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Japan Information Processing Development Center

The Office of Today and Tomorrow

No. 47

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Japan Information Processing Development Center (JIPDEC) was established in 1967 with the support of the Government and related industrial circles. JIPDEC is a non-profit organization aimed at the promotion, research and development of information processing and information processing industries in Japan.

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Japan's Office Automation Market

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(JMBA)

1. Office Automation in Japan

(1) Everyone's talking about "OA"

Over the past 2 or 3 years, the term "OA" has become firmly established among Japanese as an abbreviation for office automation. A number of stories have been reported of Japanese businessmen in the office automation field asking their American counterparts about the "OA" situation in the U.S. and getting a puzzled look in response.

The fever over office automation that has swept Japan has been generated mostly by the mass media, office automation equipment salesmen and the managers of user companies. Most office automation specialists on the other hand are a bit perplexed by all the fuss that has suddenly arisen over office automation and are worried about a reactionary decline in interest.

Their anxiety stems in part from the nature of Japan's mass communication media (which, incidentally, are referred to as MassCommi, a rather odd abbreviation, as a more natural one would be MassComm). These media know that the Japanese are quick to warm up to a subject but are even quicker to cool off. Therefore, since it is easier to write for an enthusiastic audience, they come out with article after article while their readers are still warmed up to it. But once they sense that the fever has passed, they stop completely.

As for the salesmen, they try to take advantage of the peak in enthusiasm to sell whatever they can, even products that are not well supported in terms of maintenance and other back-up services.

On the other hand, the managers of user companies have the headache of how to cope with the cost push that is certain to be generated during the 1980s by rises in labor costs, including those due to inflation. In their rush to find a way out of their predicament they are apt to force office automation equipment on their subordinates even though they are not fully versed in what office automation is all about.

These same phenomena also seem to have arisen in American and Europe. The difference with Japan may be only that the tendency to "heat up" and "cool off" is somewhat more pronounced. Still it is quite obvious that the debate over automation in Japan is both overheated and lacking in substance in the sense that those concerned have not thoroughly digested the real implications of office automation. Most of what is being said is not based on concrete figures. Even when concrete figures are used, there is a tendency to blur the distinction between production and market.

Among the office automation machines being made by Japanese manufacturers there are some that are very strongly export oriented and others that are exported hardly at all. (More will be said about this later.) The articles on office automation that are appearing in the press generally overlook the existence of these two categories of products and, without supporting their reasoning with concrete figures on the characteristic differences between domestic and foreign markets, they contend, almost frantically, that the Japanese producers must hurry or they may miss the bus. Among the Japanese, who are especially attracted by new things, this type of thinking is further stimulated by reports from abroad praising the quality of Japanese products or pointing out the threat posed by Japanese manufacturers.

As will be gone into in more detail later, this tendency may well be considered to be a reflection of characteristic of Japanese business management that might be called the look-while-you-leap system. In matters of business strategy, it often happens in japan that only the basic framework is laid out by management and the details are left to the discretion of lower company echelons. Moreover, even the basic framework may be revised as the situation develops. Taking this into consideration, it can be said that the current debate over Japan's developing office automation industry does not reflect the true strength of Japan in this field; this true strength will be found not in the press but elsewhere.

In spite of this, Japanese specialists and researchers (interestingly, there are almost no analysts in Japan) are uneasy about current trends. The main reasons for this are, first, that although there is much ado about the importance of man-machine systems in the upcoming era of office automation, what is actually being supplied by equipment manufacturers is a haphazard array of independent machines that have only begun to rise above the single function level, and, second, that because an adequate analysis of user office functions has not been made, there has been almost no research and development work done on office automation software to cover those areas that cannot be covered by the expansion of data processing. It is no exaggeration to say that there is a danger that the weight of the expectations that are being placed on the office automation industry may cuase it to sink before it even gets out of port.

(2) Five-year gap between the US and Japan

Professor Howard Lee Morgan of Pennsylvania University's Wharton School, who visited Japan during September and October of last year mainly in connection with activities of the IFIP '80 World Computer Congress, said prior to his departure that in his opinion Japan was lagging behind the U.S. in office automation by five years.

