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"Microcomputer Industry"

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Publisher Yoshihito Shimada

Editor Yuji Yamadori

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Outline of Microcomputer/Personal Computer Market

From Hobby to Business

In Japan it was the demand for hobby computers that started the boom in microcomputers. The first microcomputer was developed in 1971 by Intel, an American company, and microcomputers first appeared in Japan around 1975, in the form of kits for hobby purposes.

In September 1976 NEC opened up a microcomputer shop in Tokyo's Akihabara district, and was thus the first of the Japanese makers to take this step. The location was appropriately chosen, for a shop selling products aimed at the microcomputer hobbyist, as Akihabara is the retailing capital of Japan's electrical consumer product business, with some 3,000 stores, big and small, selling everything from home appliances and audio equipment to amateur radio products.

NEC called its shop the "Bit-Inn"; in December 1977 Hitachi opened up its own such shop nearby, calling it "Gain". In both shops microcomputers were on display and could be freely used by people coming to the shop, and there were also staff permanently on hand whose job was to explain about the machines, but whereas the main task at Bit-Inn was to sell microcomputer systems, at Gain no such sales took place on the premises, as the emphasis was on educating the public about microcomputers.

A feature of the two shops is that they are run by the semiconductor division of their respective companies and thus are completely independent of the computer divisions. At that time computer departments were in the midst of a small business computer (usually called "office computer" in Japan) boom in addition to their usual medium and large computer business, and paid little attention to microcomputers, regarding them as no more than semiconductor components for business computers. Development and marketing of microcomputers proceeded along the lines of the conventional system architecture, with the hardware consisting of the microcomputer as the CPU connected up to peripheral and terminal equipment, and the software then being added.

On the other hand, the semiconductor divisions of the corporations proceeded to start selling microcomputers as independent products, complete, individual computers in themselves. These semiconductor divisions had no software staff, because their sole business was seen as the production and sales of microcomputers as components. Thus, they couldn't carry out the kind of marketing of systems with the accompanying development of software, which was what the computer divisions did. It was therefore because

of the way the divisions were organized that sales of microcomputers were originally directed at the hobby market, with the buyer himself making up the programs. The business then, consisted of the manufacturer making available the microcomputer plus peripherals —I/O units, display units, memory units— and providing the programing language needed for the software development.

So although microcomputers are now developing into a major business, in 1975 there were few who foresaw this was going to happen. One NEC person involved in the opening of Bit-Inn said that it was just a venture, and that they had no clear idea of the future potential of this product sector.

In 1975 visitors to the shop were nearly all amateurs in the field, and it was these who from around 1977 formed the computer hobbyist customer sector. At first most of these hobbyists were young, aged from 15 to 25, but now the range has expanded, encompassing those from 13 to 60.

The use of computers for business processing in companies started with medium and large machines. The advent of small models made it financially possible for smaller firms to utilize computers for the first time, from around 1970, and then 1975 saw the start of the small business computer boom. So the computer utilization sector has expanded downwards. It was the small business computer which spread the popularity of computers for business processing, and opened the eyes of the smaller businessman to its use. From 1975 to 1980 use of small business computers increased tremendously, by an annual average of some 125–135%. During this period the microcomputer hobbyist was appearing, and microcomputers began to be oriented to business processing applications.

By the end of 1980 some 60 microcomputer shops had opened in Akihabara, and

Table 1. Tiend of Computer Shops in Japan

Stage	I	II	III	IV
Period	1975~	1977~	1980~	1983~
Type	Parts shops Ham parts shops Manufacturer-run	Consumer appliance retailers Instrument control Department stores	Software houses Manufacturers' dealers	Independent dealers/shops Supermarkets
Target customer	Amateurs	Amateurs Hobbyists	Business control dept	Small firms, Stores, House
Features	Mainly kits, limited application	Personal machines appeared, became easy to use	Emergence of firms specializing in package sales	Tailored to each type of business

15 in Osaka's equivalent, the Nihonbashi area. The owners of these shops all say that the move now is to business applications. such use of microcomputers started to increase in 1979, and as of the end of 1980 one-quarter of microcomputer purchases were for business processing purposes, and this figure is expected to climb to three-quarters in three years. Microcomputer systems bought for business use are more expensive than those for home and entertainment use and the market is stable. While owners of microcomputer shops say they want to continue to serve the hobbyist sector, their forecast is based on hopes for an increase of sales related to business processing from the management point of view.

Small business computers opened up the way for use of stand-alone systems by smaller enterprises, and now the microcomputer is starting to be eyed as a machine for the exclusive use of a particular department —patents, product development, accounts, stock control— and is therefore an independent unit, unlike such stand-alone and larger systems serving the whole company. And when in addition it is considered that the hobbyist is using the microcomputer increasingly for business purposes, the above-mentioned estimate of 75% of microcomputers being bought for business applications in another three years cannot be dismissed as wishful thinking.

Crowded Microcomputer Shows

The popularity of a type of product can be judged through related shows. At business shows held in Tokyo each year, the shifting emphasis, in the computer field, from the larger systems towards the business computer and office automation equipment, is evident from the changes in the items on display, and reflects the market popularity of such products.

In 1977 JEIDA (Japan Electronic Industry Development Association, chairman Mr. Nihachiro Katayama) put on the first microcomputer show. This year the fifth show was held from May 27th to 30th, in Tokyo. The main theme of this year's show was "the leading role of microcomputers in the '80s," and participating companies numbered 96, including 17 for the first time. Items on display included the full range of microcomputer system products, peripherals and software.

According to JEIDA, visitors to the show numbered 86,100, a big jump over the figures for 1980 and 1979 of, respectively, 61,300 and 59,700, and indication of the degree of microcomputer "fever."

The Microcomputer Show '81 was also staged in Osaka, July 2–4, and participated in by 57 companies. This year the show had 42,350 visitors, last year 34,800, and in 1979, 21,400.

Display items catching the eye included low-priced color graphic terminals, 16-bit microcomputers and Winchester disc units, with the emphasis from hobby to personal business processing use. The microcomputers on show were divided into two price groups, ¥300,000–¥1 million, and ¥1 million–¥3 million.

Typical of the former were NEC's PC-8000 Series, Sharp's PC-200, Hitachi's MB-6890, and Fujitsu's FM-8 (Fujitsu Micro 8), which was announced immediately prior to the show, drew visitors' attention. A sales point of this group is the wide range of

Table 2. Micro computer show '81 (Tokyo) Exhibitor List

Exhibitor	Exhibitor
VICTOR DATA SYSTEMS CO., LTD.	MINATO ELECTRONICS INC.
TOHOKU METAL INDUSTRIES, LTD.	STAR MFG. CO., LTD.
LIFEBOAT, INC.	AMPERE CO., LTD.
NIPPON ELECTRIC CO., LTD.	SHINSHU SEIKI CO., LTD.
TAKEDA RIKEN INDUSTRY CO., LTD.	MURATA MFG. CO., LTD.
DENSAN CO., LTD.	J. OSAWA & CO., LTD.
ASR CORPORATION INTERNATIONAL	MEIKOH ELECTRONICS CORP.
N. C. C.	JAPAN DATA INSTRUMENT CO., LTD.
SUN ELECTRONICS CORP.	SANKYO INTERNATIONAL CORP.
JAPAN MACNICS CORP.	SHARP CORP.
SOPHIA SYSTEMS CO., LTD.	TŌYŌ TELESONICS CO., LTD.
SYSCON CORP.	WATANABE INSTRUMENTS CORP.
TEAC CORP.	SHINDENGEN ELECTRIC M.F.G. CO., LTD.
CANON SALES CO., INC.	TOKYO ELECTRON LTD.
SANYO ELECTRIC CO., LTD.	COMMODORE JAPAN LTD.
YOKOGAWA HEWLETT PACKARD, LTD.	TOSHIBA CORP.
SORD COMPUTER SYSTEMS, INC.	TDK ELECTRONICS CO., LTD.
AI ELECTRONICS CORP.	OKI ELECTRIC INDUSTRY CO., LTD.
APPLE COMPUTER, INC.	TEIJIN ADVANCED PRODUCTS CORP.
JAPAN BUSINESS AUTOMATION CO., LTD.	HITACHI, LTD.
NIPPON DATA GENERAL CORP.	MATSUBO ELECTRONIC INSTRUMENTS CO., LTD.
CORE DIGITAL CO., LTD.	ASAHI GLASS CO., LTD.
DATEL KK	NIPPON TELEGRAPH & TELEPHONE PUBLIC CORP.

TANDY RADIO SHACK	TOYOMURA ELECTRONICS CO., LTD.
NS JAPAN K.K.	MIZUTANI ELECTRIC IND. CO., LTD.
PANAFACOM LTD.	I.O DATA DEVICE INC.
SHOWA SYSTEM LABORATORY CO., LTD.	DEMPA PUBLICATIONS, INC.
NACO CORP.	DEMPA COMPUTERWORLD CO.
KANTO DENSHI KIKIHANBAI CO., LTD.	NIKKEI-McGRAW-HILL, INC.
SHIBASOKU CO., LTD.	MITEC INC.
RYOYO ELECTRIC CORP.	LEASE ELECTRON CO., LTD.
ANRITSU ELECTRIC CO., LTD.	ASCII CONSUMER PRODUCTS INC.
FUJITSU LTD.	ASCII PUBLISHING
MITSUBISHI ELECTRIC CORP.	JAPAN MICRO COMPUTER CLUB.
KOHJINSHA CO., LTD.	CQ PUBLISHING CO., LTD.
TEXAS INSTRUMENTS JAPAN LTD.	KOSAIDO PUBLISHERS CO., LTD.
MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.	HUDSON CORP.
ROCKWELL INTERNATIONAL OVERSEAS CORP.	HAL LABORATORY
ADVANCE INDUSTRIES CO., LTD.	EBRAINS, INC.
CHUO ELECTRONICS CO., LTD.	ZAX CORP.
ANDO ELECTRIC CO., LTD.	INTERNIX, INC.
KOKUSAI DATA MACHINESYSTEMS INC.	SYSTEMS FORMULATE CORP.
MOTOROLA SEMICONDUCTORS JAPAN, LTD.	HAYDEN PUBLISHING CO., INC.
IWATSU ELECTRIC CO., LTD.	ELECTRONICS DIGEST CO.
EDEC CO., LTD.	PAX ELECTRONICA JAPAN CO., LTD.
KK. EWIG SHOKAI	SYSTEMS MARKETING, INC.
ASAHI ELECTRONICS CO., LTD.	ESD LABORATORY CO., LTD.
CASIO COMPUTER CO., LTD.	AMUST COMPUTER CO., LTD.

peripherals, such as memory units, displays and output units which can be linked up to the equivalent of the CPU so as to enable the required system to be made up.

The price of the basic FM-8 is ¥218,000. From a minimum system configuration of audio cassette recorder and home television set, the system can be greatly expanded by the many options available, which include color CRT display, *kanji* character unit, bubble memory unit, printer, and mini-floppy disc drives. Other units and modules available separately give high-level functions, such as voice synthesis, measurement control and high-speed computation. System capability can be further enhanced by the addition of a light-pen, plotter, standard floppy disc and 10 M-byte/20 M-byte Winchesters (8-in.). The FM-8 is the microcomputer provided with the most characteristics of this kind of product, for under ¥1 million.

Microcomputers in the ¥1-3 million range are fully oriented for business use, and as such come as complete systems for the job. That is, the purchaser buys a system already configured for the processing work it is to handle. Many manufacturers of this group of microcomputers call them personal computers, and whereas the ones under ¥1 million are sold by the semiconductor divisions of the company concerned, this group of microcomputer products is developed by the computer divisions. Typical machines in this class are Toshiba's BP-100, Oki Electric's IF-800, Seikosha's SEIKO-8300 sold by Uchida Yoko, and the Sord M 200 series.

It is the software, however, used with such computer hardware that decides the value of the product. For medium and large computers software is order-made; for small business computers existing software is altered to fit the job, while for microcomputers the software is off the shelf. Such off-the-shelf software is one of the sales points especially with microcomputers for business use, where the small scale of the enterprise precludes any hope of software being developed by the user.

Main application software is for sales inventory control, financial calculations and payroll calculations, but there are also special purpose tasks such as personnel administration, demand forecasting and nutrition value computations. As things now stand, however, there is a shortage of software, which lags far behind hardware.

New Products from Major Companies

Most of the manufacturers usually announce new products just before the show. Some other major new products announced in May are described below.

Matsushita Communication Industrial Co. announced the Mybrain 850 M, the external memory of which can be expanded by means of 8-inch Winchester-type discs. The 850 M is priced at ¥2.48 million, and the 8.4 MB fixed disc option is ¥1.05 million. The Mybrain 850 M is used as a personal system in various departments of major corporations, or in smaller companies, it is used as an independent, stand-alone system for office data processing. It can also be used as a terminal of a distributed processing system by linking it up to a host computer. It has 50 K of RAM and 2 K of PROM memory, a 12-inch color display, two 1 M-byte floppy disc units, and a choice of printers, one being 40 cps/80 cpl, and the other 100 cps/132 cpl.

Table 3. Exhibitors at Osaka Microcomputer show

AI ELECTRONICS CORP.	KANTO DENSHI KIKIHANBAI CO., LTD.
OKI ELECTRIC INDUSTRY CO., LTD.	KOKUSAI DATA MACHINESYSTEMS INC.
TAKEDA RIKEN INDUSTRY CO., LTD.	RYOYO ELECTRIC CORP.
MIZUTANI ELECTRIC IND. CO., LTD.	SYSTEMS FORMULATE CORP.
YOKOGAWA HEWLETT PACKARD, LTD.	SHINSHU SEIKI CO., LTD.
MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.	JAPAN DATA INSTURUMENT CO., LTD.
SANYO ELECTRIC CO., LTD.	NIPPON TELEGRAPH & TELEPHONE PUBLIC CORP.
TOKYO ELECTRON LTD.	TEXAS INSTRUMENTS JAPAN LTD.
NINOMIYA MUSEN CO., LTD.	TDK ELECTRONICS CO., LTD.
TEIJIN ADVANCED PRODUCTS CORP.	MITEC INC.
ANDO ELECTRIC CO., LTD.	APPLE COMPUTER, INC.
JAPAN COMPUTER INDUSTRIES	FUJITSU LTD.
COMMODORE JAPAN LTD.	NACO CORP.
TANDY RADIO SHACK	INAHARA OFFICE MACHINES CO.,
LEAD ELECTRONICS	J. OSAWA & CO., LTD.
NIPPON ELECTRIC CO., LTD.	KYODO PRINTING CO., LTD.
CANON SALES CO., INC.	SHOWA SYSTEM LABORATORY CO., LTD.
HITACHI, LTD.	ANRITSU ELECTRIC CO., LTD.
TŌYŌ TELESONICS CO., LTD.	SHARP CORP.
SOPHIA SYSTEMS CO., LTD.	NIKKEI-McGRAW-HILL, INC.
WATANABE INSTRUMENTS CORP.	TOHOKU METAL INDUSTRIES, LTD.
SHINDENGEN ELECTRIC M.F.G. CO., LTD.	ŌNO INSTRUMENTS CORP.
TOSHIBA CORP.	HAL LABORATORY
SORD COMPUTER SYSTEMS, INC.	DEMPA PUBLICATIONS, INC.
DEC JAPAN	HUDSON OSAKA CO., LTD.
PANAFACOM LTD.	JAPAN MICRO COMPUTER CLUB.
	MITSUBISHI RAYON CO., LTD.
	KODENSHA LTD.
	OSAKA CORE INC.
	ESD LABORATORY CO., LTD.
	CHUO ELECTRONICS CO., LTD.

In addition to the previous serial interface I/O port, it also has a parallel interface, so measurement and control applications are also possible. On the software side, in addition to the expanded Basic of before, it now has Basic Compiler under a CP/M operating system supplied as standard. It can also be linked up to general-purpose languages such as FORTRAN, COBOL and PASCAL. To sum up, the Mybrain 850 M is a personal computer which is on a par with a business computer.

Sharp put on sale its Hayac-2800, priced at ¥1.8 million. The main memory is 64 K and a 12-inch CRT display is incorporated into a single unit. Up to two 1-MB floppy discs can be used with the system. Printer capability is 150 cps/136 cpl. A typewriter keyboard is used with one-stroke input sensor panel. It has the programs needed for various tasks, such as edit data file, data sort, job scheduling, etc. COBOL (conforming to JIS) is used for the programing language, and simple parameter language is also available for adapting to actual job requirements. Communication capability is an optional extra, allowing the Hayac-2800 to be used as an online network system terminal.

From Casio came the Casio Σ-7, priced at ¥1.98 million. The CPU having a main memory capacity of 144 K means that the whole of the area of the floppy disc has been made available to the user. Up to two 1-MB floppy discs can be used, and it has a 12-inch CRT display. There are two types of input format, a typewriter keyboard or a book-type keyboard. Printer capability is 150 cps/80 cpl, or 150 cps/132 cpl.

For the programing language, there is CSL compiler language and the interactive-type generator language, Hero. Application software, by task, included sales, stock control, accounts, payroll computation, and by type of business, for gasoline station procedures, car maintenance, accounting offices, hotel administration, newspaper sales, civil engineering and architectural offices, stationery retailing, and wholesaling, as well as business administration.

Hitachi's offering was the BD-20, priced at ¥2.2 million. The control unit has 2 K of ROM and 62 K of RAM; 12-inch CRT display; up to two 1MB floppy discs. Input is via JIS standard keyboard, book-type intelligent keyboard or ordinary alphabetic layout keyboard. Printer capability is 120 cps/80 cpl or 180 cps/132cpl (with *kanji* output also possible). Programing language is BASIC for business application, while command language is also offered as an option, to enable non routine processing to be carried out.

Systems Formulate brought out the Bubcom 80, with prices for CPU and keyboard ranging from ¥255,800 up to about ¥1.7 million. As an example, a ¥1.334 million system consists of a 64 K ROM memory and two bubble memory holders, plus a 1.2 M-byte floppy disc unit, an 80 cps/136 cpl printer, and a 12-inch high-r esolution graphic display.

The Bubcom 80 was developed with the emphasis on retaining the low cost of a personal computer while at the same time providing data and programing language interchange capabilities with larger computers. For this, as well as coupling standard 8-inch IBM format floppy discs, it has a 300-9,600 BPS line control function. Also, a BASIC translator developed by Microsoft Inc. is the standard language, but an OS, CP/M can be

purchased for COBOL, FORTRAN and PL/1 compiler.

