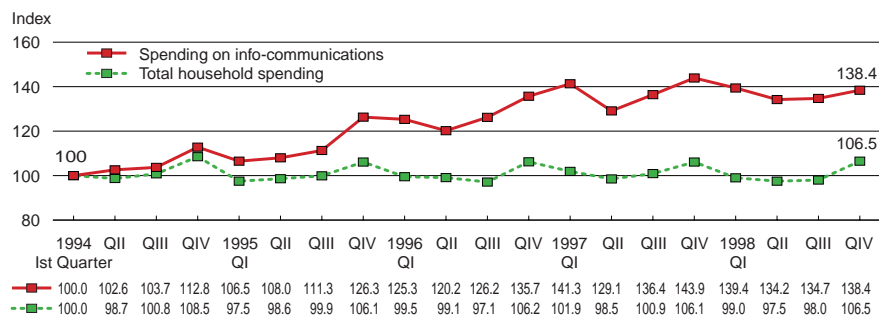


Fig. 2 Total household spending and ratio of spending on info-communications (monthly average through a year)

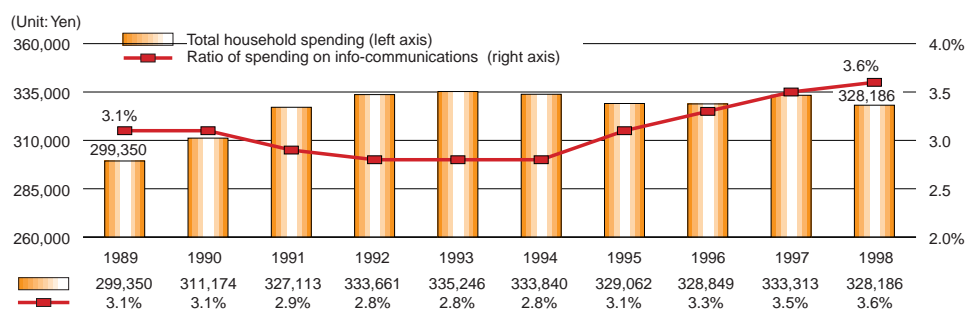
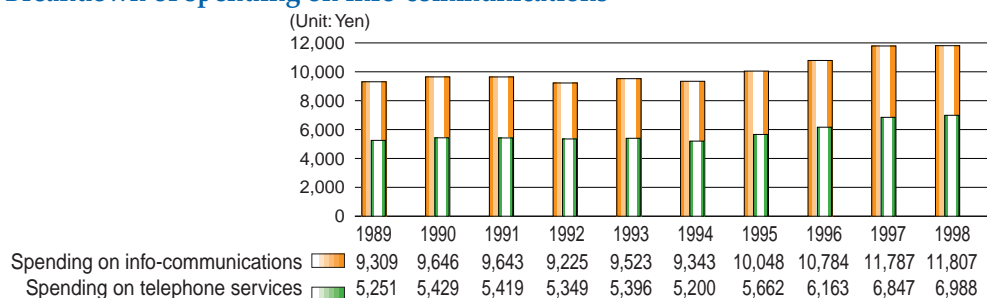


Fig. 3 Breakdown of spending on info-communications



Source: "Family Income and Expenditure Annual Report" and "Family Income and Expenditure Survey," Management and Coordination Agency

Column 2 High-speed transmission technology

Realization of new technologies such as WDM will enable high-speed transmission.

Amid the rapid increase in the number of Internet users, various technologies are being adopted to deal with the pressing need to successfully handle growing communications traffic (Refer to I-5-3-(1)). Transmission technology that uses fiber-optic networks is an important key to improving the reliability of network technologies overall.

In the 1980s, developments in optical fiber technology led to the achievement of transmission loss below 0.2 dB/km. This figure means that the strength of light beams attenuates by half after traveling about 15 km through optical fibers, due to transmission loss. Since then, however, no major breakthroughs have been made in optical fiber technology.

Research and development efforts are under way to lower the transmission loss in non-silica optical fibers. Nonetheless, the best result obtained so far has not improved on the level achieved in silica optical fibers; therefore, use of silica fibers is expected to continue for a the time being.

With today's technology, one cable can house up to 1,000 optical fibers. However, it is a different story with submarine cables: they can house a maximum of only 8 fibers, because of some limitations associated with cable laying procedures and the size of submarine optical repeaters.

It is therefore essential to develop technologies that enable high-speed transmission for longer distances without adding more fibers inside cables. At present, Wavelength Division Multi-

plexing (WDM) and optical soliton technologies are regarded as a solution to the recent increase in communications traffic. Research and development efforts are under way for both technologies.

WDM enables multiple optical signals with different wavelengths to be transmitted over one optical fiber (Fig. 1). Without WDM technology, each optical fiber can transmit a maximum of 2.5 to 10 Gbps, but when four different wavelengths are multiplexed using this technology, the fiber can transmit 10 to 40 Gbps. Realization of 160 Gbps transmission, by multiplexing 16 10-Gbps signals with different wavelengths, is now close at hand.

Optical soliton technology, on the other hand, enables long-distance transmission by using thin and sharp optical pulses (Fig. 2). These pulses allow the retention of original waveforms by minimizing deterioration of optical signals. In theory, the 20 to 100 Gbps/20,000 km level can be achieved.

With the combined use of both technologies, a transmission capacity of 400 Gbps over one optical fiber has been achieved experimentally. For this, twenty 20-Gbps optical soliton signals with different wavelengths were multiplexed on one optical fiber. Furthermore, research has also been conducted Dense WDM (DWDM) technology, which multiplexes several thousand wavelengths in a single optical fiber. This technology is expected to be put into commercial use in the near future as a method of alleviating the shortage of network capacity.

Fig. 1 WDM transmission

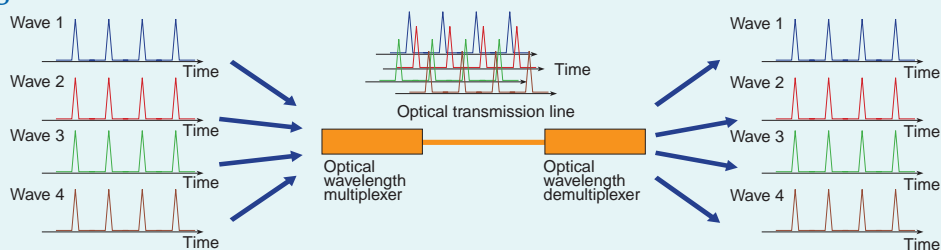
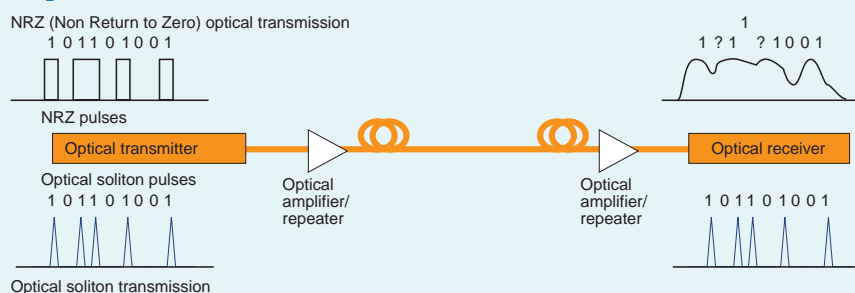


Fig. 2 Optical soliton transmission



II-9-3 Individual use of IT

(1) Outline

IT equipment is becoming an individually-held item, in addition to being a household item.