An office automation machine system has to be capable of carrying out the required processing in the language normally used in the office. In this sense, it seems reasonable to say that copying machines and facsimile machines enjoy wider use in Japanese offices than they do in American offices. However, the real driving force behind office automation in the 1980s will be computer utilization technology. Japan has come abreast of the U.S. in hardware. (Professor Morgan's

visit coincided with Japan's Information Week and among the announcements made at various shows during the period there were a number that he found quite surprising.) Still, in the field of software, almost no efforts are being made in japan to develop office automation software for use in word processing of normal office language. This can be attributed to the fact that, reflecting the 1 to 5 ratio of software personnel between Japan and the U.S., most of the Japanese software industry is still so busy with the demanding (but no necessarily profitable) task of developing software for data processing that no time is left over for anything else. Although there is a fundamental need to rapidly increase the number of Japan's software personnel, software development can be realized only through an accumulation of fundamental advances and this means that, in view of the fact that the Japanese language involves large numbers of characters that are hard to process by computer, the job of bringing Japanese word processing up to the current level of alphabet word processing will take several years. The factors involved in developing Japanese word processing hardware are also more complex than in the case of Roman alphabet word processing, as can be seen from the difficulty of developing methods for imputing the large number of Japanese characters at an economical speed or of developing printers capable of producing complicated Japanese characters with the clarity that can be obtained in the printing of the simpler letters of the alphabet.

Japanese makers and users are both very secretive, a fact that is possibly related to Japan's lifetime employment system. This also hinders advancement of office automation. The makers, for example, sell word processing software in such a form that it cannot be reworked by the user. Among the users, on the other hand, there is a strong tendency not to use general purpose data processing software but to try to develop there own special software by themselves. These peculiarities of the Japanese situation not only slow the pace of technical development relative to the U.S. by holding back technical exchanges, they may also in the future give rise to a situation where rising labor costs make it impossible to justify the cost of development altogether.

In his position as a contributing editor of the AOC Newsletter published by Advanced Office Concepts Corp., a market research firm headed by the famous American analyst Amy D. Wohl, Professor Morgan has written an article titled "Office Automation-Japanese Style."

Although the article also touches on the Japanese management practices referred to in the following section, I will at this point limit myself to a summary of the technical aspects he takes up.

- As a consequence of the establishment of the CCITT standards and the fact that a large percentage of Japanese documents are hand written, the Japanese have developed excellent multi-speed facsimile machines with high resolution.
- Facsimile systems do not, however, have the flexibility, storage and retrieval capability, compressibility or other merits attainable with computer processing using a documentary character code input.

- As the Japanese language has relatively few phonemes, Japan may develop practicable voice input technology ahead of the U.S.
- The Japanese are developing jet, dot matrix and laser printing for use in Japanese language output, and the development of such technology may be of some benefit to the Japanese manufactures in the field of graphic devices and high-resolution terminals.
- On the other hand, Japanese makers appear to be behind in the field of general-purpose computer graphics for business.
- The superior technology that the Japanese makers have developed in connection with oral recording devices, facsimile machines and copying machines is starting to be applied to highend office automation machines and word processing products.

Professor Morgan concludes his article by saying that Japan is obviously a country worth keeping an eye on.

(3) Japanese style management and office automation

The Japanese system of management is being actively introduced in large numbers of foreign countries as one based on mass production supported by excellent quality control, as typified by total quality control (TQC), and on a decision making process that emphasizes consensus.

Although it is not easy to describe the characteristics of Japanese business management clearly and simply, I will attempt an explanation based on the social and natural conditions of Japan, though I realize the social and natural conditions are themselves intricately interrelated.