The Bubcom 80 system was developed jointly with Fujitsu, and is made by Fujitsu and Fujitsu Kiden. Whereas the Fujitsu FM-8 is oriented towards stand-alone office use for business processing, shop administration, scientific and technical computations, and education, the Bubcom 80 is for when considering larger computers. This is the major difference between the two, and other than this they are alike enough to be considered sister machines.

The FM-8 is a product of Fujitsu's semiconductor division, while the Bubcom 80 is handled by the parts division. Moreover, sales of the FM-8 are handled on a dealer basis by Astor International, Uchida Yoko, Kanto Denshi Kikihanbai, and Nissei Denki, whereas the Bubcom 80 is sold directly by Systems Formulate's stores in Tokyo and Osaka, over the counter by means of educational media, and through computing centers and business computer dealers. Fujitsu does not sell either of the machines directly. It sells only hardware through dealers, and development of applications software is left to the dealers. This is the first time Fujitsu has used dealers to this extent for a machine.

A feature common to the six machines introduced in outline above is that they are desk-top systems for offices. Their business processing orientation is clear enough from their hardware configuration. As for maintenance, in the business processing field, the usual way is to enter into annual contracts, the same as for business computers. However, although the systems themselves are low-priced, personnel costs for maintenance are the same as those for medium and large machines, so the maintenance expenses relative to the whole system become proportionately higher, around 15%. The equivalent figure for large computers is 4%, and for small business computers, 5-7%.

There are thus a number of problems involved, such as why maintenance is so expensive when the machine is so cheap (a question users ask), and in a market that is seven or eight times larger than the small business computer market, and which has a dealer-outlet structure, at what stage and in what form is a company to provide a maintenance network?

Who Uses Microcomputers?

Here is given an analysis of the microcomputer market as based on the results of a questionnaire given to visitors to the 1980 microcomputer show.

"Research" was the reason most often given for visiting the show, followed by "To grasp industry trends," "For application to products of my firm," and "Pleasure." It seems from the survey that a major objective was to probe the general picture of new products and technology. However, visitors concerned with direct transactions accounted for 30%, as measured by the answer that they came to decide on what machine to settle on for their firm including the respondents answering "For application to products of my firm"; many also answered that they had delayed deciding on what machine to purchase, until they could come to the show. Microcomputer shops and dealers say that sales drop in May, the show month.

The work of most of the visitors was related to the technical (33%) and R & D

(27.7%) sides of their companies, so two-thirds were involved, either directly or indirectly, in their work, with the application or introduction of microcomputers to their firms. Next came "Sales" (9%), "Business administration" (6.6%) and "Planning," (3.3%) "General office work" (3.3%), and "Production" (2.2%). The lack of interest shown by departments related to manufacturing was surprising, but was probably due to the fact that it was more difficult for personnel to get away from the production location, and also to the limited capabilities of a microcomputer which makes it possible to understand what it can do just by reading the catalog.

"Research" accounted for 28.9% of responses and "To grasp industry trends" for 22.9%, meaning just these two accounted together for over half. Other responses: "For application to products of my firm" (19.5%), "Pleasure" (15.3%), "To decide what machine to buy" (9.5%), "Casual interest" (2.6%), and it is interesting that some also said they wanted to export microcomputers. While 29% were thus directly interested in purchasing for their firms, the intensity of the microcomputer boom is suggested by the 16.6% whose purpose was pleasure or casual interest.

Of the total, 69% said they were interested in devices and systems, specifically voice synthesis, graphic displays, voice recognition, personal computer *kanji* displays, color displays, and 16-bit microcomputers. Peripherals attracted more interest than CPUs, because the key to utilization technology lies with the peripherals.

As may have been expected, most of the visitors were young: 44.3% in their twenties, 30.1% in their thirties and 13.6% in their forties. Those over 60 accounted for 1.3%, and those aged 10–20 for 4.8%. As microcomputers drop in price, easier programing languages are developed, more applications programs are made available and the machines are more operationally efficient, the user age range will expand at both ends, to the even younger and older. However, the growth of the proportion accounted for by these two age groups will be much slower than that of those users in their thirties and forties.

Analyzed by occupation, those working at general electronic and electrical companies showed the greatest interest (38.6%). Interest among those in other occupational categories varied widely, with the following showing relatively high interest:

Computers	9.2%
Machine manufacturing	9.0%
Software	4.4%
Education, research	3.1%
Oil and chemical	2.6%
Government offices	2.6%
Communications	2.4%
Transportation, services	2.0%
Steel	0.9%
Financial and securities	0.7%
Non-ferrous metals	0.6%
Other (textiles, trading companies, civil engineering and architecture, patent offices, etc.)	9.7%
Students	9.2%

The survey shows that the interest in microcomputers spans a wide range of industries and ages. The microcomputer is not for use by specified people in a certain limited range of enterprises; instead it is a system that, within the conditional framework of its

introduction, can be used by all those who want to.

Market Strategy of Major Manufacturers

The expansion of the microcomputer market is proceeding at a very rapid pace, as is indicated by the increase in the number of visitors to the shows which started five years ago, and the number of participating companies. In addition to the domestic and foreign manufacturers of microcomputers, mainframe and business computer makers are also entering the market, and the business computer dealers are also actively moving into the business processing micro/personal computer sales field.

Here a look is taken at Toshiba, NEC and Mitsubishi, three major manufacturers who have been developing the small business computer market.

In January 1981 Toshiba started selling its BP–100, termed a business-personal computer, and tackled the microcomputer business energetically by setting up a new personal computer sales department. As may be gathered from its name, it was aimed at business customers and a dealer sales system was adopted with the object being mass-sales of the product. The sales network that was formed relied heavily on the dealers handling the company's TOSBAC System 15 Series business computer. With a price-tag of about ¥1.2 million, the BP–100 is aimed at smaller firms doing up to ¥300 million of business each year. For this, application software for sales, stock and payroll is available, with the sales system being used stating that there is no alteration to the programs. In fact, though, with users asking for some changes, it is difficult to judge how far to go to accommodate them. The sales target for fiscal 1981 is 4,000 machines. Enquiries number about 4–5 a day; and with some cases of firms which could easily use a business-class computer system leaning towards microcomputers, the BP–100 is becoming a competitor of such business computers. Because of its reliability and price, it is foreseeable that the microcomputer in the ¥1–2 million price range will become the most widespread system.

NEC's PC–8000 Series is being sold by the semiconductor division's electronic device operations department. Systems in the ¥1.5–2 million class are being handled by the small computer systems department, which sells the company's small business computers. In April this year the company put out a business-personal system, the 20/25, priced at ¥2.9 million, and this was the first microcomputer for NEC's computer group. There is, however, gap between the PC–8000 and the NEC System 20/25—¥800,000 versus ¥2.9 million, and so NEC has a plan to expand the PC–8000 upwards, and at the same time is planning to move the 20/25 downwards. Where the cross-over point will be is attracting attention, and will probably be at around ¥1.5 million, the small systems department planning sales in fiscal 1982, oriented towards the business-personal computer sector.

In May Mitsubishi Electric announced a prototype business microcomputer, and revealed that it would market a microcomputer for business use, from fiscal 1982. This means the company will be starting sales about one year later than the other computer makers.

This trio of companies, Toshiba, NEC and

Mitsubishi, opened the way to the popular use of small business computers. In number of small business computers sold each year, Mitsubishi is the leader, followed by NEC and Toshiba, but the order is the reverse with regard to business microcomputers.

Evaluations of microcomputers have to be from two viewpoints, that of the microcomputer department (which includes hobby use), and that of the business-personal computer business, handled by the computer department.

In the case of the former, NEC is out in front, while Toshiba leads with regard to the latter. Mitsubishi is not considering any hobby-oriented microcomputer sales, and is proceeding slowly with its plans for sales in the business-personal field from 1982, the company seemingly being intent on pursuing a secondary merchandise method after seeing what the other companies do. As already mentioned, NEC's computer division started selling business-personal computers from April. As things stand, however, complete sales and maintenance networks have yet to be set up, and so it is too early to say how manufacturers will rank in this area. With it being only in 1980 that the personal-business computer market began to form, it is not only NEC which lacks a systematic organization; the same is the case with Toshiba, Mitsubishi, Fujitsu, Oki Electric and Hitachi, the other major computer manufactures.

For the major manufacturers such an organization will take time. On that point, the reaction of specialist makers of business and personal computers, such as Sord and of Uchida Yoko, is quick. In April, 1981, Uchida Yoko started classes (on a fee-paying basis) for business-personal computer use, intending to link this to sales of products, specifically the Fujitsu FM-8 and the Seiko 8300.

Although the FM-8 and the Seiko 8300 are aimed at the business processing market, they are clearly differentiated by price, with the FM-8 being under ¥1 million and the Seiko 8300 over ¥2 million, and as such the intention is to provide separate dealer outlet set-ups; in the case of the FM-8 it is in the nature of a franchise. For the Seiko 8300, classes have been set up under the direct management of Uchida Yoko, freeing the dealers and promoting the sale of the machines through such educational means. These class facilities have been set up in Tokyo and Osaka, and will soon be started in other major cities such as Nagoya, Fukuoka, Sendai and Sapporo. This is a flexible sales strategy which takes account of market differences.

Sord is tying up with organizations in a different line of business to form its sales dealer network. The other firms are Toppan-Moore, a maker of computer supplies, and Forums, where artists and intellectuals gather, the intended strategy being to pack the showrooms with Sord's business-personal computers. In regional market areas, the expansion of the franchise sales network is being actively pursued.

Rush to Open Personal Computer Schools

In 1981 three distinctive trends can be seen with regard to microcomputers and personal computers. One is the opening of showrooms, another the opening of instructional facilities, and the third is the opening of

Personal Computer Schools

Company Name	School Name	Founded	Class Size	Computers Used (sets)	Length of Course in Days
Bit-Inn Tokyo System Center	Microcomputer & Personal Computer School		18	PC–8001 (9)	1 or 2
Bit-Inn Yokohama System Center	Microcomputer School	Aug. 1980	20	PC–8001 (10)	1 or 2
COM	Akihabara Instrument Room	Jun. 1981	40	PC–8001 (30)	1
Computer Service Corporation	Microcomputer Square	May 1981	20	IF–800 (20)	1 or 2
Computer Land	Computer College IF	May 1981	10	IF–800 (10)	1 or 2
Computer Two	Microcomputer School	Apr. 1980	15	IF–800 (3) Basic Master Level III (3)	2
Diamond Business System Center	Personal Computer School	Jun. 1981	25	MZ–80K2 (25)	2 or 3
Tandy Computer Center	Computer Center School	Aug. 1979	40	TRS–80 Model I (9)	1 or 4
Daiichi Katei Denki	Microcomputer School	Jul. 1981	12	MZ–80B (3) PC–8001 (4) Basic Master Level III (2)	1 or 2
Densei Co. Ltd.	Personal Computer School	Jan. 1981	Preliminary, Elementary } 30 Intermediate, Advanced, Business } 24	PC–8001 (16)	2 or 3
Hit Computer Service	Toray Apple Academy (Ginza)	Jun. 1981	30	Apple II J-PLUS (30)	5

Company Name	School Name	Founded	Class Size	Computers Used (sets)	Length of Course in Days
Information Instracting Center	Personal Computer School	Jul. 1981	15	PC-8001 (15)	1 or 2
Kanto Denshi Kiki Hanbai Co., Ltd.	System Lab.	Jul. 1980	20	Commodore VIC (10) PC-8001 (2) IF-800 (1) Mybrain (5)	1 or 2
Laox Systems	Shinjuku Microcomputer Academy	Apr. 1981	20	PC-8001 (20)	2 or 4
Micom Land Q	Microcomputer Seminar Q	Apr. 1981	5	Basic Master Level III (5)	1 or 3
Mizutani Electronic Industry Company	Mizuden Microcomputer School	Jun. 1981	5-6	MZ-80K2 PC-3100 (Total: 6)	1
Nikko Telecommunication Co., Ltd.	Academy	Jul. 1981		PC-8001	2
Japan Information Research Center	Personal Computer School	Dec. 1979	39 (2 classes)	PC-8001 (39)	1, 2 or 3
NEC Personal Computer Corporation		Sep. 1979	30-60	PC-8001 (15)	2
Japan Research Institute	Nissoken Personal Computer School	May 1980	30 (Intermediate 15)	CBM-3032 (15)	2
Ohara Book-Keeping School	Personal Computer School	Sep. 1981	20	PC-8001 (20)	8 or 2
Remac Research Institute Inc.	Personal Computer School	May 1981	24	Canon CX-1 (24)	2 or 5
Rocket	Microcomputer School	Jun. 1981	10	MZ-80K2 (10)	2

Company Name	School Name	Founded	Class Size	Computers Used (sets)		Length of Course in Days
Seagull Inc.	Microcomputer School	Dec. 1979	8–10	CBM–2001	(10)	2 or 4
Systems Formulate Corporation	Microcomputer School	Nov. 1978	24	IF–800	(24)	2 or 3
Sharp Tokyo Service Center		Oct. 1980	20	MZ–80K2	(20)	3 or 4
SORD Computer Systems, Inc.,		Apr. 1980	25 (PiPs course 50)	M203 M223	(8–10)	3
Tokei Computer Center	Computer School	Apr. 1980	13	PC–8001	(13)	1, 2 or 5
Sanyo Electronics Plaza	Sanyo Computer School	Jun. 1981	20	MBC–2000	(10)	1 or 2
Tokyo Shogyo Shisetsu Research Center	Microcomputer School	Jun. 1981	10/class	Per class TRS–80 BP–100	(7) (3)	1, 2 or 3
Tokyo Transistor Technical College	Microcomputer Technology School	Apr. 1978	30	PC–8001 TK–85	(30) (30)	2, 4 or 3 months
Uchida-Yoko Co., Ltd.	Beginner's Computer School	Apr. 1981	15	SEIKO 8500	(5)	2, 3 or 6
World There	Microcomputer School	Jun. 1981	20	Apple II J-PLUS	(20)	2 or 5
Yamagiwa Tecnica	Microcomputer School	Dec. 1980	12	Basic Master Level II, III PC–8001 PC–3100S MZ–80K2	(10) (10) (10) (10)	2
YDK System Center	Computer School	Apr. 1981	20	PC–8001	(20)	1 or 2

microcomputer shops. Nearly all the major manufacturers of mainframe and small business computers, and the dealers, have opened showrooms and used the appeallation "office automation showroom," though some of them display only microcomputers. In Tokyo alone there are some twenty such premises.

The boom in instructional facilities surpasses that of showrooms. Microcomputer manufacturers starting opening such "schools" some five years ago, and this year mainframe manufacturers and small business computer makers and dealers have also started such schools, so such facilities are spreading throughout the nation.

Microcomputer shops originally were aimed mainly at amateurs, but this year has seen shops opening, mostly in Tokyo and Osaka, that are specializing in microcomputers for business use. In Tokyo there are about 70 such shops, in Akihabara and Shinjuku, and about 25 in Osaka's Nihonbashi and Umeda areas.

Showrooms, schools, shops—each has a different function and is independent of the others, but some vendors are combining the three into one. The microcomputer market is expanding rapidly as microcomputers move further into the field of business processing.

The Future of the Microcomputer Market

The microcomputer market is estimated to have amounted to ¥4 billion in 1978, trebled in 1979 to ¥12.5 billion, and this figure was doubled in 1980, to ¥25 billion. The outlook is that this high pace of growth will continue, to ¥60 billion in 1980, and ¥90 billion in 1982.

Future areas of application, and estimated percentages:

- Business: Clerical processing, such as statistics accounts, and stock control. 24.4%
- Education: Primary computer instruction, school education. 20.9%
- Scientific and technical computation: 19.8%
- Industrial: Control of plant equipment, etc. 19.8%
- Home: Games, home systems control, etc. 12.8%
- Other: 2.3%

If a broad definition of "business" is used, everything except home use would fall into the category, and account for 84.9%. By "future" is meant the latter half of the '80s.

Systems Houses: Mainstay of Microcomputer Industry Progress

Introduction

LSI technology has been making rapid advances, greatly increasing the degree of integration and at the same time bringing down the cost involved. This has enabled venders to bring out an impressive array of microprocessors, ROM and RAM memories and peripheral chips, and make them available to users at low cost. As a result it is now possible even for amateurs to build a microcomputer and its related application devices. It is also possible for small companies not having many engineers to develop their own brand microcomputers and devices.

First developed in the early 1970s as a chip for desktop calculators, one of the main reasons the microcomputer is being rated as bringing about a second industrial revolution comes from the rapid pace of technical innovation.

Fields of application for the microcomputer are said to number some 25,000–30,000, and it is certain that the way these microcomputers are incorporated into a company's management and how they affect its competitiveness are matters of major interest to businesses in the 1980s.

The appearance from the early '70s of systems houses is a particular influence of the microcomputer. Unlike with the minicomputer or general-purpose computer, it is possible to obtain microcomputer CPUs, memories and I/O-controls individually in the form of LSI devices, which in turn means that it is possible to build a computer by hand. This formed a major factor in the appearance of the systems house.

At present systems houses are taking shape as one of the business sectors within the microcomputer appliance industry. Since 1975, in particular, there has been a surge in the number of new systems houses, so that nation-wide there are probably close to 200, counting both specializing and non-specializing firms. Estimated sales for fiscal 1981 are in the order of ¥100 billion, so it seems to be an industrial sector with rosy prospects. But is it? To answer this, here we take a look at moves in and subsequent to 1980.

Systems Houses in the Microcomputer Industry

A systems house can be defined as a maker of microcomputer application devices, which combines its own software technology and knowhow with the devices and microcomputer, developing systems and systems prod-

ucts, in line with the requirements of the users, which use to the full the functions of the microcomputer.

Microcomputers form a major industry; Fig. 1. gives an outline indication of the position of systems houses within the industry, in terms of function. Specializing as it does in microcomputer application, it is somewhere between the chip-maker and the manufacturer of applications devices, and its work is to provide applications support, developing and producing OEM items, and at the same time developing and producing products under its own brand-name. This requires technology related to:

1. Microcomputer software and hardware
2. The Block B sector of Fig. 1—related devices and components (and related knowledge)
3. The place where application products and systems are to be used (and related knowledge)
4. Systems engineering, such as systems analysis and design (and related knowledge)

Basically, the nature of the work can be boiled down to the following.