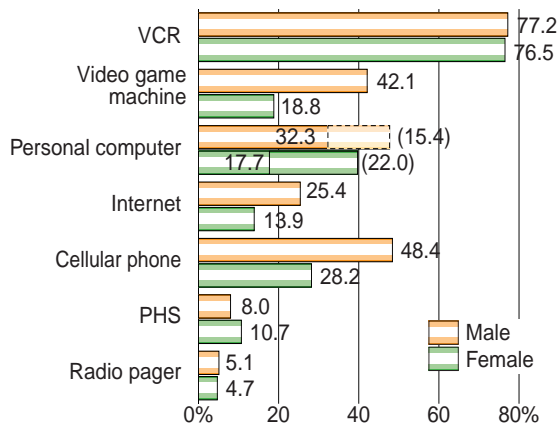
The ownership and usage of info-communications equipment by individuals was analyzed in MPT's "Survey on the Use of Telecommunications Equipment." This yielded the following results:

1. Individual ownership and usage by gender and age

The report revealed that men in Japan own or use

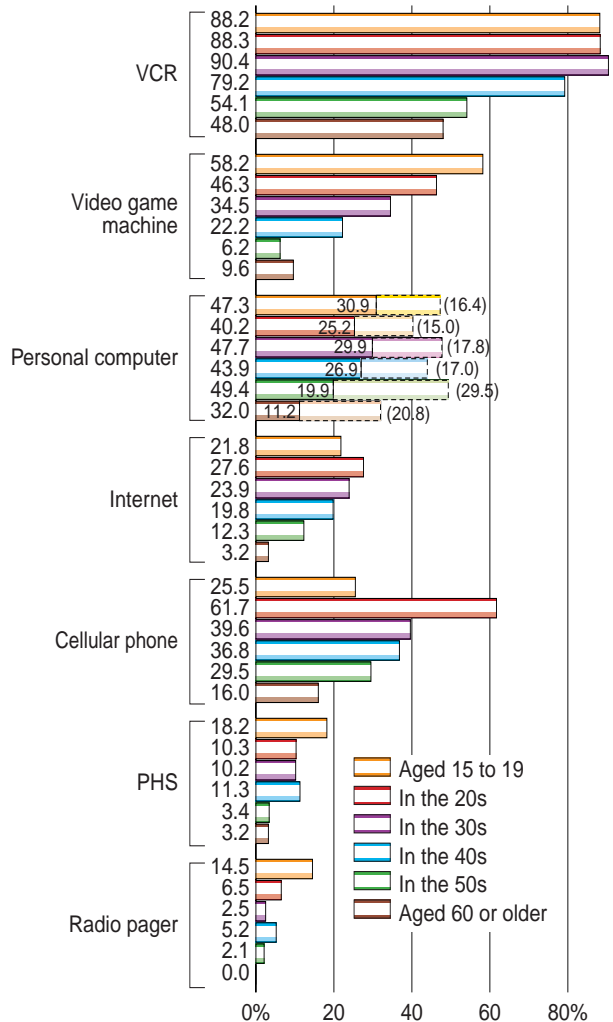
video game machines, computers, the Internet and cellular phones at least 1.5 times more than women (Fig. 1). By age, people aged 15 to 19 and in their 20s are most likely to own or use and the figures decline as the age increases. Regarding cellular phones and the Internet, ownership and usage rates were highest for people in their 20s, with 61.7% of those surveyed owning cellular phones (Fig. 2).

Fig. 1 Individual ownership and use info-communications equipment (by gender)



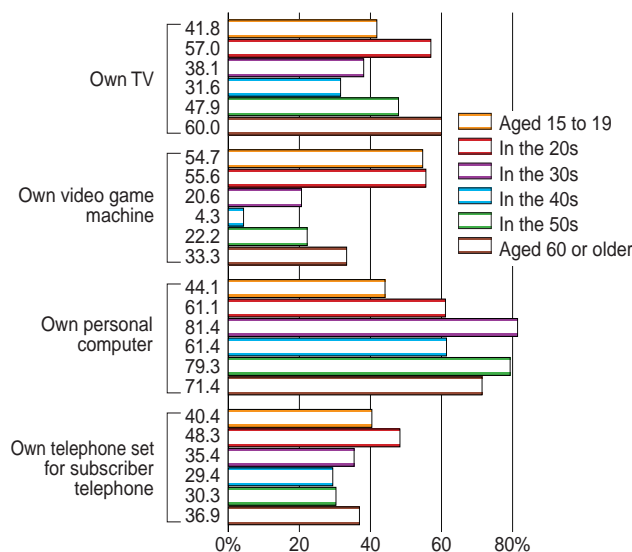
Note: Solid line graph indicates ratio using personal computers at home; and the dotted line graph indicates ratio holding personal computers at home but not using them.

Fig. 2 Individual ownership and use info-communications equipment (by age)



Note: Solid line graph indicates ratio using personal computers at home; the dotted line graph indicates ratio holding personal computers at home but not using them.

Fig. 3 Rate of people owning their own info-communications equipment



Source: "Survey on the Use of Telecommunications Equipment," MPT

2. Rates of people having their own info-communications equipment

Info-communications equipment at home are not only jointly used by the family, but also used by a certain member of the family. Among all info-communications equipment, personal computers are the most frequently used by individuals. Of all home personal computer users in their 30s, 81.4% had their own personal computers at home. The personal computer tends to be held personally.

3. Penetration rate of mobile communications terminals and intention to own such terminals

Regarding the penetration rate of mobile communications terminals and intention to hold such terminals, especially young people aged 15 to 19

strongly desire to hold mobile communications terminals including cellular phones, PHS and radio pagers. It is expected that subscribers of such terminals will expand in the future, particularly among young people.

4. Burden of cellular phone charges

An analysis on cost burden of cellular phone services, rapidly expanding within the youth community, shows that 60.7% of the cellular phone subscribers aged 15 to 19 who tend to live with their family paid for their telephone bills by themselves (Fig. 5). The figure indicates that cellular phones are owned individually. It is expected that in mobile communications expenditures, users may select service prices through their own volition.

Fig. 4 Penetration rate of mobile communications devices and intention to own such devices