First, taking a look at the social aspects of Japan, it should be noted that, in spite of having a population of over 100 million, Japan is one of the few racially homogeneous countries of the world. Its people are relatively well educated and their most noticeable national traits are docility and industriousness. These characteristics, coupled with the fact that Japan is an island country, give the society as a whole a strong awareness of being a community with a common destiny. This accounts not only for the country's low crime rate but also for the lifetime employment system that is so widespread in Japan. Although this system has the drawback of making it difficult to give full play to employee creativity, it gives all employees a sense of participating in the management of the company in some form or other and gives the members of the actual managerial staff a sense of shared responsibility. As a result, and as has become widely known throughout the world, this has led to managerial practices that emphasize team work and consensus, with decisions being made on the basis of consensus only after much time has been spent consulting with everyone concerned in order to sound out opinions and ideas on an informal basis. Once a decision has been made, however, it can be implemented very quickly indeed since there is no need to explain to content or why it is justified.

Turning next to the natural conditions, Japan is a narrow island country falling in a single time zone. As a large portion of the land is mountaineous, the population is concentrated in cities located in the flatter areas.

As a result, the price of land in Japan is exceedingly high by standards anywhere in the world. This in turn accounts for the use of large open offices as a means of reducing the amount of working space per individual and thus offsetting the high cost of land and building space. Within the open office, the desks of workers with closely related jobs are ordinarily clumped into islands, the desks of each island or section being in actual physical contact with each other. Seated in this arrangement, the individual workers cannot help overhearing the conversations and telephone calls of their fellow workers or seeing the papers spread out on their neighbors' desks. Each worker is, therefore, constantly aware of what the other workers in his section are doing.

This office layout, coupled with the consensus management system described above, promotes the "look-while-you-leap" method of proceeding with various tasks and jobs. To be more specific, even though the emphasis is on consensus and each worker is aware of what his comrades are doing, the individual workers have different backgrounds, knowledge and capabilities which give them different degrees of understanding of the objectives. Moreover, the objectives of the job have been defined only in terms of a general framework and numerous unexpected situations are apt to be encountered as the work progresses. As a consequence, decision making invariably starts on a mutual understanding arrived at through what can best be described as telepathy, and modifications and revisions are made as required. This behavior of management and employees and the environment of the Japanese company in which this behavior takes place give rise to a high level of communication probably not found anywhere else in the world and, at any rate, a form of communication that is too good to be easily replaced by any half-baked office automation schemes. In this sense, any attempt to proceed with office automation in Japan on the same level as that in the U.S. by simply restructuring what has been developed in the U.S. to match the Japanese situation will probably not succeed in breaking down the special characteristics of the japanese office. This relationship is shown graphically in Figure 1.

It must be realized, of course, that the actual Japanese office is much too complex to present graphically. For example, it would not be easy to graphically show that the generation gap in Japanese offices is much more pronounced than in most Western countries. This is, however, the case since the methods of education differ greatly between pre-war and post-war Japan. Although, as I mentioned earlier, the group management system has a tendency to suppress creativity, the younger generation is nevertheless more assertive in self-expression and puts greater emphasis on creativity. The "ringi" system peculiar to japan's group management system presents another everyday example of the problems of introducing office automation in Japan. In this system, a document is circulated prior to decision making in order to obtain the opinions and/or approvals of those concerned on the problem under study. Circulated together with the document are small envelopes which, because of the custom of writing out everything by hand in Japan, make it inconvenient to switch over to a microfilm or electronic file