1. Support: Development, production and maintenance of application products for OEM and support.
2. Manufacture: Development, production and sales of application products and systems.
3. Development, production and sales of support devices and systems.
4. Development, production and sales of related devices, and systems houses.

This isn't to say that each systems house does all of this. The nature of the work of any particular systems house depends on

Fig. 1 Enterprise Groups in the Microcomputer Industry

A: Semiconductor manufacturers
- MPUs, Memories, Intelligent parts for microcomputers
- Other intelligent microelectronics parts
  - [IC, LSI, VLSI]

B: Manufacturers of related parts and devices
- Sensors
- Input devices
- Interfaces
- Peripherals
- Output devices
- Transmission devices
- Ordinary electronic parts
- Ordinary machine parts

C: Systems Houses, etc.
- Application products
- Development support
- Utilization technology support
- Software
- Hardware
- Devices and systems:
  - Development support
  - Design support
  - Production support
  - Maintenance support
- Application devices
- Application systems

D: General manufacturers
- Mass-production (application) products:
  - Consumer products
  - Cars
  - Cameras
  - Office equipment
  - Other
- Medium-production products
- Small-lot diverse products
- Large-scale application systems
- Small-Scale application systems

E: Distribution and marketing business

F: Users
- Private, Home, Office, Factory (Primary, secondary and tertiary industries)

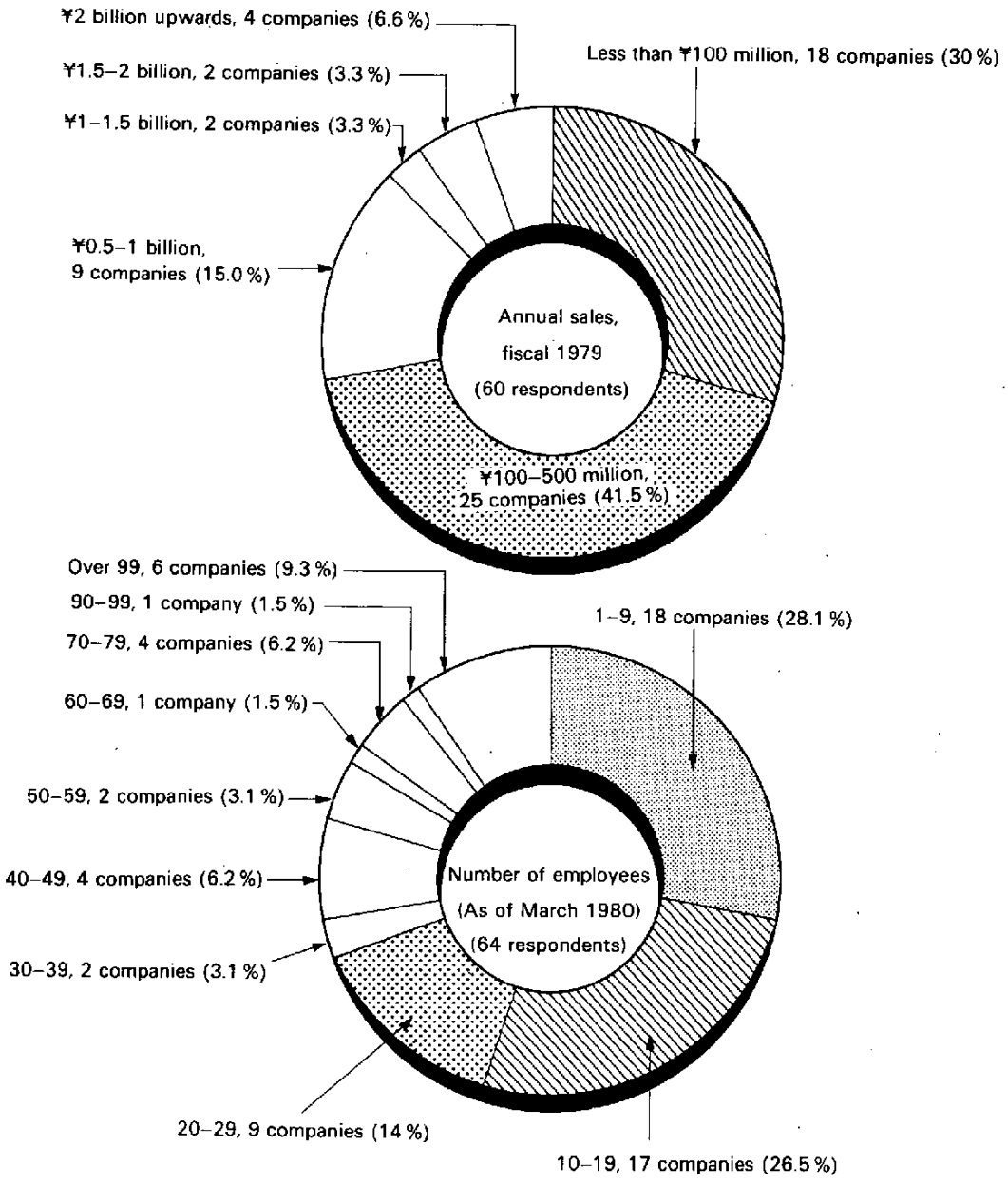
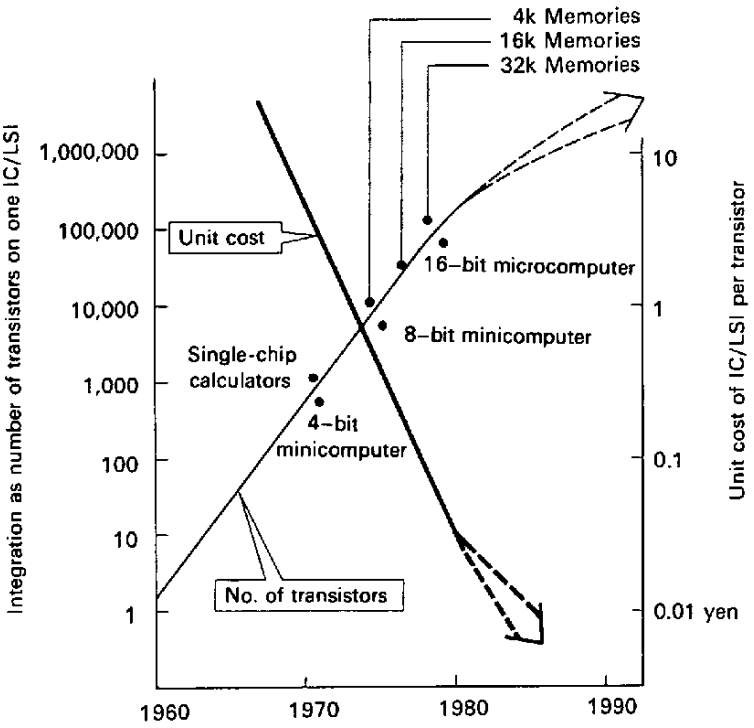


Fig. 2 Size of Systems Houses



The number of transistors that could be integrated on a 5 mm silicon chip has roughly doubled each year; therefore the cost per transistor dropped by half every two years. However, the common view is that this pace will slow.

Fig. 3 Semiconductor Technology, Base of Microcomputer Revolution

which item it concentrates on. More specifically, systems houses are divided into the following four areas of management emphasis.

1. Development, design, production, and maintenance
2. Support, OEM, own-brand
3. Stand-alone systems, systems parts, systems, related devices
4. By field of specialization
   —Machine tools, medical electronics, office machinery, automatic vendors
   —Production systems, monitoring systems, transmission systems

Present Situation

Below is provided an outline of a survey conducted by MITI on Systems Houses, and published in March 1980.

The majority of systems houses are small firms, as shown by the fact that 60% have a capital of less than ¥15 million. As might be expected, nearly all of the firms were established after 1965, developing along with the microcomputer itself. Officers of the companies are young, in the 30–40 age group, and many are technical people who previously belonged to another company. Seventy percent have 50 or fewer employees, but with the high degree of technical skill needed for the development of systems products, more than half the employees have received advanced education. In most cases, individual orders are rather small, averaging less than ¥20 million. For nearly all companies, the amount of backlogs at the end of

each business term is less than ¥200 million. As for production, there is a fairly sharp division between two types: on the one hand, the production of single items, and on the other hand, mass-production on a subcontracting basis.

The Japan Economic Journal (JEJ) conducted a survey on systems houses in the fall of last year. According to that survey, the scale of the 66 companies surveyed was small, with the average annual sales figure being ¥471 million, and the average number of employees, 36.3; but sales growth was high, with half the companies having increased their sales by 150% over the previous year, and they had so many orders that they were finding it difficult to deal with them all. It is especially notable that 26% of the houses recorded FY 1979 sales which were at least twice the FY 1978 figure. This rapid growth rate is drawing the attention of many other enterprises.

When it is considered that the MITI survey is based on data from the second half of 1978, the rate of growth indicates just how good the prospects are for the systems house industrial sector. The Japan Economic Journal points out that although microcomputer hardware is progressing very rapidly, it is clear that utilization technology is not making so much progress, and there is a very great demand for software development.

The changes in the systems house situation over the past 10 years are now becoming clear. That is, the individual characteristics of the various houses are stating to emerge. One type is maker-oriented, aiming at the inhouse mass-production of microcomputer application systems. Such firms are riding the personal computer boom, constantly announcing new products, and are not limiting themselves to the domestic market but are also venturing overseas. A second group is joining with OEMs, and developing business computers or special POS units tailored to specific applications. Some software houses and computing centers are joining the ranks of this group. A third group is formed by smaller manufacturers of electrical equipment who are moving into the systems house sector in line with the policy to expand their business. Here a look is taken at each of these types.

Patterns of Entry to the Systems House Business

(1) From the Information Processing Industry

Two examples from the information processing industry, already mentioned, are software houses and computing centers. An increasing number of computing centers are entering the ranks of systems houses or microcomputer shops. Four such firms are members of the Japan Microcomputer Systems Industry Association, founded in 1975, and having 40 member firms and 10 supporting member companies. One reason for this move by computing centers is that the rapid growth in the popularity of Small business computers from around 1975 has affected their business adversely. One way they responded to the changes in their situation was to start the development of special devices for special applications using microprocessors (POS units, development of specialized office computers, etc.) And there was an increasing tendency to move into the marketing of devices related to putting their own

firms onto on-line operation. In all probability there will be an increase in this former group. Also, they have started into software education and the development of personal computers, which is attracting attention nowadays, so they themselves are imparting, to some extent, the nature of a microcomputer-shop style of business to their operations.

In some cases it may be a matter of the top management of the computing centers and software houses changing the direction of their thinking, but it seems that often their evaluation of microcomputers rose and they made their move because of demands from within their company.

What with the coming increase in the use of small business computers and distributed processing systems, the outlook is that there will be more and more companies entering this field from the information processing industry.

(2) Entry of Mainframe Manufacturers

Mainframe manufacturers were quick off the mark regarding hobby microcomputers, and personal and home computers, and are now eying a move into the systems house business.

In America almost none of the major computer manufacturers have involved themselves in this area, whereas he Japanese makers are about to do just that. This indicates in some measure a big difference in the industrial structure of the two nations. Venture businesses may exist in Japan, but venture capital does not. Moreover, the traditional pattern in Japan is that the major manufacturers cover everything from mainframes to office equipment. If facsimiles are taken as an example, even if a company develops a prototype system incorporating a microcomputer, without a major manufacturer there will not be the funding needed for mass-production and volume sales.

Shown in Table 1 is the Japan Development Bank's estimate (published this January) of OA (office automation) device production. In many cases systems houses made a considerable contribution to the basic design of these devices. From now on, however, it is very possible that the major manufacturers will in many cases have the application technology developed inside the company or by associated companies.

The subsidiaries set up last year by NEC and Hitachi for LSI design and microcomputer software development can be regarded as one sign of this trend. The NEC company is called "Japan IC Micom Systems" and is capitalized at ¥50 million; the Hitachi company is called Hitachi Microcomputer Engineering and is also capitalized at ¥50 million. Common to the two firms is what was emphasized by NEC: that microcomputer application is spreading very rapidly, but sales depend on adequate software.(JEJ Oct. 17 1980.) Hitachi mentioned the design of electronic devices incorporating as an objective. (JEJ Oct. 17 1980.) This is an indication of the active move into this new sector by the major mainframers, a trend sure to become more pronounced in the 1980s. This shows that the potential of the microcomputer is being fully recognized by society. Whereas previously a systems house was a kind of small scale R & D enterprise, now this is a period which is seeing the participation of large-scale capital.

Table 1. Production Forecast for Office Automation Equipment

(Units: ¥100 M, %)

	1979	Proportions	1985	Proportions	Average annual growth
Office computers (fiscal year)	1,463	16.1	6,359	28.4	27.7
Facsimiles (fiscal year)	618	6.8	2,419	10.8	25.5
Electronic exchanges	1,091	12.0	4,083	18.2	24.6
Office equipment	5,926	65.1	9,553	42.6	8.3
Details: Copiers	2,596	28.5	3,940	17.5	7.2
Calculators	1,769	19.1	2,550	11.4	6.6
Cash registers	753	8.3	1,120	5.0	6.3
Word processors	—	—	200	0.9	—
Other	838	9.2	1,743	7.8	13.0
Total	9,098	100	22,414	100	16.2

(3) Participation by Electronics Devices Trading Companies

These companies (including firms under the direct management of U.S. manufacturers) which had been handling semiconductors and other devices, began developing microcomputer software from around the fall of 1980, the reason being that although such firms specialized in providing devices and components, there was an increasing call, from their clients, for software development.

As indicated by the JEJ survey, the increase in the work was stretching the capacity of the systems houses, who were finding they just didn't have enough manpower to handle it all. Also, though, in some cases the trading firms made this move for reasons of policy, to expand their business. Whatever the reason, it is a fact that the good business situation of the systems house business spurred on such moves.

Another factor was the rapid growth in personal computers. Previously, the usual thinking for personal computers was to sell the hardware, after which the purchaser could do as he liked. The rapid jump in sales, however, resulted in more users asking for software back-up. But then, it was becoming no longer a matter of selling just LSI chips; with the increased sophistication of LSI technology, sales became bound up with software.

(4) Machine Industry Participation

Mechatronics and robots, the combination of machine industries with microcomputer application technology, are expected to flourish from now on, and as part of this microcomputers will be used in the machine industry more and more in the 1980s.

The recent stepped-up application of microcomputers to robots is well known. Sim-

ilarly, the application of microcomputers to NC machines, which in response to demands for more intelligent systems and greater energy-efficiency and labor-saving, will be remarkable.

Future Role of Systems Houses, and Related Problems

In the modern era the major corporations have been at the center of progress in technical innovation. Basic technology and industry, giant systems industries, mass production industries—all these depend a great deal on the efforts of the major enterprises. However, such major organizations are often baffled when it comes to responding to the diverse needs of an advanced society.

Many low-volume demand industries exist among the high-volume demand industries, the many inter-industry and combinational technology industries exist among the giant industries, and the industrial-academic association sector where efforts are made to put to industrial use academic science and technology, also exists—among such as these there are many which do not conform with major enterprise merits.

In the microcomputer industry too, this is not an exceptional situation; the work of these being small in scale may by that fact mean that it is better suited to smaller companies with the capability—to systems houses. Systems houses have to wield their own strong individuality in building up and using a technology application capability which is the match of that of the major enterprises, to develop application products, thereby functioning as smaller knowledge-technology intensive enterprises.

The future role of the systems house can be narrowed down to the following four areas.

① Mainstay smaller Companies, and Systems Houses

Smaller companies are involved in a huge range of work; in Japan their employees account for 85% of Japan's workforce, and 60% of the value added. The smaller companies thus form the stout mainstay of Japanese industry. However, when considering, in the context of an advanced industrial country, greater future development, modernization and the implementation of high value added are urgent tasks for which technological development is a vital necessity. As such the contribution of microelectronics is so considerable as to warrant special mention.

By its nature, microelectronics will tend to filter down to all industries and be applied in every field; it has the position of a vital, basic necessity for industry.

② Inter-industrial Exchanges, and Systems Houses

A great many industries have been growing and developing as separate individuals, developing technology as they go along. However, along with the advancement of society there has as a matter of course been interference between such industries, and combining and amalgamation—which is as should be for the advancement of society. Interchanges and exchanges between and among industries lead to integrated rationalization, more efficiency, and higher value added. Especially in consideration of progress of underdeveloped and developing nations, and the horizontal international division of labor, it is necessary for the in-

dustries of the advanced nations to orient themselves towards knowledge and systems type industries, through inter-industry exchanges.

The systems houses, with their nimbleness, have a major role to play in the creation of products and systems resulting from such inter-industrial exchanges.

③ Inter-industry Technology Development, and Systems Houses

Bringing together the technologies of two disparate industries requires a bridging technology. Systems houses are well placed when it comes to combining electronics technology with the technologies of other industries—meaning with regard to the development of inter-industrial technology, to which microelectronics is central and without which applications development is difficult. That is, systems houses are well placed to develop as a new sector at a time when there are moves towards combined technology and knowledge industries.

④ Fine Technology and Systems Houses

For Japan, as an industrially advanced member of the international community, great things are expected of fine technology, and it is considered that a major contribution in this respect will be forthcoming from the development and prosperity of the Japanese-style systems house business. To develop as an industry, however, it is necessary for the houses to stop being in the nature of a subcontract development department of the major manufacturers, and to develop their own, original technology. The outlook is that this business sector, which has made do with small groups of technical personnel, will be borne along from now on by microcomputer application engineers. What will be wanted of systems houses than will be independently developed technology, the establishment of their own brand of technology.

The advance of microcomputer application technology is having a major effect on former industrial classifications; firstly, by the formation of a new industrial sector, i.e. systems houses, and by their central role in linking together differing industrial fields. This is a development that will become more pronounced.

Recommendations Submitted by the Information Industry Group, Industrial Structure Council

The recommendations in question were submitted in answer to an inquiry made by the Minister of International Trade and Industry on July 18, 1980 to the Information Industry Group of the Industrial Structure Council entitled [In what ways should informationalization and the information industry be developed in the 1980s and what policies should be adopted in relation to them].

There have been no comprehensive recommendations made by the Information Industry Group since September, 1974, so this recommendation is the first for six years.