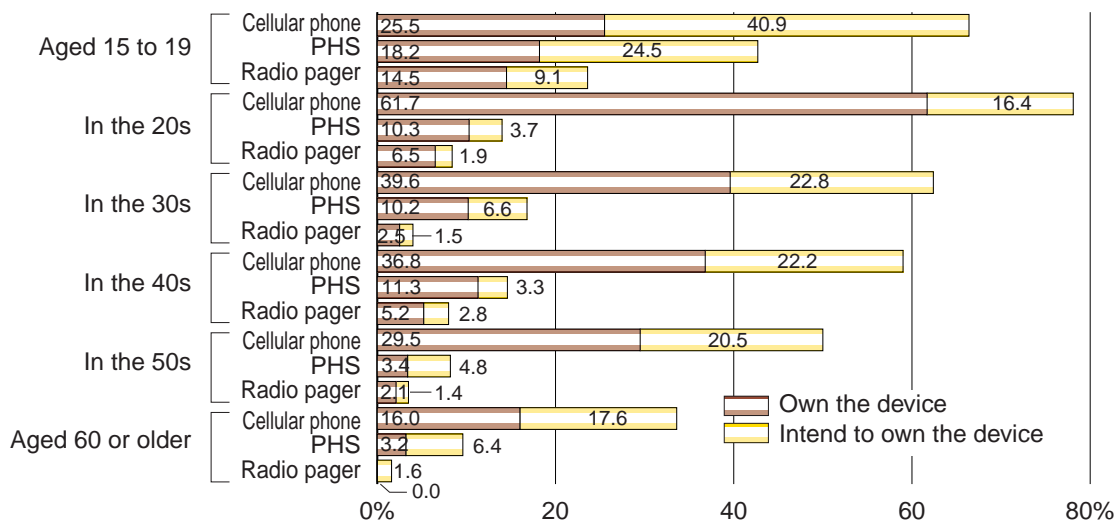
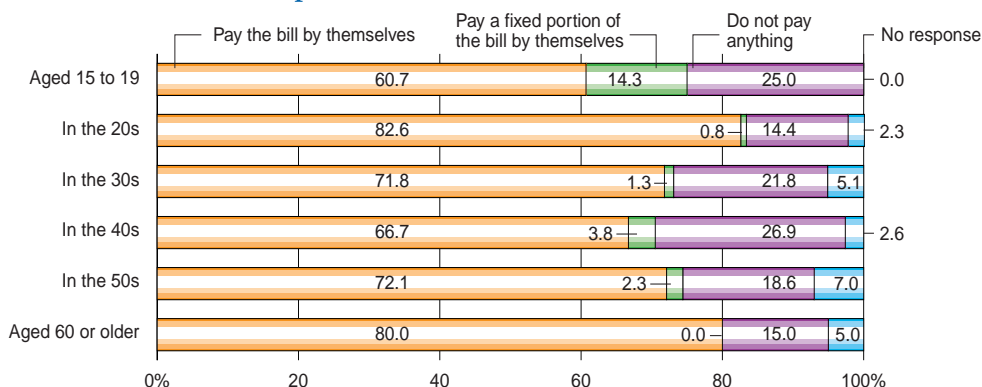


Fig. 5 Cost burden of cellular phone services



Source: "Survey on the Use of Telecommunications Equipment," MPT

(2) Living space

Younger generation tends to use info-communications equipment at their own rooms.

An analysis based on MPT's "Survey on the Use of Telecommunications Equipment" and other sources indicates that 42.1% of owners of personal computers and 40.4% of subscribers to cellular phones use them in their own rooms within a household, rather than in communal living rooms (Fig. 1). Among those surveyed, computers were the equipment that was most likely to be used mainly by one individual within a household.

Most people reported that they used cellular phones on the move. The largest percentage of subscribers mainly using their cellular phones in their

own rooms at home were subscribers aged 15 to 19 (Fig. 2).

The analysis showed that television sets are usually sited in a communal room of a household, where they are watched by people of all ages in a family. Regarding subscriber telephones, however, there was a marked tendency for younger age groups to have individual use of a subscriber telephone in their own rooms. More than a third of respondents in their 20s and almost half of those aged 15 to 19 said that they had such phones, which were additional to the subscriber phone used by the

Fig. 1 Ratio of people using info-communications equipment at their own rooms (excluding one-person households)

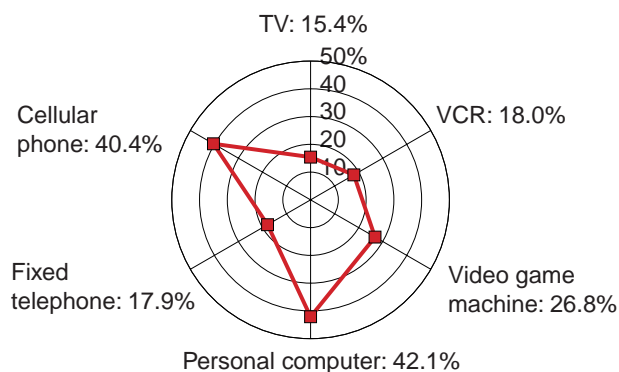
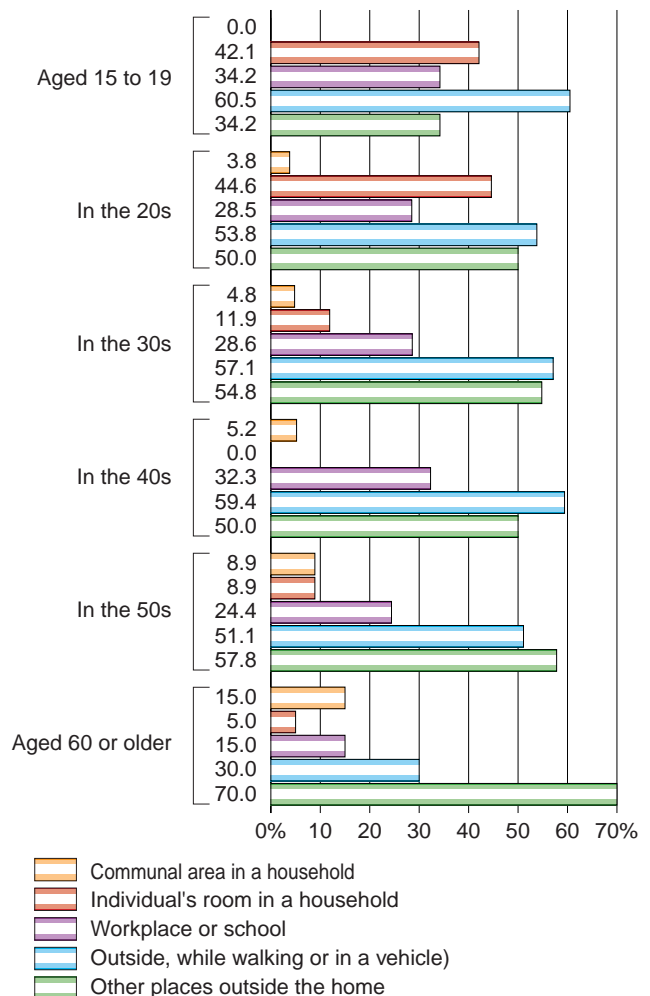


Fig. 2 Major sites of cellular phone use (multiple replies possible) (excluding one-person households)



Source: "Survey on the Use of Telecommunications Equipment," MPT

household as a whole (Fig. 3). This reflects the tendency, referred to in the previous section, toward individual use of info-communications equipment, especially among younger people.

The greater use of mobile phones is indicated by the 78.4% of respondents who said they make phone calls while walking outside the home, as well as the 58.8% who said they use phones any-

where. At the same time, however, it is clear that people are becoming more aware of problems associated with the use of mobile phones. According to MPT's "Communications Usage Trend Survey (Household Section)," many people now consider that there should be certain restrictions placed on the use of mobile communications devices in some places.