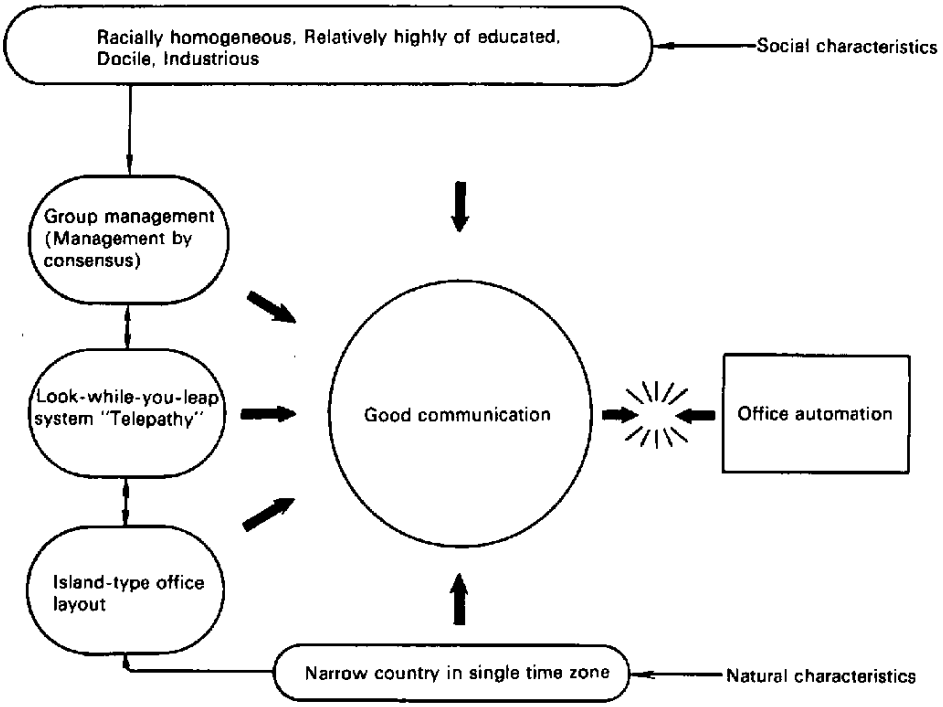

Fig. 1 Characteristics of the Japanese Office

system. Moreover, as handwritten documents are often difficult to read and reflect the idiosyncracies of the writer, a person thinking of examining stored documents might be discouraged from doing so.

The examples I have given suggest that there is a strong possibility that the Japanese office will change with the passage of time and the introduction of technical advances. And it seems reasonable to predict that during the 1980s office automation equipment will gradually advance to the point of justifying these changes. The Japanese office would appear to be just at the threshold of transformation.

2. Japanese Office Machines and the Market

(1) Production and export of Japanese office machines

The rapid upswing in the production of Japanese office machines began about ten years ago. Up to that time the thrust in Japan's information, communications and office machine industries was centered on (a) developing domestic capability to produce general-purpose computers and minicomputers, (b) expanding utilization of telephone circuits for data communications, (c) employment of integrated circuits in calculators and (d) domestic production of coated paper copiers (CPC) (also known as electrofax (EF)). Exports at this time were for all in-

tents and purposes limited to desk-top calculators.

Now, ten years later, the picture has changed completely. Digital technology as embodied in the VLSI and other electronic elements is reducing computer size, digitalizing communications circuits and, coupled with precision optical technology and processing technology realized through the application of such optical technology, creating new office machines with intelligent functions.

These trends are worldwide and are reflected in the development of Japanese office automation equipment, which I will now outline in accordance with the internationally accepted convention of excluding from the category of office automation equipment general-purpose computers and minicomputers used for data processing and peripheral and terminal devices used in conjunction with these.

An overview of Japan's office machines shows that the balance between production and exports differs greatly depending on machine type. Office machines have the largest export ratio, followed by communications equipment and then, in lowest position, by computers. This pattern reflects the fact that japanese hardware is now approaching top world standards but that exports of products which also entail software are either very low or now just beginning. This weakness in equipment requiring software can be attributed first to the small number of software specialists in Japan compared to the advanced nations and second to the fact that the Japanese language is very special, making it difficult to export to a large number of other countries which require software entailing numerous factors which differ not only from Japan but also from one country to the next.

Among hardware items, those exported in the largest quantities are for the most part those which are mass produced. As I mentioned earlier, Japan has well developed mass production technology supported by superb quality control technology. This mass production technology relates not only to the final products but also widely to the production of components as well. Thus, as electronics comes to play a greater role in office machines, the office machine manufacturers are able to enjoy the benefits not only of their own mass production technology but also of the outstanding capability to supply large quantities of low-price components which Japanese component manufacturers have developed through their business of supplying components for consumer products.

The bar graph in Figure 2 shows the production and export values of the main types of Japanese office machines for 1980. It should be noted that the production and export values are not calculated on the same base. The production values are on an ex-factory basis whereas the export values are on an FOB basis including additional costs incurred in conjunction with the domestic distribution system.