The outline of the recommendation was as follows:

Outline of the Recommendation

The Scope and Depth of Informationalization Parallels that of the Industrial Revolution

Informationalization does not only contribute to increasing productivity and to conserving resources and energy in industries, but also assists in solving social problems such as those of education and the medical services and in enhancing the quality of domestic life. Its effects have scope and depth equal to that of the Industrial Revolution.

Informationalization that Realizes the Aims of the Ministry of International Trade and Industry in the 1980s

Japan faces three national tasks in the 1980s namely, (1) its contribution in the international field as an economic superpower, (2) the surmounting of difficulties arising from its lack of natural resources, and (3) the harmonization of "vigor" and "refinement". These tasks can be effectively tackled only by promoting informationalization, thus informationalization is a task confronting every Japanese to direct the future course of Japan.

Building an Informationalization Society to Promote Vigorous Economic Activity and Gracious Living

The recommendation defines a goal for an informationalization society in the 1980s, with the emphasis on building "an informationalization society which is rich in humane qualities, supported by a strong economy while fulfilling its responsibilities as a principal member of the international society." It reviews the way informationalization should be developed in the areas of industry, society and personal life.

Information Industry to Lead the Way in the 1980s

The aim for the computer and information process industries in the 1980s is defined. These industries will lead the way in intensifying creative knowledge within the industrial structure of Japan in the 1980s.

Strengthening of Policies for Informationalization and Informationalization as an Investment in the Social Base

The basic directions for policies for informationalization and the information industry for the 1980s have been identified. Three basic approaches are defined, as follows: (1) Strengthening of the base, (2) promotion of technological development, and (3) international deployment. The recommendation states that policies related to informationalization and the information industry should be construed as a kind of investment in the social base, taking into consideration the range over which informationalization operates from industry to domestic life. It also suggests that the Government should implement wellplanned and positive policies based on a long-term viewpoint.

Expansion of the Informationalization Base—E.g., Removal of Restrictions on Circuits

In expanding the base, the recommendation points out the necessity of removing institutional restrictions which prevent the steady progress of informationalization. The present restriction on communication circuit utilization in particular should be removed in moving towards an informationalization society.

Promotion of the Development of Innovative and Creative Technologies Which Lead the World

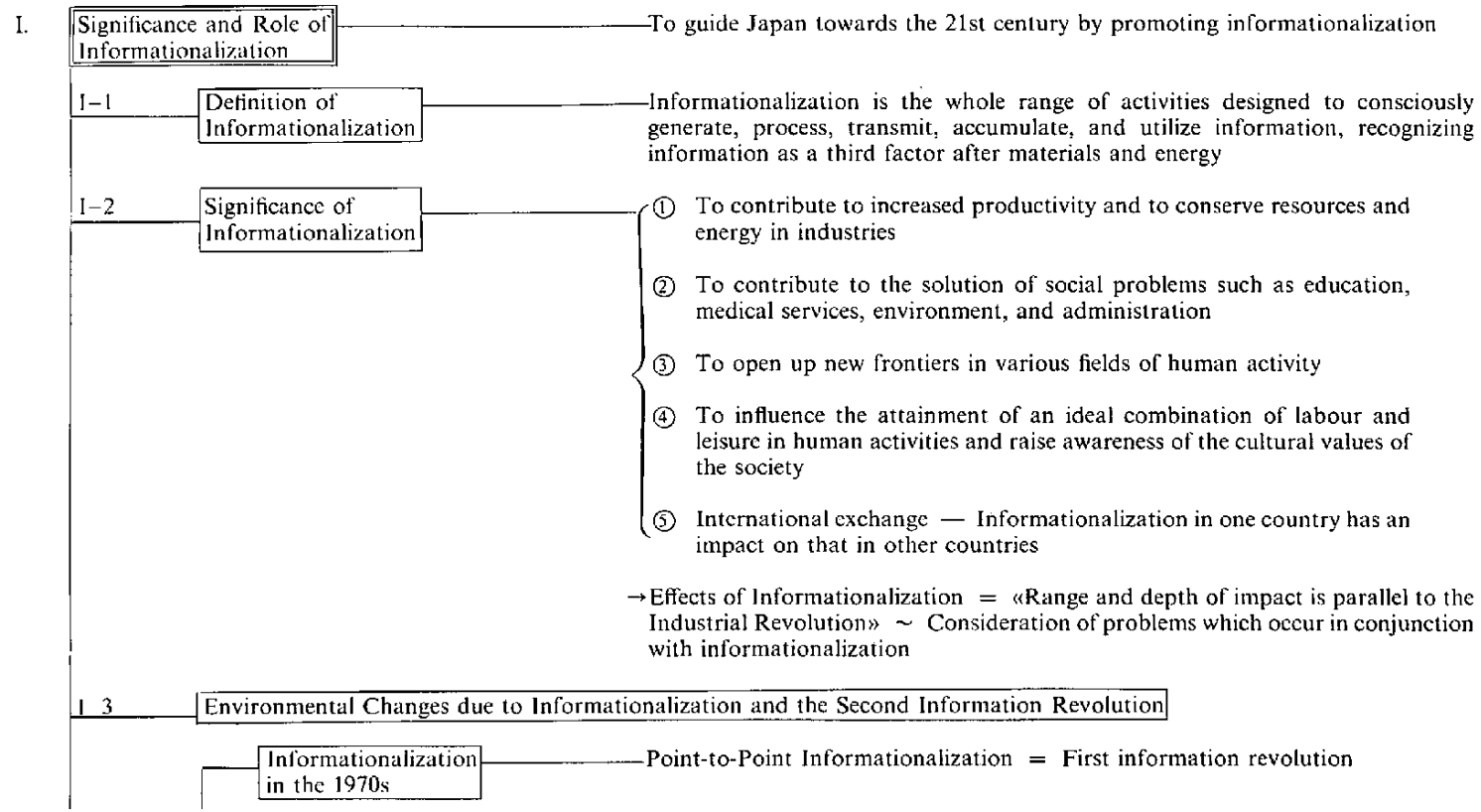
Recognizing that technology is the means to advance an informationalization society and that information-related technology is the standard bearer of Japan as a technically-oriented country, specific tasks should be undertaken with respect to basic and pioneer technologies that will not be fully researched and developed if left in the hands of private enterprise.

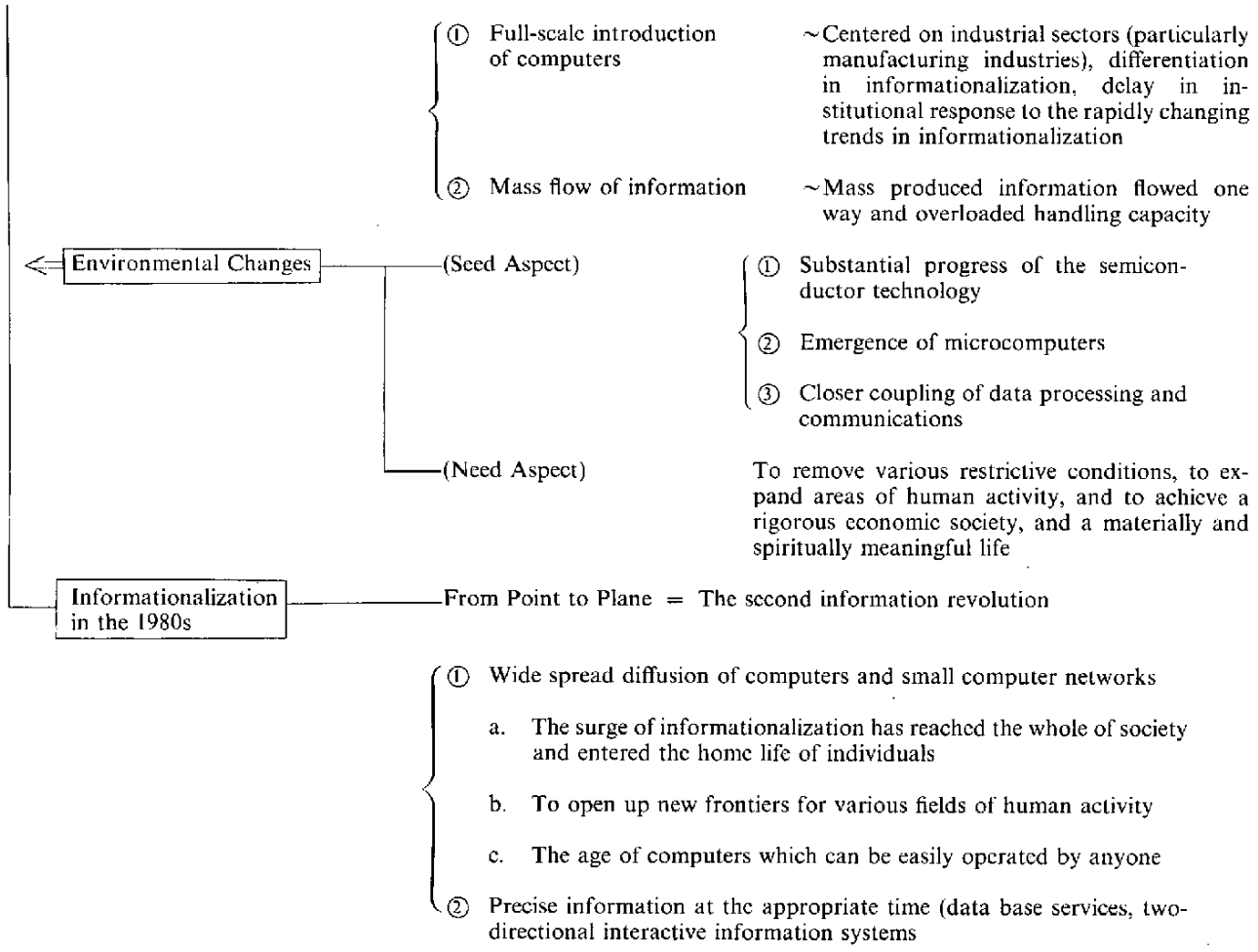
Positive Contribution to World Informationalization

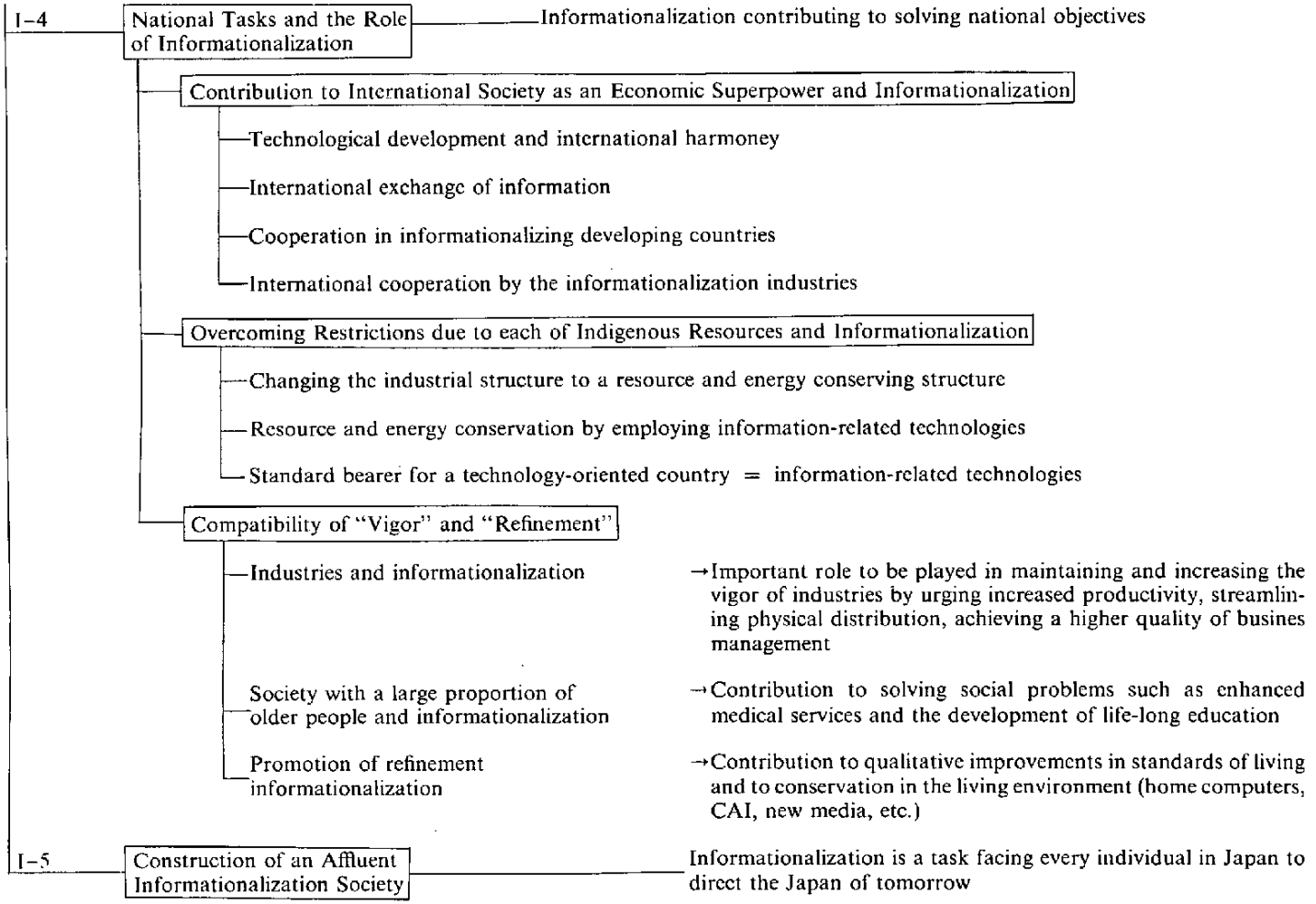
Based on the view that Japan should make a positive contribution towards world informationalization, it recommends, in terms of international deployment, the exchange of information, technology and personnel with advanced countries and cooperation in informationalization with developing countries. It also recommends that international deployment be undertaken in the spirit of international harmony.

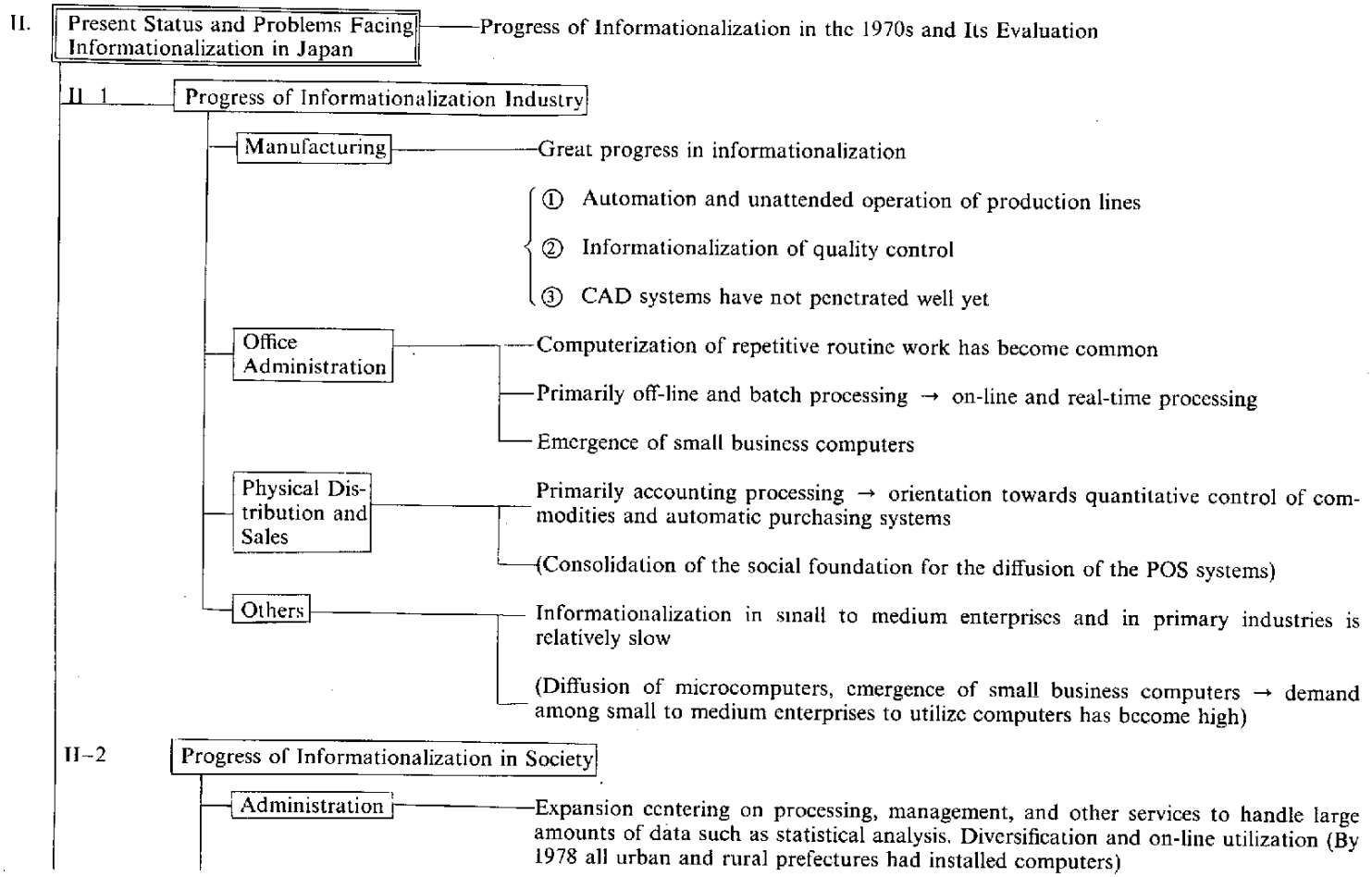
In what ways should informationalization and the information industry be developed in the 1980s and what policies should be adopted in relation to them.