Fig. 3 Location and usage of TVs and subscriber telephones (excluding one-person households)

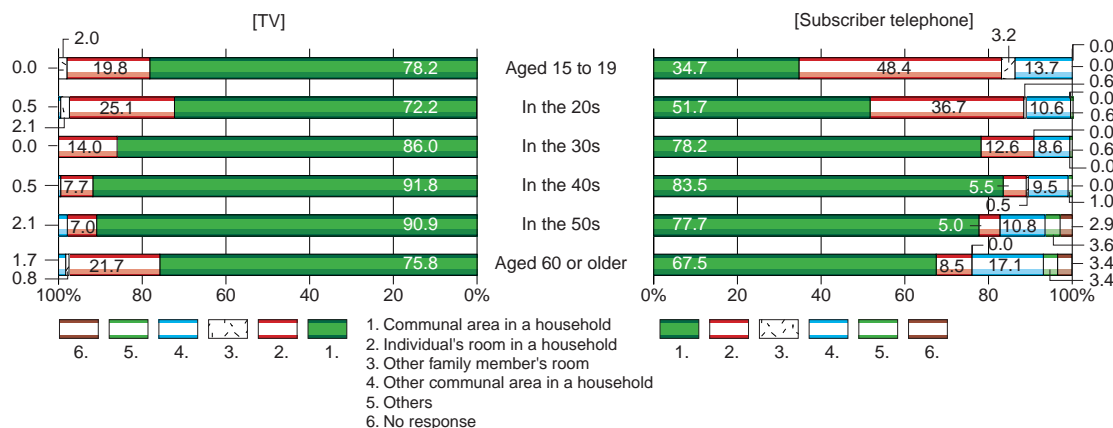
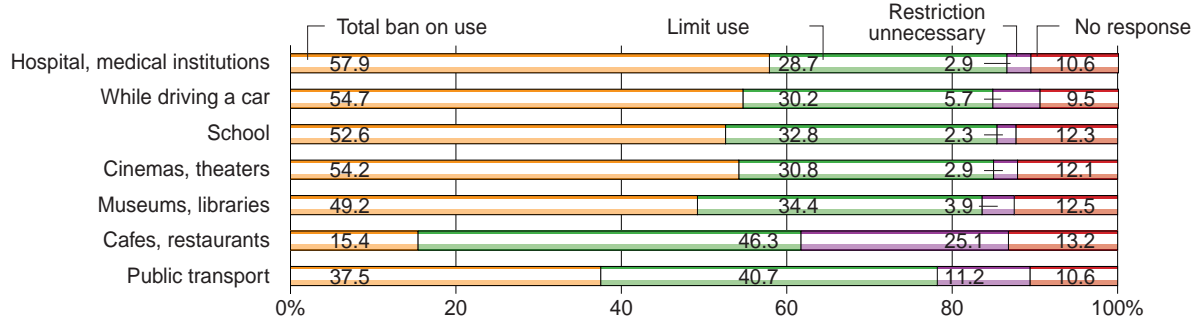
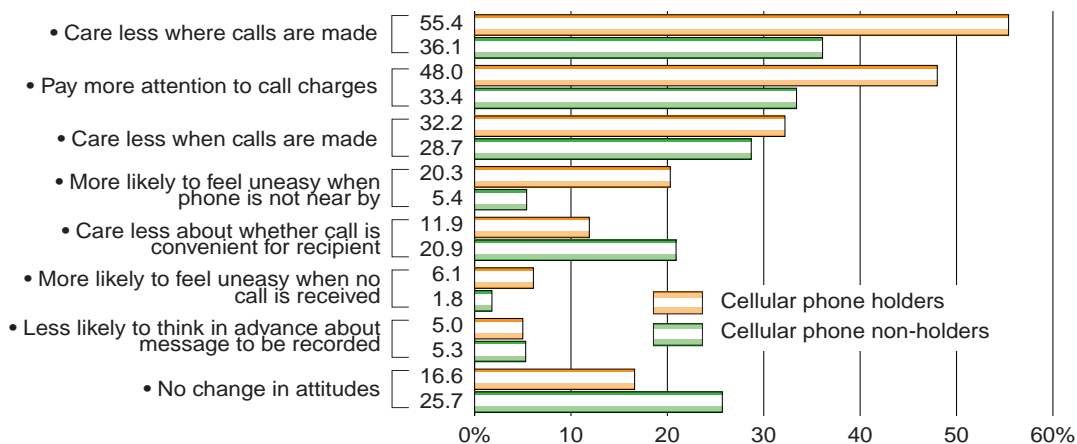


Fig. 4 Opinions on restricting cellular phone and other mobile phone use



Source: "Communications Usage Trend Survey (Household Section)," MPT

Fig. 5 Changes in consciousness for using the telephone due to expansion of cellular phone or other mobile communications terminals



Source: "Survey on the Use of Telecommunications Equipment," MPT

(3) Lifestyle

Younger people spend less time watching TV than older people, and more on using other types of info-communications equipment.

In order to examine the impact of the spread of info-communications equipment on people's lifestyles, the average amount of time people spend each week on using various equipment was analyzed, using MPT's "Survey on the Use of Telecommunications Equipment" and other sources.

Combining the surveys figures on use of info-communications equipment with the weekly hours of "free time" reported in NHK's survey of "Japanese Time Use" (Refer to Endnote 20), reveals that a significant part of people's free time was spent in front of a screen of some type, even when they were doing other things as well (Fig. 1)

Especially the younger generation tends to watch screens upon using VCR, video game machine and

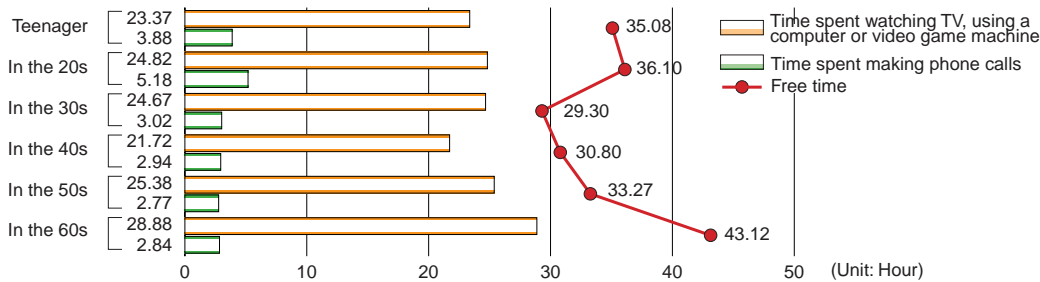
personal computer rather than TV longer than the older generation; the younger generation also tends to watch TV shorter time than the older generation (Fig. 2).

The surveys also reveal that Internet users spend the time online that they used to allocate to watching television (Fig. 3).

Regarding the time spent on phone calls, the total duration of those made by people aged 15 to 19 and in their 20s was larger than that of calls made by older people, especially for calls made by cellular phone or PHS. People in their 20s spent a total of 5.47 hours on phone calls each week, nearly twice as long as people in their 60s (Fig. 4).

MPT's survey also showed that subscribers to

Fig. 1 Weekly free time, and time spent on using info-communications equipment



Note: Figures for teenagers include people aged 16-19 for "free time" and 15-19 for use of info-communications equipment
Sources: "Japanese Time Use," NHK; "Survey on the Use of Telecommunications Equipment," MPT

Fig. 2 Hours per week spent using computers, video game machines, TVs or video recorders

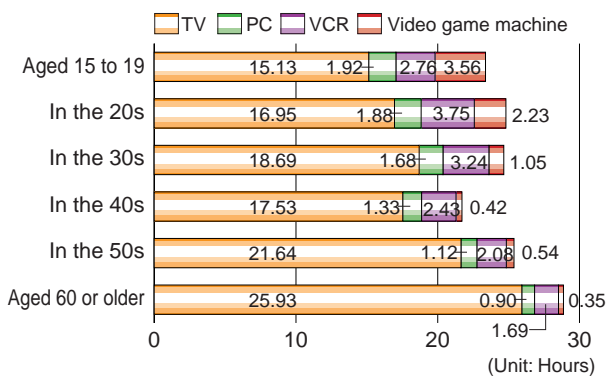
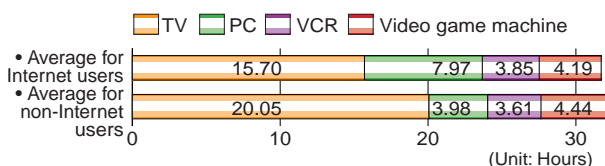