In this graph, the figures for office computers and personal computers were provided by the Japan Electronic Industry Development Association (JEIDA), for facsimile machines by the Communications Industry Assn. of Japan (CIA-J), and for all other machines by the Japan Business Machine Makers' Assn. (JBMA).

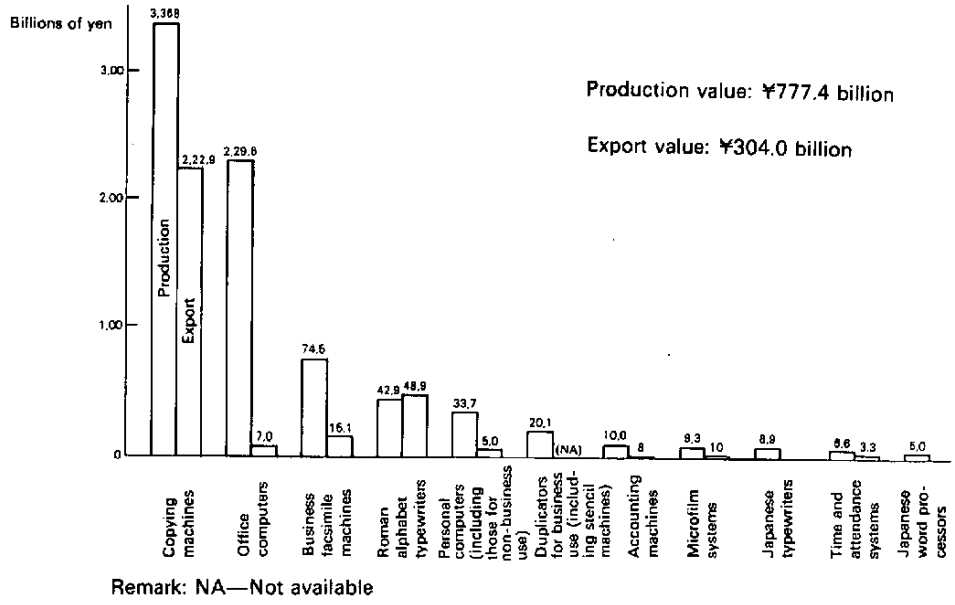

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Fig. 2 Production and Export of Main Japanese Office Machines in 1980

Items included in this graph are copying machines, office computers (the Japanese name for small business computers), business facsimile machines, Roman alphabet typewriters, personal computers (including those for non-business use), duplicators for business use (including stencil machines), accounting machines, microfilm systems, Japanese typewriters, time and attendance systems, and Japanese word processors. Not included are general-purpose computers, minicomputers, peripherals, data terminals, private branch exchanges (PBX), key telephones, telephone terminals, calculators, voice recognition equipment, mailing machines and audio-visual products.

According to these figures, the production value of Japanese office machines during 1980 came to ¥777.4 billion, while the value of exports amounted to ¥304.0 billion. The top five machine types in terms of production were: 1) copying machines, 2) office computers, 3) business facsimile machines, 4) Roman alphabet typewriters, and 5) personal computers. The top five in exports were: 1) copying machines, 2) Roman alphabet typewriters, 3) business facsimile machines, 4) office computers, and 5) personal computers. The percentage of total exports accounted for by office computers is very small.

Japanese word processors first came on the market during 1980 and as a result are in the lowest position among all machine types enumerated. It is expected, however, that they will rise to 6th or 7th place during 1981. Also, Japanese Roman alphabet typewriter and Japanese word processor manufacturers made entries into the electronic Roman alphabet typewriter and Roman alphabet

word processor fields during 1981 and these two product categories are also expected to make substantial growth. Another interesting aspect of the office machine field and one in which japan differs remarkably from Europe and the U.S. is the exceedingly low level of production and use of microfilm systems in Japan.

The anticipated trend during 1981 and for several years to follow is for word processing systems and PBXs to supplement the current top five and come to play an increasing role in the promotion of office automation. There will, however, probably be some changes in the ranking among the top seven machine types. An analysis of the likely changes is given in the following.