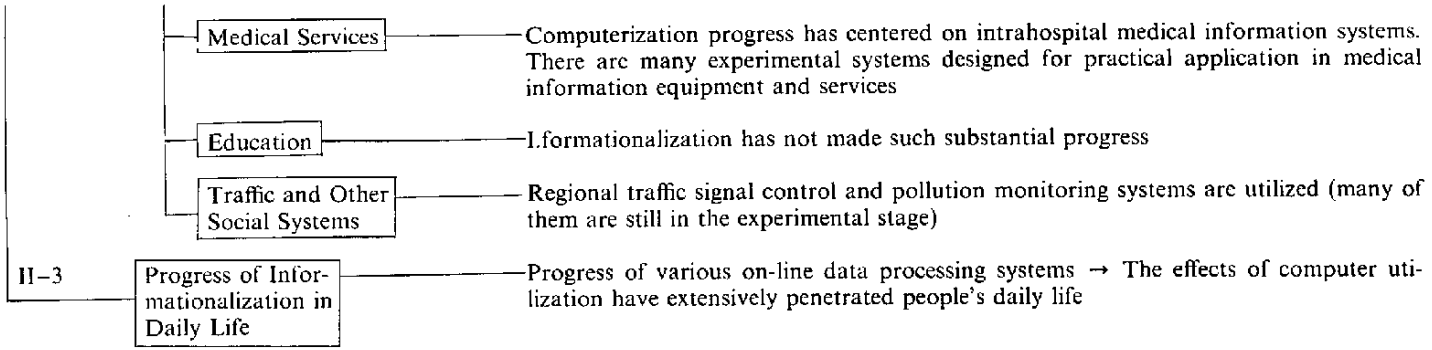
Present Status and Perspectives

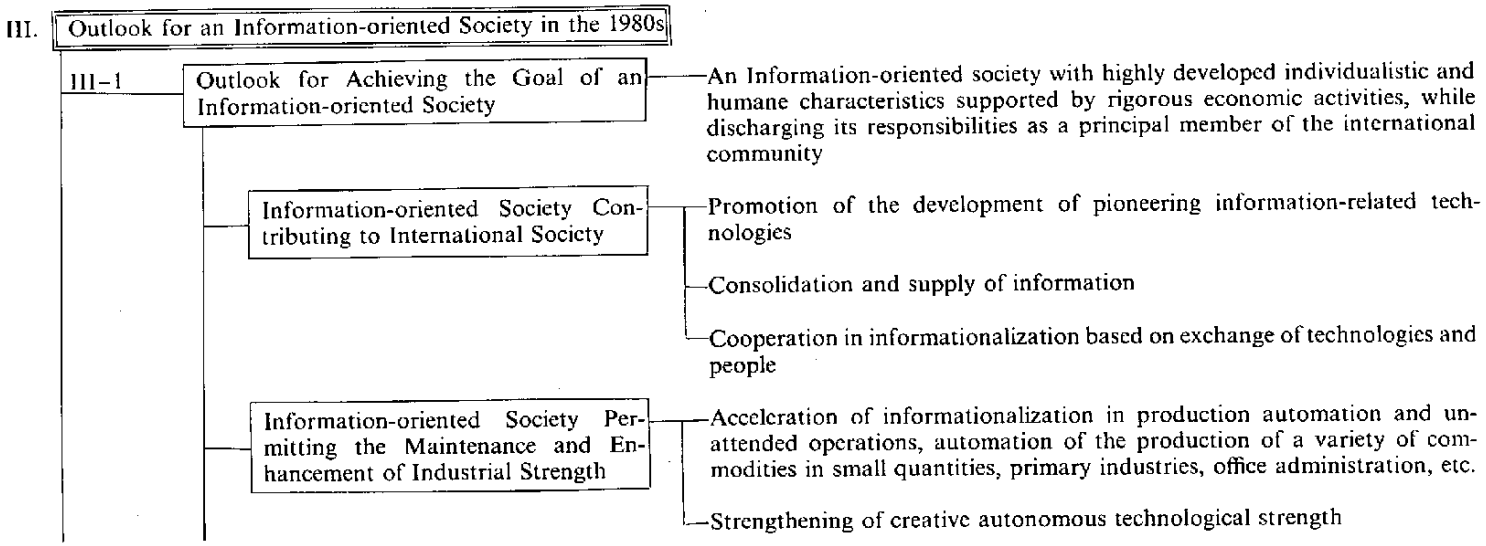


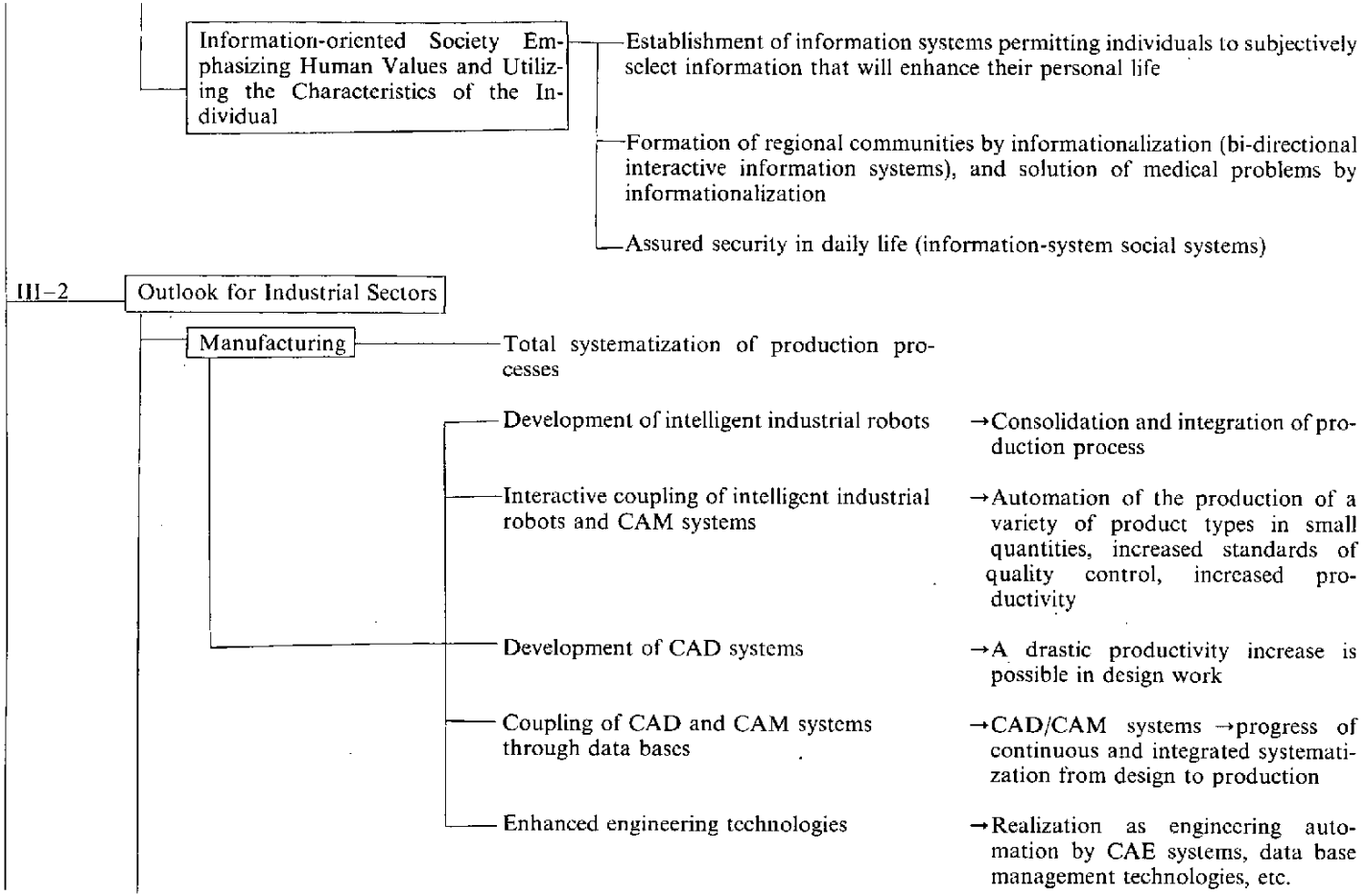

① Full-scale introduction of computers
~Centered on industrial sectors (particularly manufacturing industries), differentiation in informationalization, delay in institutional response to the rapidly changing trends in informationalization
② Mass flow of information
~Mass produced information flowed one way and overloaded handling capacity
Environmental Changes
(Seed Aspect)
① Substantial progress of the semiconductor technology
② Emergence of microcomputers
③ Closer coupling of data processing and communications
(Need Aspect)
To remove various restrictive conditions, to expand areas of human activity, and to achieve a rigorous economic society, and a materially and spiritually meaningful life
Informationalization in the 1980s
From Point to Plane = The second information revolution
① Wide spread diffusion of computers and small computer networks
a. The surge of informationalization has reached the whole of society and entered the home life of individuals
b. To open up new frontiers for various fields of human activity
c. The age of computers which can be easily operated by anyone
② Precise information at the appropriate time (data base services, two-directional interactive information systems

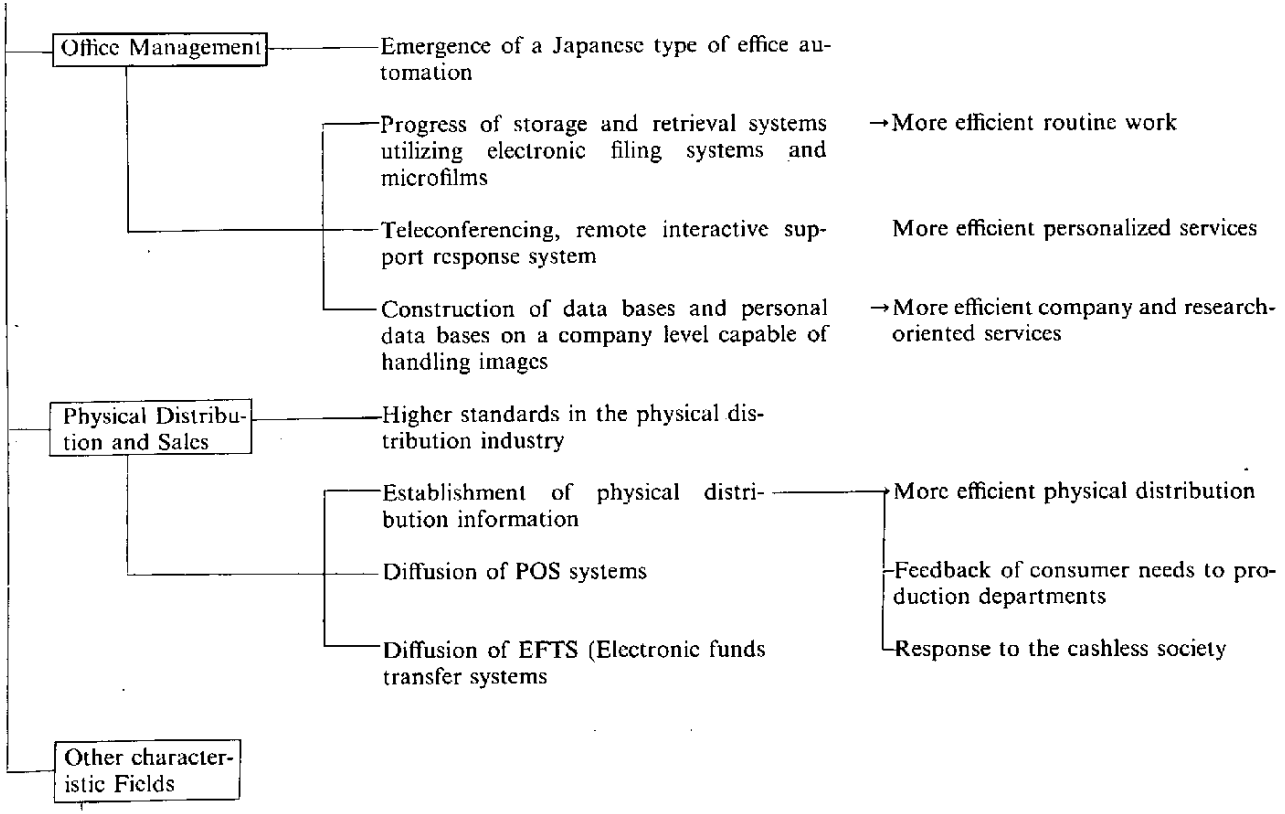

I-4
National Tasks and the Role of Informationalization
Informationalization contributing to solving national objectives
Contribution to International Society as an Economic Superpower and Informationalization
Technological development and international harmoney
International exchange of information
Cooperation in informationalizing developing countries
International cooperation by the informationalization industries
Overcoming Restrictions due to each of Indigenous Resources and Informationalization
Changing the industrial structure to a resource and energy conserving structure
Resource and energy conservation by employing information-related technologies
Standard bearer for a technology-oriented country = information-related technologies
Compatibility of "Vigor" and "Refinement"
Industries and informationalization
→Important role to be played in maintaining and increasing the vigor of industries by urging increased productivity, streamlining physical distribution, achieving a higher quality of busines management
Society with a large proportion of older people and informationalization
→Contribution to solving social problems such as enhanced medical services and the development of life-long education
Promotion of refinement informationalization
→Contribution to qualitative improvements in standards of living and to conservation in the living environment (home computers, CAI, new media, etc.)
I-5
Construction of an Affluent Informationalization Society
Informationalization is a task facing every individual in Japan to direct the Japan of tomorrow

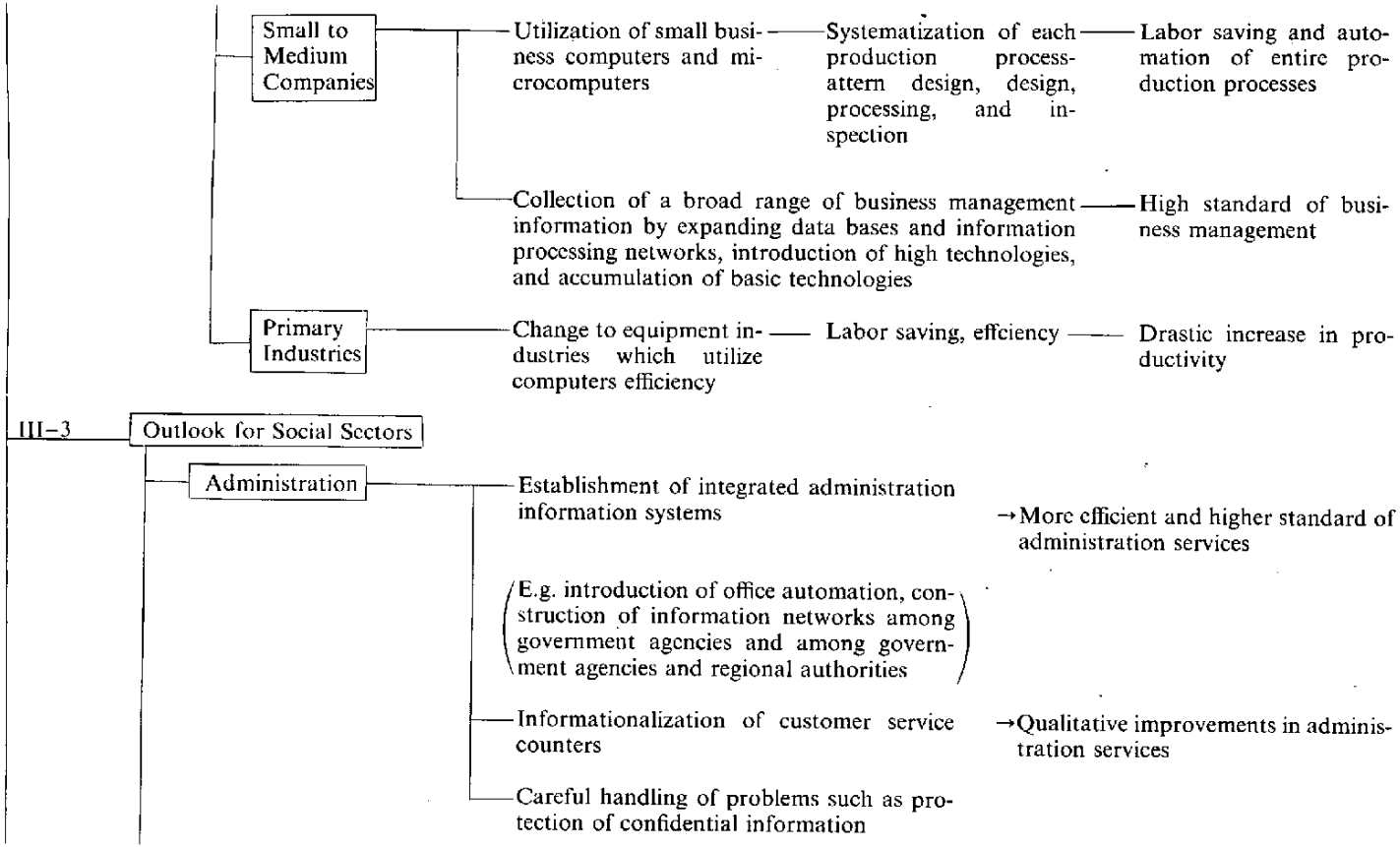

II. Present Status and Problems Facing Informationalization in Japan
Progress of Informationalization in the 1970s and Its Evaluation
II 1 Progress of Informationalization Industry
Manufacturing
Great progress in informationalization
① Automation and unattended operation of production lines
② Informationalization of quality control
③ CAD systems have not penetrated well yet
Office Administration
Computerization of repetitive routine work has become common
Primarily off-line and batch processing → on-line and real-time processing
Emergence of small business computers
Physical Distribution and Sales
Primarily accounting processing → orientation towards quantitative control of commodities and automatic purchasing systems
(Consolidation of the social foundation for the diffusion of the POS systems)
Others
Informationalization in small to medium enterprises and in primary industries is relatively slow
(Diffusion of microcomputers, emergence of small business computers → demand among small to medium enterprises to utilize computers has become high)
II-2 Progress of Informationalization in Society
Administration
Expansion centering on processing, management, and other services to handle large amounts of data such as statistical analysis. Diversification and on-line utilization (By 1978 all urban and rural prefectures had installed computers)