Fig. 3 Comparison of equipment use between Internet users and non-users (Internet usage hours per week)



Source: "Survey on the Use of Telecommunications Equipment," MPT

Fig. 4 Time spent on the telephone per week

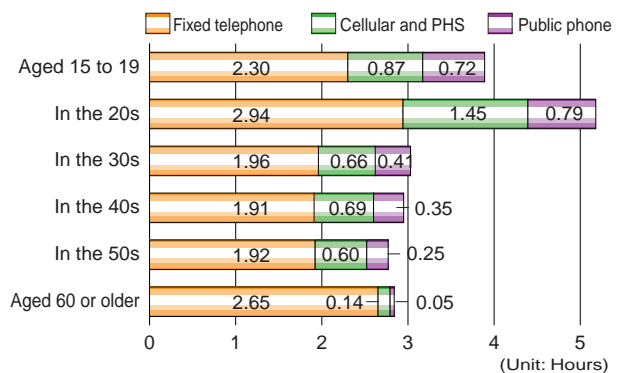
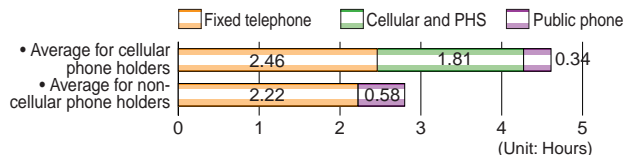


Fig. 5 Comparison of telephone use between mobile phone subscribers and non-subscribers



mobile phone services spend about 50% longer on phone calls each week than non-subscribers, even including usage of subscriber telephones (Fig. 5). A further comparison between usage of mobile and subscriber phones revealed the following:

1. Frequency of usage

In the case of mobile phones, the number of outgoing calls is larger than incoming calls. However, the position is reversed for subscriber telephones. Among female users, there is no difference in how often mobile or subscriber phones are used, but among men, usage of mobile phones once or more a day is double the figure for subscriber phones (Fig. 6).

In addition, with the rapid expansion of mobile phone usage among younger people, not only do they make more calls from such devices than older generations; their rate of outgoing calls by mobile

phone is twice that of subscriber telephones (Fig. 7).

2. Call duration

There is no gender difference in the average total duration of mobile phone calls per week. However, in case of subscriber phones, the total weekly duration of calls by female users was much longer than that of male users, probably due to differences in the amount of time spent at home (Fig. 8).

The average duration of each call by subscriber telephone was longer than that of calls by mobile phones. Women made longer calls than men by both subscriber and mobile phone (Fig. 9), and younger people made longer calls than older people. For all age groups, the duration of calls made by subscriber telephone was about twice as long as those made by mobile phone (Fig. 10).

Fig. 6 Daily telephone usage, by gender

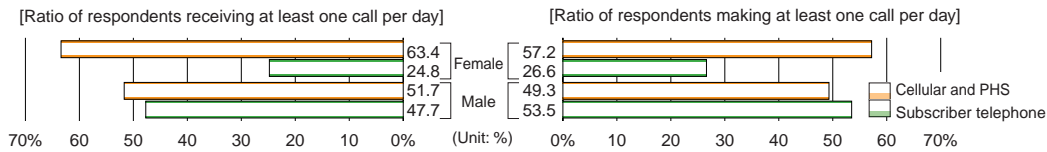


Fig. 7 Ratio of respondents making at least one call per day, by age

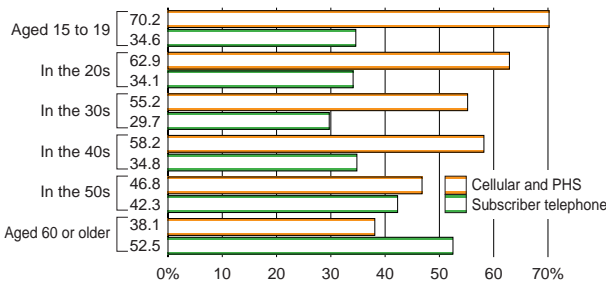


Fig. 8 Average total call duration per week

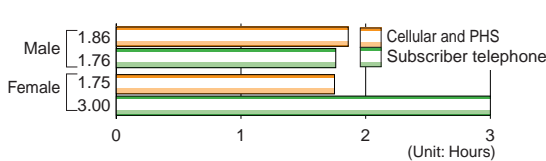


Fig. 9 Average duration per call, by gender

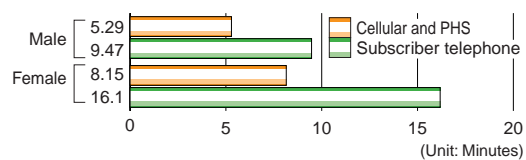
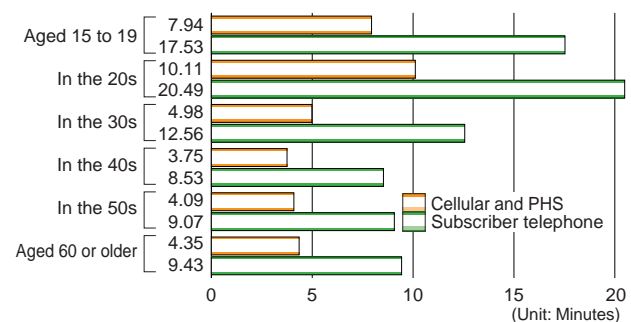


Fig. 10 Average duration per call, by age



Source: "Survey on the Use of Telecommunications Equipment," MPT

(4) "Churn" phenomenon

Younger generation tends to change services of mobile communications.

As the mobile communications market for individuals expands, services and equipment functions improve, while price competition becomes heated, users tend to switch fairly frequently from one service to another in the so-called "churn" phenomenon. In their search for higher quality and lower prices, users may typically switch from radio pager to PHS, and from PHS to a cellular phone, or choose a different firm to provide the service (Fig. 1).

The term "churn" phenomenon originated in the U.S., where there has been intense competition in telecommunications services for individuals, including long-distance phone services, leading customers to cancel their service contracts early and move to another carrier that seems to offer a better deal. This tendency has seen as causing serious managerial problems which can have a major impact on a carrier's business.

In the Japanese mobile communications industry, the monthly churn rate (or rate of cancellation of

contracts among the total number of subscriptions, except for changes in types of terminal) is said to be around 3%. According to MPT's "Survey on the Use of Telecommunications Equipment," the most common reason cited by users for changing their carriers was coverage area (Fig. 2). However, since the differences in the coverage areas of operators are narrowing, it is expected that users will pay more attention in future to the level of call charges, as well as the price of equipment and its design, weight and size.

To try to prevent the churn phenomenon, carriers have taken measures such as introducing long-term contracts and value-added services, such as transmission of text messages. However, it is difficult for a company to differentiate itself from competitors who may also quickly introduce similar services. As a long-term measure, operators may make efforts to improve their brand image and encourage customer loyalty.