- **Copying machines**

The marketing strategy of Japanese copying machine manufacturers in putting emphasis in production and export on popular type medium- and low-speed plane paper copier PPC models has been successful, with good growth being registered in both production and export. Using their success in this area as a base, the Japanese makers can now be expected to expand their product lines into high-speed copiers and high-speed non-impact printers, areas that have up to now been monopolized by Xerox, IBM and Kodak.

- **Office computers and personal computers**

Although both production and exports are growing rapidly, the thrust of future growth seems likely to be in exports and to center on hardware. Growth in personal computers is expected to be particularly fast.

- **Facsimile**

The growth in facsimile machines, including those for non-business use, has been large and the market is expected to exceed ¥100,000 million for 1981. Although the growth in exports is particularly large, domestic shipments are also expected to accelerate rapidly as a result of Nippon Telegraph and Telephone Public Corporation's commencement of exclusive digital facsimile network services and introduction of minifax services.

- **Word processing and typing machines**

As was mentioned earlier, production of both Japanese language and Roman alphabet machines is rising sharply and the combined production value for these two machine categories is expected to come abreast that for facsimile machines within a few years.

(2) Japan's office machine market

The scale of japan's office machine market can be expressed as:

Value of japanese manufacturer shipments − Value of exports + Value of imports.

This formula is, however, hard to apply since, as mentioned earlier, the domestic figures for production and export value are calculated on different bases and, moreover, since there are differences in the manner of classifying machines between the figures for domestic production and those for exports and imports. I would therefore like to present my own estimation of Japan's office machine market during 1980, adding to the list of machine types PBXs and key telephones and making such adjustments and

allowances as I see fit. As will be noted from the result of my estimates as shown in Figure 3, the value of Japan's office machine market during 1980 was ¥494,000 million. This estimate covers nearly the same machine types as those covered by a study conducted in respect of the U.S. market by a certain market research firm. According to the results of the American survey, the scale of the U.S. market in 1980 amounted to about $10,000 million (¥2.2 trillion), meaning that the Japanese market is about 22.5% of that of the U.S. As the ratio between the populations of Japan and the U.S. is about 1:2 and the ratio of whitecollar workers to total population is about the same in the two countries, these results imply that, when compared with the U.S., Japan's office machine market is still in the cradle. They also present strong evidence of what was said earlier about the hindrance to office automation in Japan presented by the Japanese language and the peculiarities of the Japanese office.

There are two points about this estimate that require special attention. The first of these is that not all office machines coming within what has been termed here as the office machine market are used for office automation. Office machines are naturally used in places which can hardly be encompassed by the word "office," such as warehouses, retail shops and factory offices. In