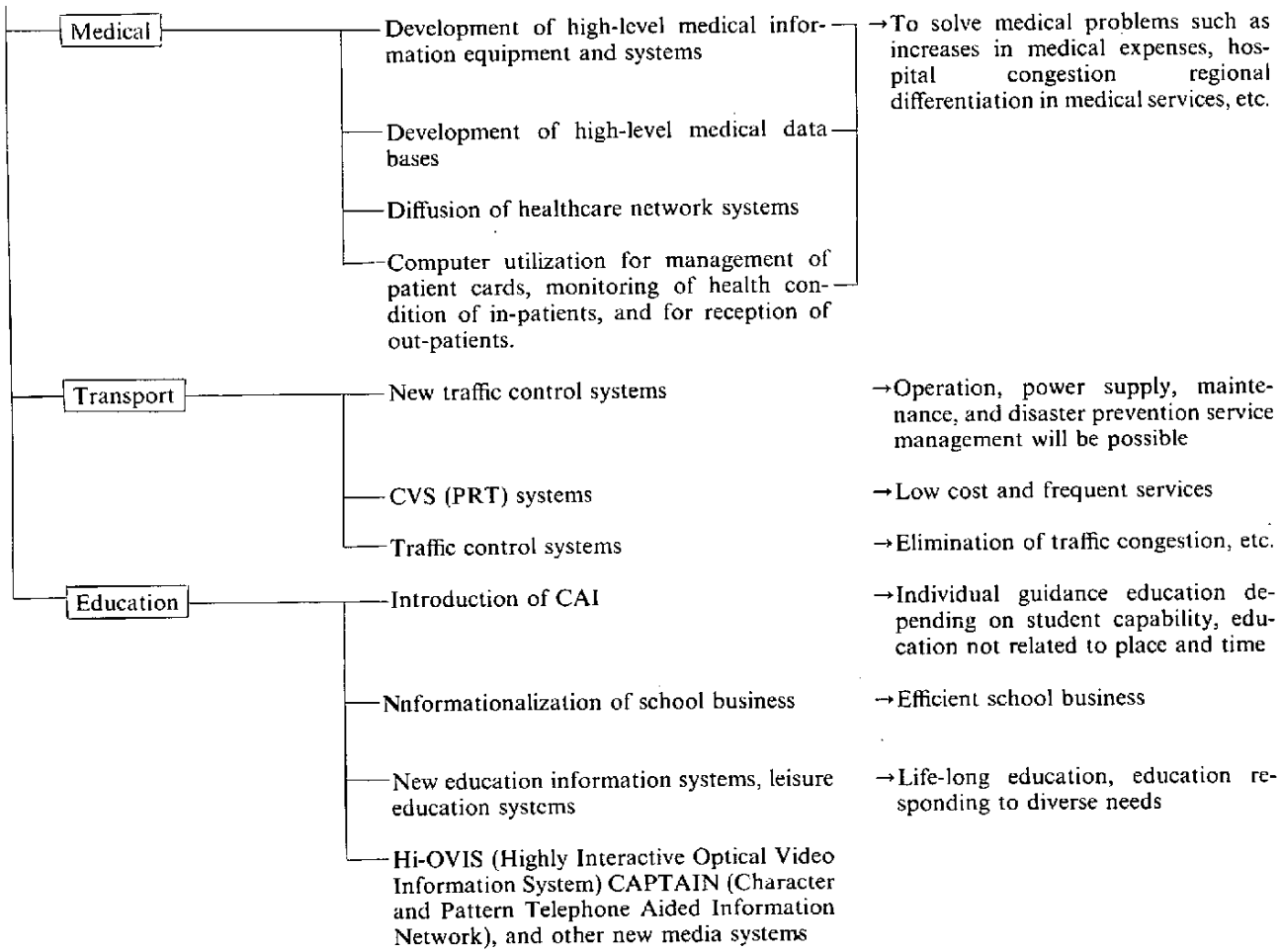

Medical Services
Computerization progress has centered on intrahospital medical information systems. There are many experimental systems designed for practical application in medical information equipment and services
Education
Informationalization has not made such substantial progress
Traffic and Other Social Systems
Regional traffic signal control and pollution monitoring systems are utilized (many of them are still in the experimental stage)
II-3
Progress of Informationalization in Daily Life
Progress of various on-line data processing systems → The effects of computer utilization have extensively penetrated people's daily life


III. Outlook for an Information-oriented Society in the 1980s
III-1
Outlook for Achieving the Goal of an Information-oriented Society
An Information-oriented society with highly developed individualistic and humane characteristics supported by rigorous economic activities, while discharging its responsibilities as a principal member of the international community
Information-oriented Society Contributing to International Society
Promotion of the development of pioneering information-related technologies
Consolidation and supply of information
Cooperation in informationalization based on exchange of technologies and people
Information-oriented Society Permitting the Maintenance and Enhancement of Industrial Strength
Acceleration of informationalization in production automation and unattended operations, automation of the production of a variety of commodities in small quantities, primary industries, office administration, etc.
Strengthening of creative autonomous technological strength


Information-oriented Society Emphasizing Human Values and Utilizing the Characteristics of the Individual
Establishment of information systems permitting individuals to subjectively select information that will enhance their personal life
Formation of regional communities by informationalization (bi-directional interactive information systems), and solution of medical problems by informationalization
Assured security in daily life (information-system social systems)
III–2
Outlook for Industrial Sectors
Manufacturing
Total systematization of production processes
Development of intelligent industrial robots
→Consolidation and integration of production process
Interactive coupling of intelligent industrial robots and CAM systems
→Automation of the production of a variety of product types in small quantities, increased standards of quality control, increased productivity
Development of CAD systems
→A drastic productivity increase is possible in design work
Coupling of CAD and CAM systems through data bases
→CAD/CAM systems →progress of continuous and integrated systematization from design to production
Enhanced engineering technologies
→Realization as engineering automation by CAE systems, data base management technologies, etc.


Office Management
Emergence of a Japanese type of effice automation
Progress of storage and retrieval systems utilizing electronic filing systems and microfilms
→More efficient routine work
Teleconferencing, remote interactive support response system
More efficient personalized services
Construction of data bases and personal data bases on a company level capable of handling images
→More efficient company and research-oriented services
Physical Distribution and Sales
Higher standards in the physical distribution industry
Establishment of physical distribution information
More efficient physical distribution
Diffusion of POS systems
Feedback of consumer needs to production departments
Diffusion of EFTS (Electronic funds transfer systems
Response to the cashless society
Other characteristic Fields


Small to Medium Companies
Utilization of small business computers and microcomputers
Systematization of each production process-attern design, design, processing, and inspection
Labor saving and automation of entire production processes
Collection of a broad range of business management information by expanding data bases and information processing networks, introduction of high technologies, and accumulation of basic technologies
High standard of business management
Primary Industries
Change to equipment industries which utilize computers efficiency
Labor saving, effciency
Drastic increase in productivity
III–3
Outlook for Social Sectors
Administration
Establishment of integrated administration information systems
→More efficient and higher standard of administration services
E.g. introduction of office automation, construction of information networks among government agencies and among government agencies and regional authorities
Informationalization of customer service counters
→Qualitative improvements in administration services
Careful handling of problems such as protection of confidential information


Medical
Development of high-level medical information equipment and systems
Development of high-level medical data bases
Diffusion of healthcare network systems
Computer utilization for management of patient cards, monitoring of health condition of in-patients, and for reception of out-patients.
→To solve medical problems such as increases in medical expenses, hospital congestion regional differentiation in medical services, etc.
Transport
New traffic control systems
→Operation, power supply, maintenance, and disaster prevention service management will be possible
CVS (PRT) systems
→Low cost and frequent services
Traffic control systems
→Elimination of traffic congestion, etc.
Education
Introduction of CAI
→Individual guidance education depending on student capability, education not related to place and time
Nnformationalization of school business
→Efficient school business
New education information systems, leisure education systems
→Life-long education, education responding to diverse needs
Hi-OVIS (Highly Interactive Optical Video Information System) CAPTAIN (Character and Pattern Telephone Aided Information Network), and other new media systems

III-4 Outlook for Aspects of Personal Life

- Diffusion of home computers and microcomputers — Home automation → Organization of personal life
- Home interactive learning systems of an on-line or stand-alone type, CATV systems → Enhanced quality of life
- Formation of information networks covering regional communities → Improved living conditions «new close-knit communities with good human relations»

IV. Perspectives and Tasks of Information Industries in the 1980s

IV-1 Perspectives and Tasks of the Computer Industry in the 1980s

Significance and Role of the Computer Industry

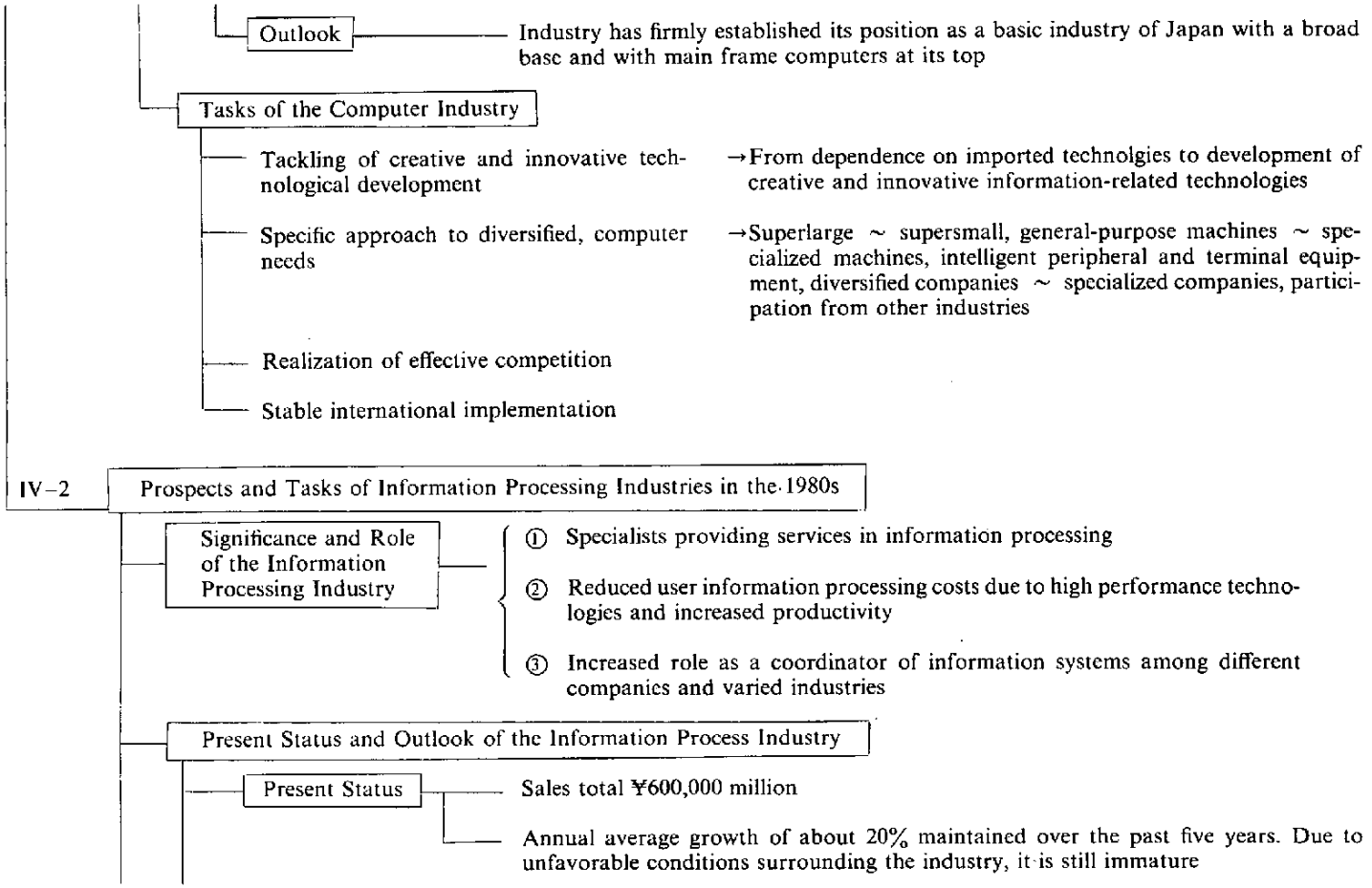
① Technology intensive and high added value
② Effect of technology on other industries is great
③ Resource and energy conservation industry
④ Has a considerable impact on related industries and accelerates expansion of these industries

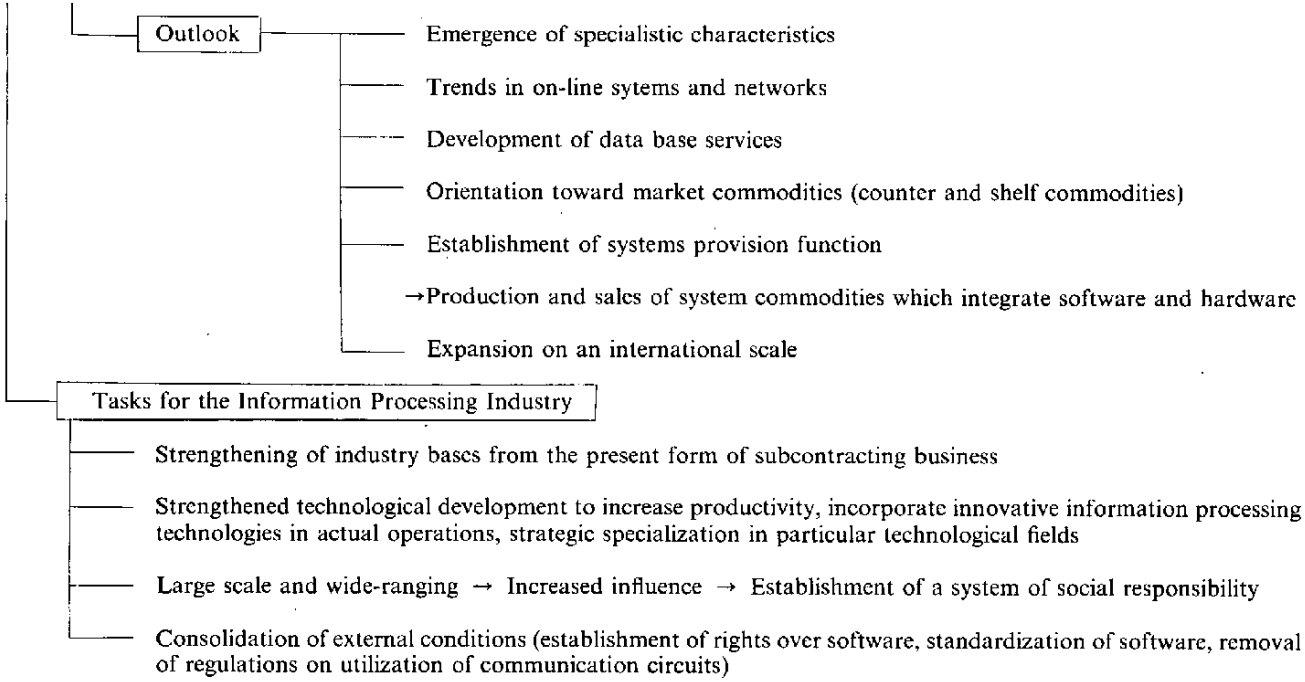
→ Leading industries are opening up prospects for the 21st Century «basic industry of Japan»

Present Status and Outlook of the Computer Industry

Present Status

- Production value totals ¥1,350,000 million
- High growth industries whose growth always surpasses that of Japan's GNP


Outlook
Industry has firmly established its position as a basic industry of Japan with a broad base and with main frame computers at its top
Tasks of the Computer Industry
Tackling of creative and innovative technological development
→From dependence on imported technolgies to development of creative and innovative information-related technologies
Specific approach to diversified, computer needs
→Superlarge ~ supersmall, general-purpose machines ~ specialized machines, intelligent peripheral and terminal equipment, diversified companies ~ specialized companies, participation from other industries
Realization of effective competition
Stable international implementation
IV–2
Prospects and Tasks of Information Processing Industries in the 1980s
Significance and Role of the Information Processing Industry
① Specialists providing services in information processing
② Reduced user information processing costs due to high performance technologies and increased productivity
③ Increased role as a coordinator of information systems among different companies and varied industries
Present Status and Outlook of the Information Process Industry
Present Status
Sales total ¥600,000 million
Annual average growth of about 20% maintained over the past five years. Due to unfavorable conditions surrounding the industry, it is still immature


Outlook
Emergence of specialistic characteristics
Trends in on-line sytems and networks
Development of data base services
Orientation toward market commodities (counter and shelf commodities)
Establishment of systems provision function
→Production and sales of system commodities which integrate software and hardware
Expansion on an international scale
Tasks for the Information Processing Industry
Strengthening of industry bases from the present form of subcontracting business
Strengthened technological development to increase productivity, incorporate innovative information processing technologies in actual operations, strategic specialization in particular technological fields
Large scale and wide-ranging → Increased influence → Establishment of a system of social responsibility
Consolidation of external conditions (establishment of rights over software, standardization of software, removal of regulations on utilization of communication circuits)