Fig. 1 The churn phenomenon -- cause and effect

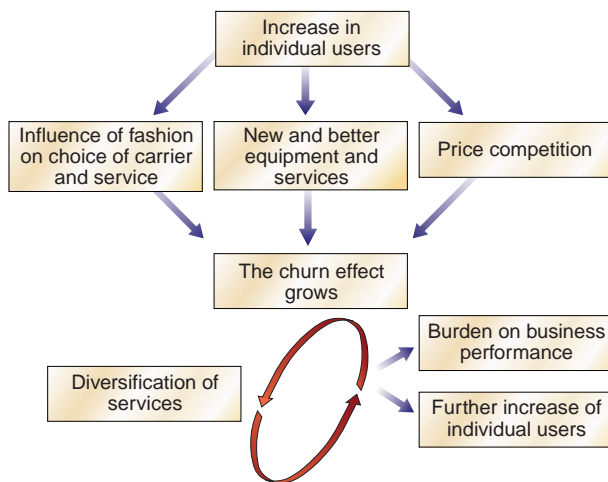
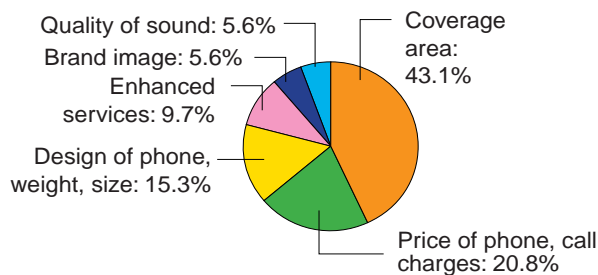


Fig. 2 Users' main reasons for changing carrier

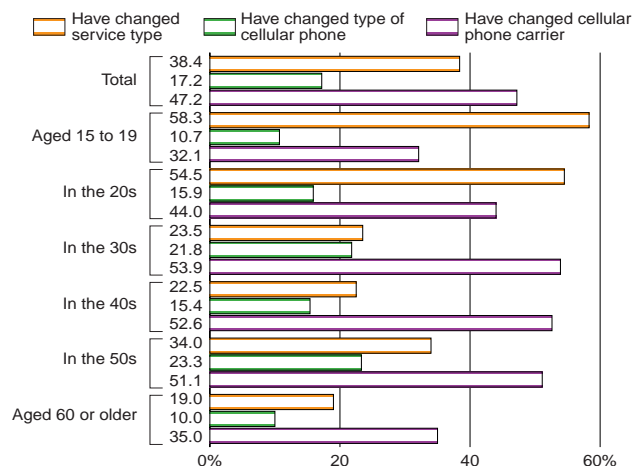


Source: "Survey on the Use of Telecommunications Equipment," MPT

Table Churn phenomenon from the perspective of consumer behavior

Consumer behavior	Example
Churn with cancellation of contract	
Changes in service type	<ul style="list-style-type: none"> • Cancellation of radio pager contract with operator A ➔ Subscribe PHS service with operator B • Cancellation of PHS contract with operator B ➔ Subscribe cellular service with operator C
Changes in operators	<ul style="list-style-type: none"> • Cancellation of PHS contract with operator B ➔ Subscribe PHS service with operator B' • Cancellation of radio pager contract with operator A
Churn without cancellation of contract	
Changes in type of terminals	<ul style="list-style-type: none"> • Cellular terminal (type D of operator C) ➔ Cellular terminal (type E of operator C)

Fig. 3 Percentage of mobile communications users contributing to the churn phenomenon



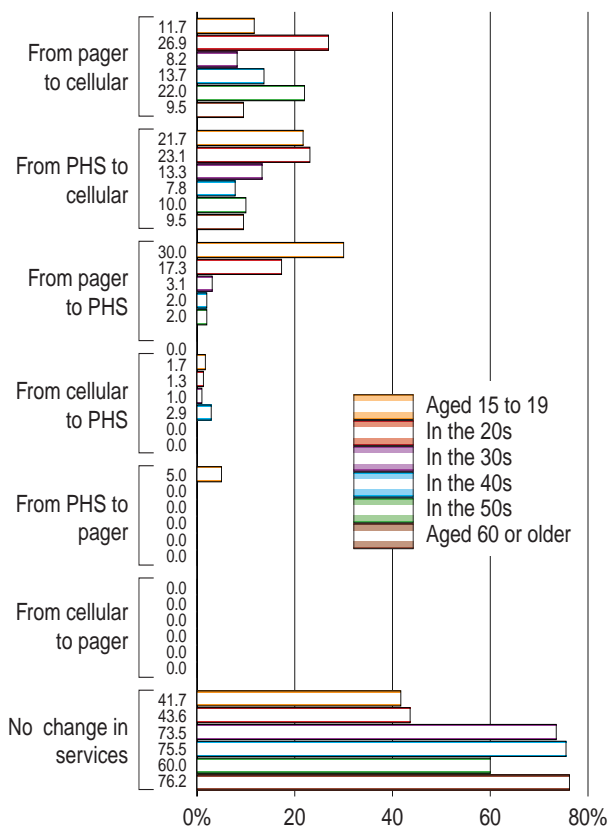
An analysis of the churn phenomenon among cellular phone services, including changes in model of terminal, in the "Survey on the Use of Telecommunications Equipment" found that, while keeping the same carrier, nearly half of all subscribers surveyed had changed the type of equipment used, and 38.4% had changed the type of service they used, such as from radio pager to PHS. Only 17.2% had changed their carrier. By age, users aged 15 to 19 and in their 20s changed service types at a relatively high rate (Fig. 3).

1. Changes in service type

Most changes in service type were from radio pager to PHS or cellular phone, or from PHS to cellular phone, reflecting the general trend towards a decrease in the numbers of radio pager and PHS subscribers. By age, changes made by people aged 15 to 19 were most often from radio pager to PHS, while those made by people in their 20s were to cellular phones from either radio pagers or PHS (Fig. 4).

2. Changes in cellular phone carrier

Fig. 4 Direction of changes in service by mobile communications users



The survey also revealed that 36.4% of the users who had subscribed to cellular phone services for three years or longer had changed their carrier at least once. Meanwhile, 29.4% of subscribers who had used a cellular phone for only six to twelve months planned to change their carrier (Fig. 5).

3. Changes in type of cellular phone

Among people who had subscribed to cellular phone services for three years or longer, 85.2% had changed the type of phone they used, as well as nearly half those who had subscribed for 12 - 24 months. However, only 10% of people who had used a cellular phone for 6 - 12 months had changed models. These figures suggest that users start thinking about getting a new phone about one year after they begin subscribing (Fig. 6), at around the same time when many also consider changing their carrier.

Operators have confirmed that when new types of equipment and services are introduced, more people change their phones and, when doing so, they also tend to change carrier.

Fig. 5 Changes in carrier by cellular phone users (by length of service use)

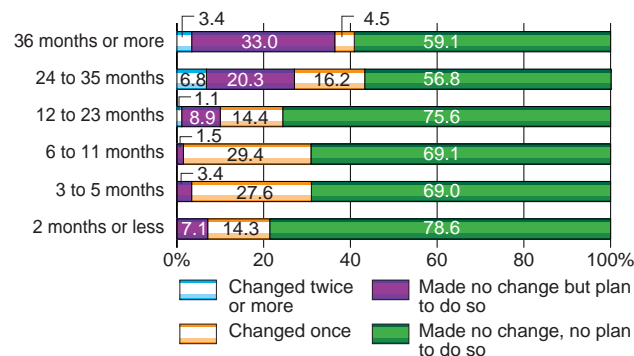
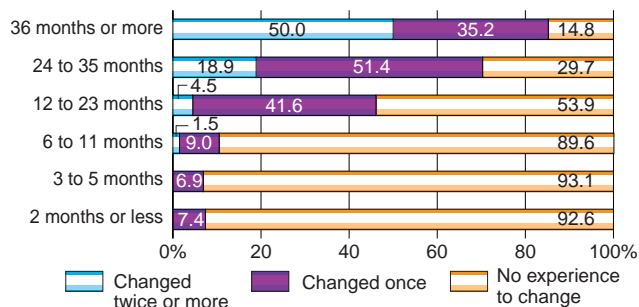


Fig. 6 Changes in type of terminal by cellular phone users (by length of service use)



Source: "Survey on the Use of Telecommunications Equipment," MPT

II-9-4 Introduction of IT into public sector

(1) Central government ministries and agencies

Almost every worker at ministries and agencies has a computer on the desk, and 92.6% of the computers are connected to LANs.