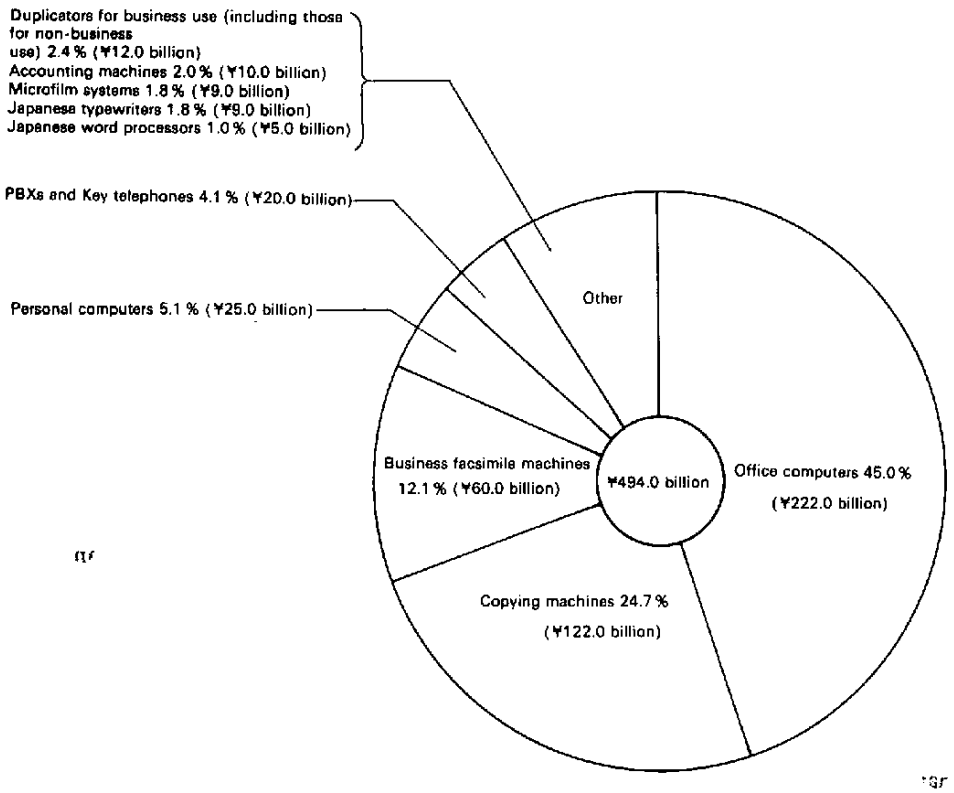

Fig. 3 Japanese Office Machine Market in 1980

fact, at least one American market survey firm has contended that a distinction should be made between the office machine market and the office automation market.

The second point, which is related to the first, is that among the office machines, the office computer in particular is often used outside of offices. According to a certain American survey firm, 66% of the small business computers used in the U.S. are used outside offices. Although most American market surveys in the field of office automation give top ranking to PPCs, it will be noted from Figure 3 that in Japan copying machines at 25% fall far behind office computers at 45%. However, if it is assumed that, as in America, 66% of Japan's office computers are also used outside offices, then, since it is safe to assume that the percentage of copying machines used outside offices is not so great as in the case of office computers, it could be concluded that copying machines also hold first place in Japan's office automation market. Such a conclusion would not only demonstrate the similarity of the world's office automation markets but would also serve to confirm in figures that the operation of Japanese offices centers on handwritten documents.

3. Office Automation Prospects in Japan

As I have repeatedly pointed out and shown through the use of figures, office automation in Japan is by and large still at the entry level. The individual office machines exist only as points, lines or partial systems within mammoth overall office systems. In this sense, there is more similarity than difference between Japan and the U.S., in spite of the fact that the U.S. is more advanced. This is clear from the criticism that has been mounting in the U.S. since last year over the fact that the movement toward office automation has been limited to the level of providing tools for secretarial and clerical tasks, and from the increasing number of cries that are being heard for the development of systems that will be truly helpful in the performance of managerial and professional work.

Japan is highly sensitive to these trends in the U.S. Ever since Japan broke its self-imposed isolation just over a hundred years ago, the Japanese have actively shown an enterprising spirit in their efforts to absorb the cultural and technical advances of the world. This same spirit will also be applied to office automation and, although there are some who, as I mentioned earlier, cannot see beyond the superficial glamour of office automation, the trend among both manufacturers and users is to watch all new developments with interest, particularly those in the U.S. Advanced and capable users have, for example, begun detailed studies of local area network, Integrated Service of Digital Network (ISDN), teletex, videotex and the deliberations of CCITT and ISO regarding reference models for Open Systems Interconnection (OSI). They are also closely watching such voice/data PBX systems as Datapoint's, Xerox 8010 Star System, as well as that which is sometimes referred to as the "missing link," voice mail.

Not only are the Japanese characterized by an enterprising spirit, they are also good at assimilation. Take office computers for example. Though the latest machines are still not in wide use, 80% of the new machines

currently being produced have gone a step beyond mere *kana** input/output capability and are able to handle *kanji*** input/output. It is fairly easy to develop a system capable of accepting *kana* input and producing *kana* output. The input of Japanese language text including *kanji*, however, requires considerable ingenuity in the development of the input system and inevitably entails a decline in input speed. A system capable of accepting *kana* input and providing a *kanji* output, on the other hand, requires the preparation of complex software and hardware for the conversion of the *kana* to *kanji*.