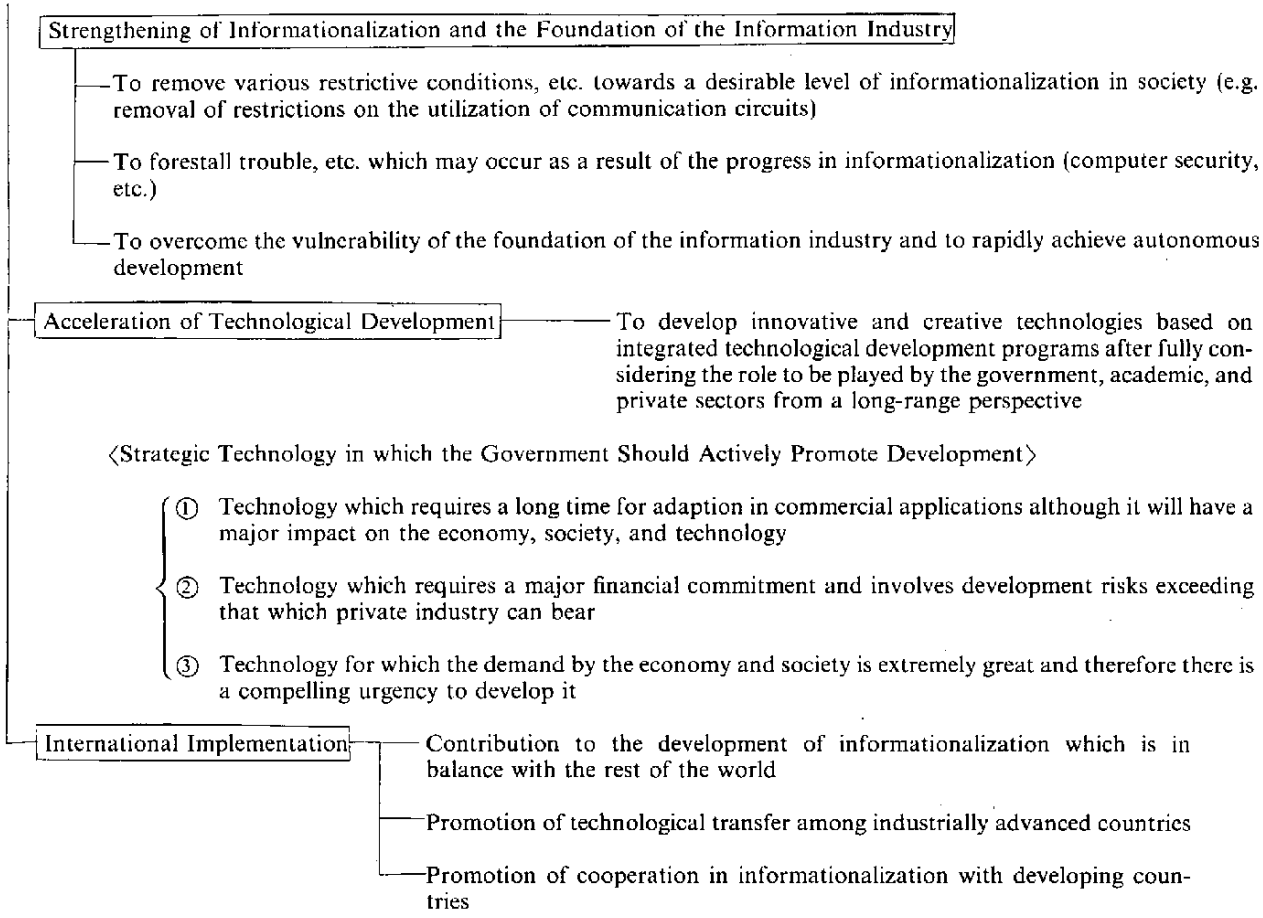
Policies to be Implemented in the 1980s

I. Basic Direction for Informationalization and Information Industry Policies

I-1 Necessity for Policies

- Necessity for Government Subsidies
  - In order to effectively carry out informationalization:
    - Utilize creativity and vigor of private enterprises while
    - The Government itself must indicate the direction and goals of future informationalization and implement policies required to achieve them
- Implementation of Strategic Policies — Before implementing new policies, past policies are reviewed, and policies are implemented after concentrating on strategically important areas
- Information-Related Policies are Investment in the Social Foundation
  - Great advantages, both direct and indirect, are anticipated in the future over the whole spectrum of industry, society, and private life. Policies must be made and implemented steadily and in a well-planned manner based on a long-range viewpoint
    - → Hesitation now, merely because of the short-term fiscal situation, etc., will result in considerable problmes in the future
    - → The necessity of also studying ways and means to ensure a stable sources of funds

I-2 Basic Direction of Policies


Strengthening of Informationalization and the Foundation of the Information Industry
To remove various restrictive conditions, etc. towards a desirable level of informationalization in society (e.g. removal of restrictions on the utilization of communication circuits)
To forestall trouble, etc. which may occur as a result of the progress in informationalization (computer security, etc.)
To overcome the vulnerability of the foundation of the information industry and to rapidly achieve autonomous development
Acceleration of Technological Development
To develop innovative and creative technologies based on integrated technological development programs after fully considering the role to be played by the government, academic, and private sectors from a long-range perspective
〈Strategic Technology in which the Government Should Actively Promote Development〉
① Technology which requires a long time for adaption in commercial applications although it will have a major impact on the economy, society, and technology
② Technology which requires a major financial commitment and involves development risks exceeding that which private industry can bear
③ Technology for which the demand by the economy and society is extremely great and therefore there is a compelling urgency to develop it
International Implementation
Contribution to the development of informationalization which is in balance with the rest of the world
Promotion of technological transfer among industrially advanced countries
Promotion of cooperation in informationalization with developing countries

II. Strengthening of Informationalization and Foundation of the Information Industry

II-1 Review of the Communication Circuit Utilization Systems

① To review utilization restrictions on communication circuits for on-line information processing to meet changes in the economy and technological progress and to abolish unrealistic regulations. Minimum required regulations should clearly define their scope, and free utilization should be permitted for all other cases. This means adoption of a negative list system (the scope of regulation should be limited to the removal of technical difficulties in transmission, switching, charging, etc. and to elimination of telephone and telegraphic business)

② To improve the circuit utilization changing system for on-line information processing (the system should be independent of the telephone charging system and should be one that is rationalized to reduce the difference in charges due to distance by making full use of technological progress.

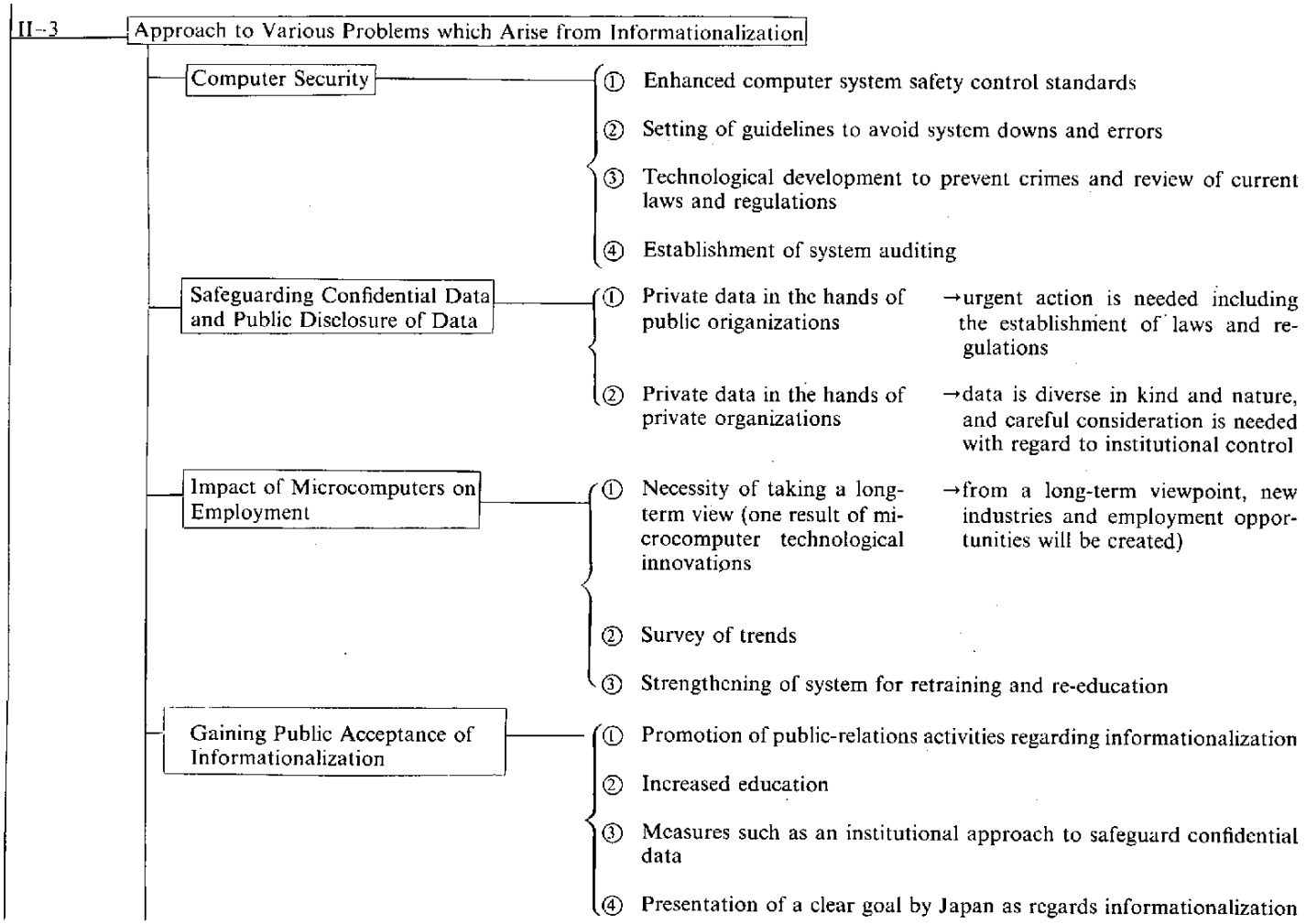
③ Problems related to the data communication facilities and services of Nippon Telegraph and Telephone Public Corp. — removal of restrictions on communication circuit utilization. Strengthening of general conditions so as to avoid disadvantages which the private sector may suffer as a result of this. (Avoidance of competition with private operators, and clear-cut division of responsibility between private and government sectors)

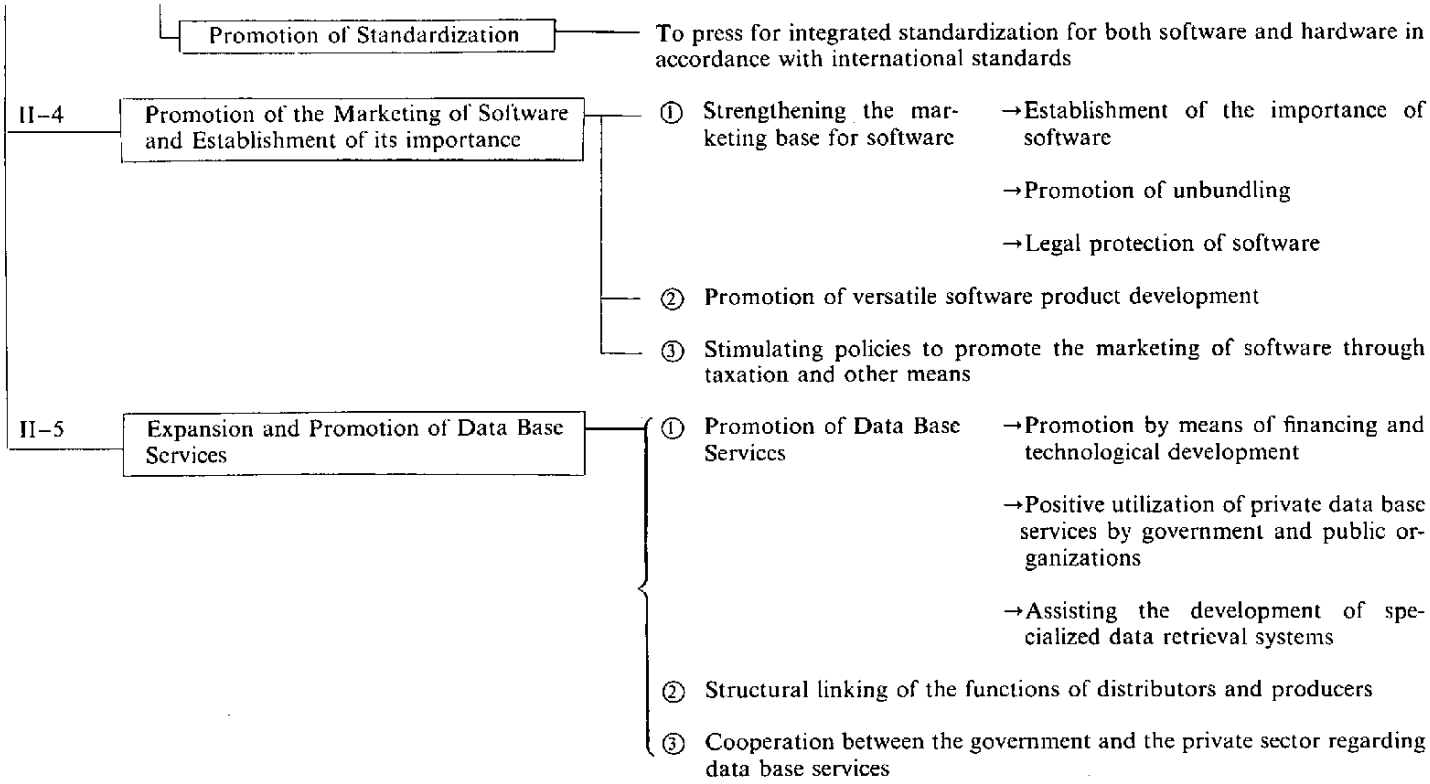
II-2 Response to the Linking of Information Processing and Communications

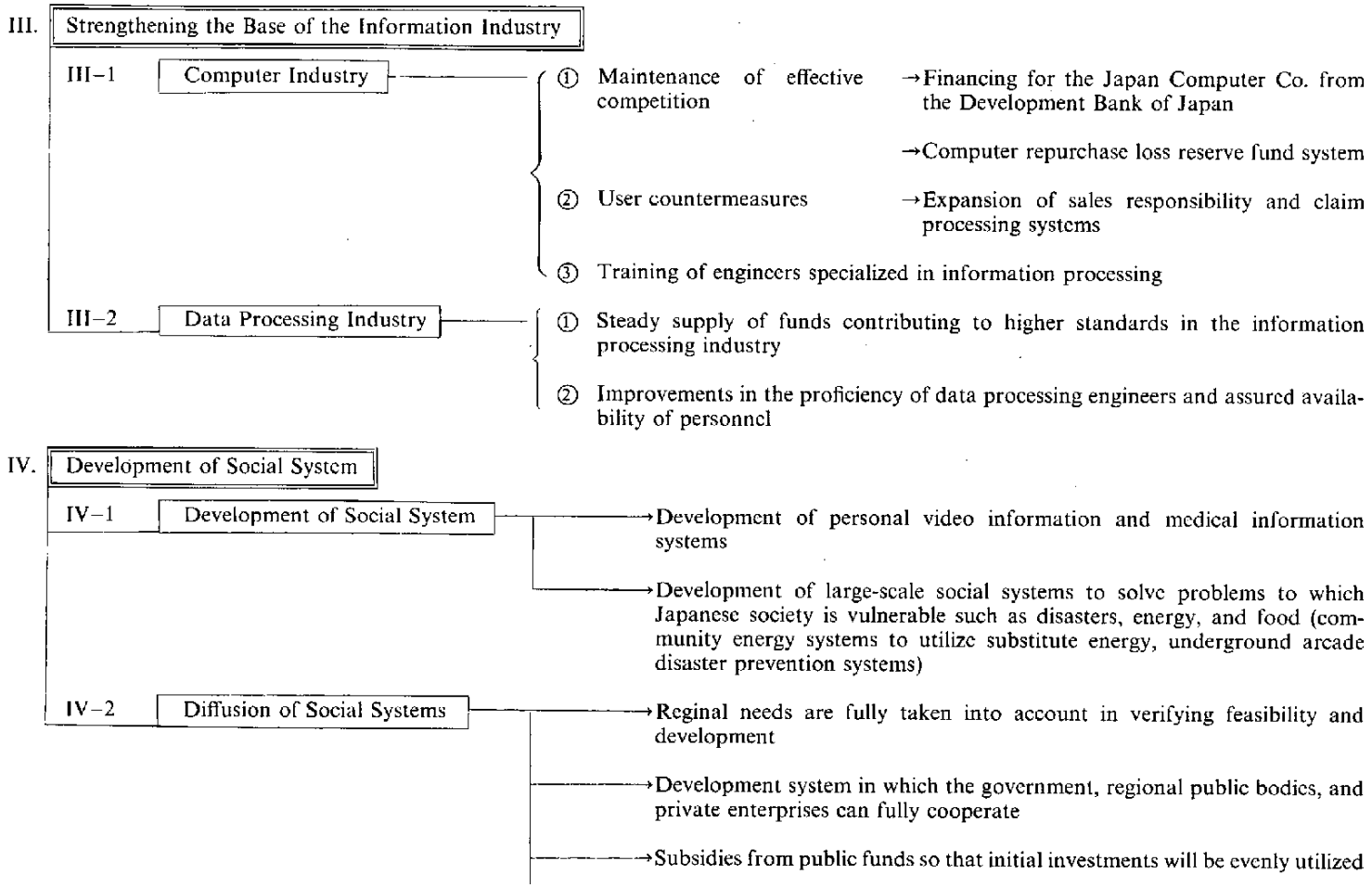
① Acceleration of technological development

② Expansion of digital communication circuit networks

③ Necessity for prompt revision of related laws and regulations so that current communication laws and regulations do not block the realization of new data services or cripple technological development in its initial stages


II-3
Approach to Various Problems which Arise from Informationalization
Computer Security
① Enhanced computer system safety control standards
② Setting of guidelines to avoid system downs and errors
③ Technological development to prevent crimes and review of current laws and regulations
④ Establishment of system auditing
Safeguarding Confidential Data and Public Disclosure of Data
① Private data in the hands of public organizations →urgent action is needed including the establishment of laws and regulations
② Private data in the hands of private organizations →data is diverse in kind and nature, and careful consideration is needed with regard to institutional control
Impact of Microcomputers on Employment
① Necessity of taking a long-term view (one result of microcomputer technological innovations →from a long-term viewpoint, new industries and employment opportunities will be created)
② Survey of trends
③ Strengthening of system for retraining and re-education
Gaining Public Acceptance of Informationalization
① Promotion of public-relations activities regarding informationalization
② Increased education
③ Measures such as an institutional approach to safeguard confidential data
④ Presentation of a clear goal by Japan as regards informationalization


Promotion of Standardization
To press for integrated standardization for both software and hardware in accordance with international standards
II-4
Promotion of the Marketing of Software and Establishment of its importance
① Strengthening the marketing base for software
→Establishment of the importance of software
→Promotion of unbundling
→Legal protection of software
② Promotion of versatile software product development
③ Stimulating policies to promote the marketing of software through taxation and other means
II-5
Expansion and Promotion of Data Base Services
① Promotion of Data Base Services
→Promotion by means of financing and technological development
→Positive utilization of private data base services by government and public organizations
→Assisting the development of specialized data retrieval systems
② Structural linking of the functions of distributors and producers
③ Cooperation between the government and the private sector regarding data base services