According to the "Basic Survey on Administrative Informatization in fiscal 1998," compiled by the Management and Coordination Agency, as of April 1998 a total of 230,066 computers, up 23.8% from the previous fiscal year, were in use at 25 ministries and agencies, including external organizations. Among them, 43,702 computers, up 2.9% from the previous fiscal year, were at internal ministerial organs.

These figures indicate how growth in the number of computers is shifting to external organizations as well as attached organizations and facilities, since there are already 0.86 computers per official at internal bureaus and departments, and the goal of one per official will soon be achieved. Meanwhile, the ratio of computers to officials is 0.51 at central governmental ministries and agencies as a whole (Table and Fig.).

At internal bureaus and departments 92.6% of computers are connected to LANs. In other words, networks linking all computers have been almost completed. The Kasumigaseki WAN, which links the LANs in each ministry and agency, was launched in January 1997 according to the "Basic Plan for Promoting Administrative Informatization" decided by the Cabinet in December 1994. As of February 1999, in addition to 31 national organizations which from the beginning had planned

to join the network, five other organizations had also done so: the Financial Supervisory Agency; the Network of Local Finance Bureaus of the Ministry of Finance (Kanto Finance Bureau); the Printing Bureau of the Ministry of Finance; the National Diet Library (network linking the libraries of each ministry and agency), and the Japan Institute of Labor, a special corporation under the Ministry of Labor.

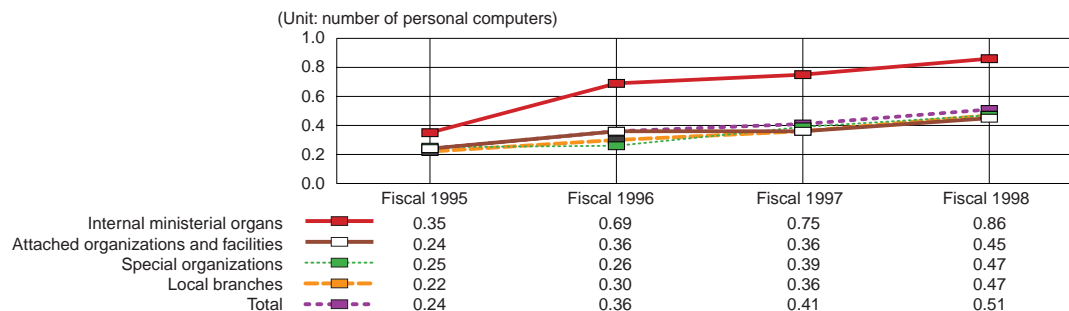
In fiscal 1998, new operations were launched on the Kasumigaseki WAN, such as a database for white papers and other official documents, as well as the National Diet Library Network linking its headquarters and branches. In addition, the Statistical Information Database System and the Common Information Retrieval System, which the Administrative Management Bureau of the Management and Coordination Agency used to provide for each ministry and agency through its exclusive network, started being provided through the Kasumigaseki WAN.

The very popular Common Information Retrieval System is used to refer to statutes but, in the past, it could only be accessed from a limited number of terminals during limited hours. Due to the new arrangement, officials, who mostly have their own computers, can now access the system round the clock and productivity has been improved.

Table Number of personal computers used at central governmental ministries and agencies

Category	Internal bureaus and departments	Attached organizations and facilities	Special organizations	Regional branches	Total
Number of computers installed in fiscal 1998	43,702	50,287	31,016	105,061	230,066
Number of computers installed in fiscal 1997	(42,457)	(39,388)	(24,625)	(79,344)	(185,814)
Number of officials in fiscal 1998	50,951	111,138	66,342	223,384	451,815

Fig. Number of personal computers per official at central governmental ministries and agencies



Note: Excluding computers at national schools under the jurisdiction of the Ministry of Education, due to the difficulty in defining those solely for staff use, rather than for students

Source: "Basic Survey on Administrative Informatization in fiscal 1995 to 1998," Management and Coordination Agency

Related site: "Basic Survey on Administrative Informatization in fiscal 1998" (<http://www.somucho.go.jp/gyoukan/kanri/gyou9821.htm>)

(2) Local government

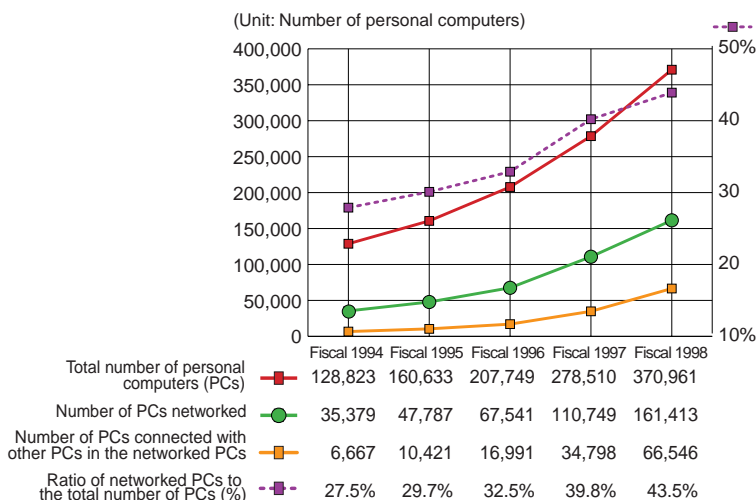
By networking personal computers, informatization of administrative jobs has been further promoted.

According to the "Survey on the Use of IT by Administrative Workers" compiled by the Ministry of Home Affairs a total of 370,961 personal computers, up 33.2% from the previous fiscal year, were in use at local government offices around Japan as of April 1998. Among them, 161,413 computers were linked with local area networks. Due to the expansion of LANs, as well as greater use of e-mail and "electronic sanction," an increasing number of local public bodies have been able to improve their

efficiency (Fig. 1 and Table).

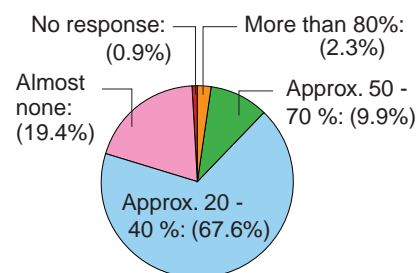
On the other hand, according to MPT's "Survey of IT usage by local public bodies," a mere 2.3% of the local governments have allocated computers to 80% or more of their officials. The figure indicates how far the use of computers at local public bodies lags behind usage at central government ministries and agencies, where almost every official has a computer (Fig. 2).

Fig. 1 Trends in the number of computers at local government offices



Source: "Survey on the Use of IT by Administrative Workers," Ministry of Home Affairs

Fig. 2 Percentage of staff with computers at local government offices



Source: "Survey of IT usage by local public bodies," MPT, 1998

Table Status of LAN usage at local government offices (as of April 1998)

Type of local government	Number of local government using LANs	Number of systems by administrative job					
		E-mail	Electronic bulletin board	Facilities management	Document management	Electronic conferencing	Electronic sanction
Prefecture	43 (37)	117 (84)	91 (62)	38 (24)	32 (24)	24 (14)	4 (2)
Cities, towns and villages	1,221 (919)	334 (179)	265 (133)	197 (101)	186 (110)	40 (17)	25 (11)
Total	1,264 (956)	451 (263)	356 (195)	235 (125)	218 (134)	64 (31)	29 (13)

Note: Figures in parentheses indicates the numbers as of April 1997

Source: "Survey on the Use of IT by Administrative Workers," Ministry of Home Affairs

Related site: "Survey on the Use of IT by Administrative Workers" (<http://www.mha.go.jp/news/981027.html>)

(3) Education

Distance learning using info-communications at universities has attained full-fledged status.

1. Distance learning programs at individual universities

The rapid development of info-communications technology has provided a variety of educational tools for use in higher education. Some universities in Japan have launched distance learning programs linking remote campuses by television conference systems carried via satellite communications or optical fiber networks. Others have started providing programs linking classrooms at different universities.

Since the Japanese higher education system was initially established without regard for the concept of distance learning, it became necessary to revise the official standards for educational institutions. Accordingly, in March 1998 the Ministry of Education revised the regulations for establishing a university, enabling institutions to conduct full programs of distance learning, using a variety of communications media. As of March 1999, a total of 60 credits from such distance learning programs were admitted as eligible credits for graduation.

One example of a distance learning program can be seen at Nihon University, where students are allowed to take some courses at different faculties from the one in which they are registered. In fiscal 1998, Nihon University launched interactive distance learning classes using a satellite communications and a TV conferencing system. This enables students at the Faculty of Arts in Tokyo's Nerima-City, at the Faculty of International Relations in Mishima, Shizuoka Prefecture and at the Faculty of Engineering in Koriyama, Fukushima Prefecture to take two courses of a general education program provided by the university's Center for Information

Networking at Tokorozawa in Saitama Prefecture. Credits taken through the system are recognized as eligible credits for graduation.

2. Networks linking different universities via satellite communications

Since October 1996, the National Institute of Multimedia Education, a common-use facility for universities under the Ministry of Education, has been promoting a project to construct a network between different universities via satellite communications. This is known as the Space Collaboration System Project (SCS).

The SCS program lets participating universities hold joint classes and seminars, making full use of the special features of satellite communications such as wide area coverage, simultaneous broadcasting and interactive communications. As of the end of fiscal 1998, 83 educational institutions including national universities, private universities, technical colleges and common-use facilities for universities, were participating in the program, which made use of 100 VSAT earth stations. By the end of December 1997, the system had been used for distance learning on 818 occasions and for a total of 1,826 hours.

In addition, an experiment was launched in fiscal 1998 to provide open college programs nationwide, transmitted to public facilities such as community centers. This uses the education information satellite communications network that links national organizations such as the Ministry of Education, the National Education Center and community centers, libraries and schools across Japan. The system will begin full-scale operation in fiscal 1999.

Table Growth of operational stations for SCS project

Organizations using the system	Fiscal 1996	Fiscal 1997	Fiscal 1998	Fiscal 1999
National university	38 (38)	27 (65)	6 (71)	29 (100)
Private university	0 (0)	0 (0)	11 (11)	3 (14)
National college of technology	3 (3)	5 (8)	0 (8)	6 (14)
Common-use facilities for universities	10 (10)	0 (10)	0 (10)	1 (11)
Total	51 (51)	32 (83)	17 (100)	39 (139)

Note: Figures in parentheses are operational facility number. Figures for private university include the University of the Air.

Source: National Institute of Multimedia Education

Related sites: Faculty of Engineering, Nihon University (<http://www.ce.nihon-u.ac.jp/>); National Institute of Multimedia Education, Ministry of Education (<http://www.nime.ac.jp/>)

(4) Medical care, public health and welfare

Telemedicine utilizing info-communications technology has been promoted.

The development and diffusion of info-communications technology has also helped to make a reality of telemedicine, the system through which patients in remote locations can receive medical help through computer communications. Doctors can monitor patients' health and make diagnoses by using images and other data transmitted over the system, and can then send advice on treatments.

In line with these developments, in December 1997 the Ministry of Health and Welfare sent a notice under the name of the Director-General of the Health Policy Bureau to each prefectural governor nationwide. This stated that telemedicine does not necessarily infringe Article 20 of the Medical Practitioners Law requiring doctors to offer direct, face-to-face treatment of patients, provided that "medical practitioners can get efficient information regarding the patient's physical and/or psychological condition not at the same level as the direct, face-to-face treatment, but at a level considered as an alternative to such direct treatment, upon consideration of any issue that is involved in providing an appropriate telemedicine.

According to the "Research on Comprehensive Promotion of Medical Information," part of an information technology development research project conducted in fiscal 1997 by the Ministry of Health and Welfare, 210 telemedicine cases were either being treated or had been treated in the experimental phase of the system (Table).

Besides that, as part of the "Post-Pan-Pacific Regional Telecommunications Network Experiments and Research by Satellite (POST-PARTNERS) Project" (a satellite communications experiment in the fields of education and academic exchanges linking countries and areas in the Asia-Pacific re-

gion via satellite communications), a telemedicine experiment was conducted in January 1999 linking the National International Medical Center of Japan and a hospital in Thailand in cooperation with MPT.

Meanwhile, as part of its Project for Enhancement of Regional and Daily Living-Related Information Infrastructure, MPT has been promoting the development of local government networks (Refer to III-6-2) linking hospitals and clinics via info-communications network. The ministry has also been supporting local governments' promotion of facilities for developing and disseminating applications in the fields of medicine, public health and welfare.

Among the local governments involved is that of Katsurao Village in Fukushima Prefecture. In June 1998, TV telephone terminals were distributed to each household, as well as to public facilities in the village, and these are being used to help provide medical, public health and welfare services. In Katsurao Village, about 25% of the population is aged 65 or older, but there is no resident doctor. A physician and a dentist visit the village clinic once or twice a week to give treatment, but in order to obtain more frequent information on the condition of elderly people in the village and provide medical advice, a district welfare officer and public health nurses use the TV telephone system. In December 1998, home-use health checking devices that measure blood pressure and pulse rate were installed in 30 village households, and Katsurao's telemedicine or home health control system was fully launched.

The system is being used to control the physical conditions of villagers. Doctors see the collected data at a terminal installed in the clinic or other places, and give medical advice to villagers using the TV telephone.

Table Telemedicine cases in Japan (as of December 1998)

Categories	Being carried out (including temporary suspension)	Experiments completed	Total
Telepathology	20	8	28
Teleradiology	73	14	87
Medical treatment and care at home	25	13	38
Ophthalmology	5	1	6
Dentistry	3	0	3
Image for medical treatment	22	18	40
Others	3	5	8
Total	151	59	210

Source: "Research on Comprehensive Promotion of Medical Information," part of the information technology development research project of the Ministry of Health and Welfare in fiscal 1997

Related sites: "Research on Comprehensive Promotion of Medical Information," part of the information technology development research project of the Ministry of Health and Welfare in fiscal 1997 (<http://square.umin.u-tokyo.ac.jp/enkaku/>); Katsurao Village (<http://www.fusion.isp.ntt.co.jp/katurao/>)