III. Strengthening the Base of the Information Industry
III-1 Computer Industry
① Maintenance of effective competition
→Financing for the Japan Computer Co. from the Development Bank of Japan
→Computer repurchase loss reserve fund system
② User countermeasures
→Expansion of sales responsibility and claim processing systems
③ Training of engineers specialized in information processing
III-2 Data Processing Industry
① Steady supply of funds contributing to higher standards in the information processing industry
② Improvements in the proficiency of data processing engineers and assured availability of personnel
IV. Development of Social System
IV-1 Development of Social System
→Development of personal video information and medical information systems
→Development of large-scale social systems to solve problems to which Japanese society is vulnerable such as disasters, energy, and food (community energy systems to utilize substitute energy, underground arcade disaster prevention systems)
IV-2 Diffusion of Social Systems
→Reginal needs are fully taken into account in verifying feasibility and development
→Development system in which the government, regional public bodies, and private enterprises can fully cooperate
→Subsidies from public funds so that initial investments will be evenly utilized

- Review of and improvements in the current legal system so as to ensure the smooth introduction of a social system
- Subsidies on financial and taxation arrangements to new management bodies such as third sector system

V. Promotion of the Development of Information-Related Technologies

V-1 Strengthening of the Research and Development Structure

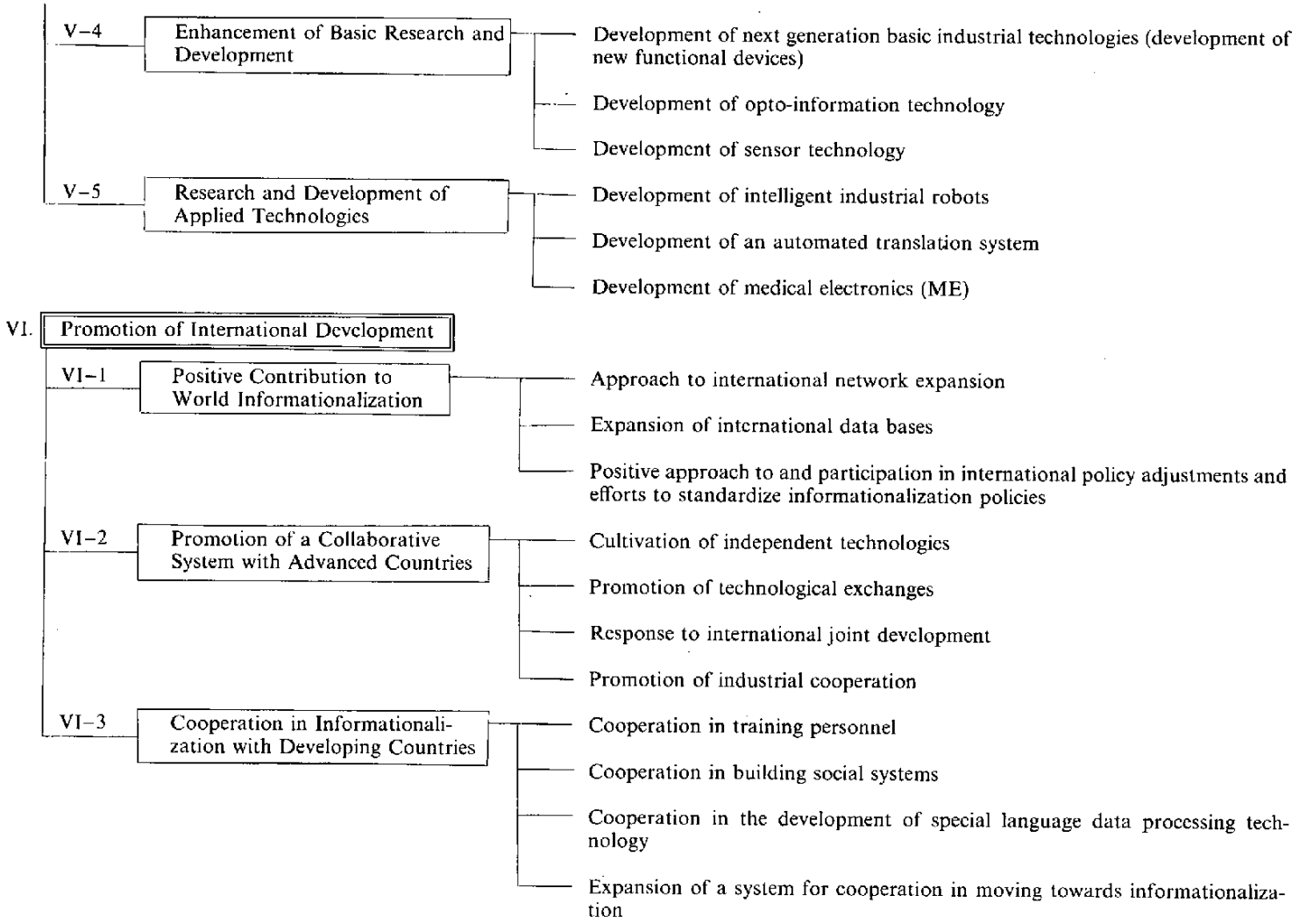
- Establishment of integrated technological development programs and strategies
- Promotion of structural collaboration among various test and research organizations with a drive towards pioneer technologies
- Study into the creation of an integrated research and development organization covering both hardware and software
- Study of how international cooperation should be conducted

V-2 Preferential Development of Technologies Related to Software

- Promotion of Development of basic software technologies for the next generation of computers
- Promotion of software and maintenance technology development
- Promotion of development of pioneer data processing technology
- Development of large-scale software technology
- Development of software which is highly versatile and easy to operate

V-3 Development of Technological Innovations

- Research and development of high-speed computer systems for scientific and engineering applications
- Research and development of 5th generation computers


V-4
Enhancement of Basic Research and Development
Development of next generation basic industrial technologies (development of new functional devices)
Development of opto-information technology
Development of sensor technology
V-5
Research and Development of Applied Technologies
Development of intelligent industrial robots
Development of an automated translation system
Development of medical electronics (ME)
VI. Promotion of International Development
VI-1
Positive Contribution to World Informationalization
Approach to international network expansion
Expansion of international data bases
Positive approach to and participation in international policy adjustments and efforts to standardize informationalization policies
VI-2
Promotion of a Collaborative System with Advanced Countries
Cultivation of independent technologies
Promotion of technological exchanges
Response to international joint development
Promotion of industrial cooperation
VI-3
Cooperation in Informationalization with Developing Countries
Cooperation in training personnel
Cooperation in building social systems
Cooperation in the development of special language data processing technology
Expansion of a system for cooperation in moving towards informationalization

News in Brief

New Ministry of Posts and Telecommunications Projects for Fiscal 1981

4 January 1981

The main MPT budgetary items for 1981 relating to data communications have been approved. New projects for which appropriations have been made include the "High-Level Comprehensive Data Communications System" to undergo development and testing at Tsukuba Academic Community and a project aimed at formulating a long-term view in connection with communications administration (Communications Policy Vision for the 1980s). Also, funds were appropriated for continuing trial operation of the Captain system (a character and graphic information network) which has been functioning on a test basis since late 1979. In addition, nearly the full amount of funds requested were granted in connection with a series of data communications technology projects that have been under way since 1979.

The High-Level Comprehensive Data Communications System is a communication network centered on bidirectional CATV (cable TV) that encompasses both a community information network for private homes and a data communications network directed to research institutions. MTP's plans call for completion of the system by 1985, the year in which an international science and technology exhibition is scheduled to be held at Tsukuba Academic Community. Funds amounting to ¥54 million were requested for working out the basic concepts of the system during fiscal 1981. ¥31 million was granted.

Survey and research for another key project, the working out of a "Communication Policy Vision for the 1980s," includes topics relating to the needs of the communications media and trends in technological development. The "Vision" is to be formulated in parallel with the studies to be conducted by the Electrical Communications Policy Study Group (Chairman: Yoshishige Ashiwara, Chairman of Kansai Electric Power Co.) newly formed in the autumn of 1980. The amount appropriated was ¥21 million.

During fiscal 1981, the number of Captain system monitors is to be doubled to 2,000 and improvements are to be made in the machines used by both the monitors and the suppliers of information. Also, the practicality of the system is to be enhanced through the introduction of closed systems among a limited number of monitors and a system for ordering merchandise. Of ¥81

million requested, ¥57 million was approved.

¥215 million was requested for conducting development and studies toward upgrading data communications. ¥209 million was approved.

Japan Management Association Conducts Survey on Use of Japanese Language Word Processors

26 January 1981

The Japan Management Association conducted a survey in November on "Use and Awareness of Japanese Language Word Processors." The survey was conducted in respect of 529 firms throughout the country including companies listed on the Tokyo Stock Exchange, data processing firms and small and medium sized enterprises.

Among the firms listed on the Tokyo Stock Exchange and the computer divisions of data processing firms, 14.33% replied that they were using word processors and 7.7% replied that they would begin using word processors in the near future.

In addition, slightly over 30% of those replying said that they had seen or operated a word processor. Adding those who said that they had no direct experience but knew about word processors brought the total to 85.36%, showing that the awareness of Japanese language word processors is extremely high.

As regards the necessity of having a word processor, the percentage of computer divisions answering "extremely high" was 23.75% and the percentage of document divisions giving this reply was only slightly lower at 21.63%.

Concerning preference in type of input system, it was found that 42.06% of the computer divisions and 28.37% of the document divisions preferred the "keyboard system" while, on the other hand, 13.71% of the computer divisions and 21.63% of the document divisions preferred the "Character-board system"

Nippon Telegraph and Telephone Public Corporation to Commercialize Optical Fiber Transmission

25 February 1981

Nippon Telegraph and Telephone Public Corporation recently announced that it would begin medium and small capacity repeaterless transmission between nearby telephone exchanges using optical fibers from 1981 and would also commence final in-circuit testing of large capacity optical transmission between large cities. Medium and small capacity transmission will be carried out not only with short wavelength (0.85 micron) light but also, for the first time anywhere in the world, with long wavelength (1.3 micron) light. Also, single mode optical fiber will be used for the large capacity transmission.

Final in-circuit testing of medium and small capacity optical fiber transmission between nearby telephone centrals without the use of repeaters was completed in Kawasaki in January last year. Commercial operation is scheduled to begin over 12 transmissions intervals totaling 110 kilometers in Tokyo, Osaka and other parts of the country near the end of fiscal 1981. Construction work is to begin shortly. The transmission modes will be 32 megabit/sec (480 telephone cir-

cuits) and 100 megabit/sec (1,440 circuits). The distance between repeaters will be 10 kilometers for short wavelength transmission and 15 kilometers for long wavelength transmission.

The testing of large capacity optical fiber transmission is to be conducted over an 80-kilometer interval between NTT's Musashino Electrical Communications Laboratory in Mitaka, Tokyo and the Corporation's Fourth Electrical Communications Laboratory which is presently still under construction in Atsugi, Kanagawa Prefecture. Plans call for establishing the required technology through testing by the end of fiscal 1982 and practical application in trunk line transmission between major cities such as Tokyo-Osaka within fiscal 1983. The transmission mode will be 400 megabit/sec (5,760 telephone circuits) and the interval between repeaters 20 kilometers. The maximum transmission distance will be 2,500 kilometers.

Captain System Enters Second Test Phase

10 April 1981

The Ministry of Posts and Telecommunications, Nippon Telegraph and Telephone Public Corporation and Captain System Development Laboratory have been pushing forward with tests aimed at putting the Captain system (a character and graphic information network system) into practical operation by fiscal 1983. Now, according to a recent announcement, second phase testing will begin from this summer.

First phase practical testing begun in December 1979 was completed at the end of March. Second phase testing is scheduled to start in August and continue to the end of fiscal 1982.

In order to increase the system's practicality during the second phase testing the monitor area will be expanded to include all of Tokyo's wards and the number of monitors will be doubled to 2,000. Also, the information storage capacity will be increased from the present 100,000 frames to 200,000 frames. Other improvements will be made to make it easier for the monitors to access the information they desire. For example, it will be made possible to use preset short code numbers for obtaining commonly used information and to search the system index using *kana* characters instead of numerals.

New services are also to be incorporated. One of these will involve the improvement of user terminals to permit the production of hard copies. Another will be a system for allowing a pre-designated group of user terminals to utilize special information. There will be added a closed user group service, and an order entry service which will make possible simple inquiry and response between users and information suppliers regarding orders for merchandise.

Administrative Management Agency Compiles Statistics on Computer Utilization at Government Offices

19 April 1981

The Administrative Management Agency has compiled the results of its 1980 survey on computer utilization at the government offices and special public corporations. The agency reports that as of the end of March

there were 309 computer installations at 212 divisions in 21 ministries and agencies. (A "division" here refers to a section or office in charge of operating a computer or developing a computer system.) The total value of these installations came to ¥189.9 billion, a 1.8 fold increase over five years earlier. The value per installation has increased 1.4 times over the same period. Utilization is expanding from such conventional areas as statistics, salaries, mutual aid, pensions insurance and registrations to various types of information retrieval and other forms of utilization related to the formulation of government policy. As a result of improvements in processing mode, online processing (including cases where online processing is combined with remote and batch processing) has now reached 66.8% (205 computers). The number of computer personnel as of April 1 was 5,132 in 223 divisions for an average of 23 per division.

Of the 109 special corporations, 59 had 680 computer installations in 333 divisions. The total value of the installations has reached ¥165.6 billion.

In addition to being used for salary computation, accounting and the compilation of statistics, these computers have recently become used more and more for data retrieval, forecasting and analysis. The number of computer personnel as of April 1 stood at 7,169.

Nippon Telegraph and Telephone Public Corporation Develops World's Largest Computer

22 April 1981

NTT's Yokosuka Electrical Communications Laboratory (Director: Reijiro Fukutomi) today announced that it had completed development of its DIPS-11 Model 45, the world's largest and fastest computer. The capacity of the main memory is 128 M-byte and the lag time of the processor's high speed logic LSIs is 0.35 nanosec per gate. The main feature of the computer is the provision of a high speed (64 K-byte) and low speed (512 K-byte) two-stage buffer memory between the processor and the main memory so as to take full advantage of the ultra-high speed of the logic LSIs and the large capacity of the main memory. This is the world's first computer to use this system. The Yokosuka Laboratory forecasts that the super large computers developed by companies throughout the world will in the future employ this same system.

The processor is constituted of 12 thirty-centimeter square printed circuit boards each having 121 LSIs. These boards are housed in a space amounting to 50 cm^3, an indication of the high density that has been attained. An air cooling system is used for easy maintenance.

The first machine for practical use will be completed in 1982 and will be used for NTT services from the same year.

JIPDEC Publishes Report on Fifth Generation Computer Survey

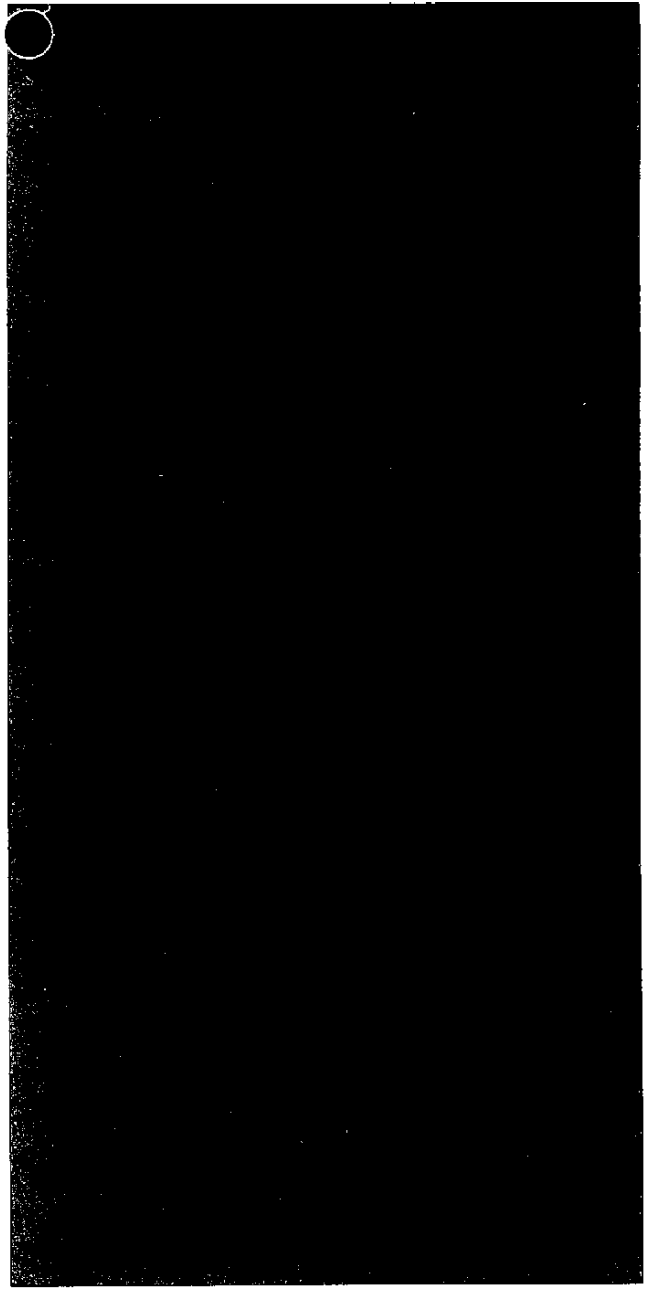
23 April 1981

Japan Information Processing Development Center (JIPDEC) has published a report on its survey conducted over a two-year period in connection with the "Fifth Generation Computer" which is expected to appear during the 1980s. (Report available in

Japanese only.)

The report forecasts that the role of information processing systems in society will increase greatly during the 1990s and that the Fifth Generation Computer will contribute to the solution of a number of anticipated future problems in connection with energy, the aging population etc. The report goes on to say that in order to meet the social needs of this coming age, the Fifth Generation Computer will be required to have "very high-level capability." More specifically, the report outlines a computer with functions approaching the human level which is (1) capable of voice, graphic, video and documentary input/output, (2) capable of conversing and processing in a natural language, (3) possesses expert knowledge which it is able to employ on its own, and (4) capable of learning, associating and reasoning.

A large number of subjects require research and development before such a new computer system can be realized. The report singles out a number of such subjects that must be taken up: fundamental application systems, new architecture, VLSI technology, systematization technology, and others. The report divides these technologies into 7 groups encompassing 26 subject categories and strongly urges that development be begun on these as early as possible. JIPDEC will present this report at the "1981 International Conference on the Fifth Generation Computer" to be held in Tokyo in October, and hopes to receive the comments of specialists from throughout the world.



JIPDEC

Japan Information Processing Development Center