The Japanese office computer manufacturers have overcome these problems step by step until now a full 80% of the new machines being put out are able to cope with *kanji* input and output. Makers of word processors, on the other hand, are putting even more effort than the office computer makers into computer processing of Japanese language text. At present, the mainstream in word processors is still stand-alone type systems, but there is certain to be diversification of multi-terminal type systems in the near future. Also, progress will no doubt also be made in the development of hybrid data processing and word processing systems whose ordinary mode of operation is to input and output Japanese language information from both the office computer side and the word processor side. On the low-end side, developmental work is proceeding to provide personal computers with a similar function. These efforts are a reflection of the fact that the primary prerequisite for viable office automation is that it must make processing easier in the mother tongue of the country concerned. This means, for example, that a foreign manufacturer of office automation equipment thinking of entering the Japanese market would be wise not to make the mistake of thinking a particular product will be successful in Japan simply because it was successful in its own country.

Professor Morgan pointed out that Japan is a country worth keeping an eye on. I would like to add to this by saying that Japan is a country worth keeping an eye on both as a market for and as a developer of office automation equipment.

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*Characters of the Japanese phonetic syllabary.
**Chinese ideographs.

Office Automation at Okamura Corporation

by Akira Iga
Manager of D.P.
Okamura Corporation

Introduction

Alvin Toffler, in his book *The Third Wave*, states that "while the average factory worker in the United States today is supported by an estimated $25,000 worth of technology, the office worker . . . , works with $500 or $1,000 worth of old typewriters and adding machines, and is probably among the least productive workers in the world. Office productivity has climbed a bare 4 percent over the past decade. . . . "

Production has been raised by providing the workers at factories with the power of labor facilities and the result of this has been to swing the balance in overall personnel make-up away from factory workers toward staff and office workers. It has therefore become an important task of business enterprises today to improve the productivity of office workers, including those in executive and managerial positions, by making advances in such new areas of productivity as "intellectual productivity" and "creative productivity."

Overview of Okamura Corporation

Okamura Corporation was established in 1945 as an "industrial cooperative" among a number of aeronautical engineers who, having been put out of work by Japan's defeat in the Second World War, pledged to cooperate with one another. From the inception of the company, all members of Okamura have consistently striven to promote the progress of the company by building up its strength through cooperation, frugality and the accumulation of company reserves, and to contribute to society through superb products.

The operations of Okamura have been characterized by the development of advanced technology, as can be seen, for example, in its production in 1953 of the N52, Japan's first postwar airplane, and of its completion in 1955 of the Mikasa, Japan's first frontengine, front-wheel-drive (FF) passenger car with automatic transmission. Using this technological power, Okamura continued to expand its operations particularly in the office furniture and industrial machinery sectors until today it boasts a total capital of ¥2,700 million, 2,200 employees, as well as 7 factories, 60 sales offices and 168 affiliated sales outlets spread throughout Japan. Sales for the current fiscal year are predicted to reach about ¥60,000 million.

History of Okamura's Management Information System

Quick to realize that Japanese wages would eventually approach those in Europe and the United States, Okamura began at an early stage to modernize its business operations, particularly through the com-

puterized rationalization of office management. Fundamentally, the work was devoted to realizing efficient office processing with the minimum number of personnel. For a company like Okamura with relatively low-profit main product lines to maintain and advance its business operations, there was no choice but to reduce the number of indirectly related personnel to the minimum possible while at the same time upgrading the efficiency of office operation. In realizing efficient business operation with the minimum number of personnel, the effective utilization of the computer was, as might be expected, found to be the most effective and appropriate tool.

(1) Introduction of the IBM 1440 System and MOS —1966—

On the basis of the concept embodied in the Management Operating System (MOS) introduced by IBM as its first total system, Okamura cut over to a nationwide on-line network system for sales and distribution in order to assure appropriate stock levels, improve machine operating rate, and reduce office expenses, and at the same time introduced batch processing centered on a monthly accounting period for production control, personnel management and accounting.

(2) Introduction of PICS and the IBM 360 —1970—

This being the era of large-scale mass production, emphasis was on making arrangements for parts and materials for the standard production program so as to avoid any need to stop the production line. The system was therefore centered on quantity planning and on the inventory control required to support quantity planning. PICS (Production Information Control System) was devised to strengthen hardware by upgrading computer performance and increasing the speed and capacity of the disc memory, and by doing this it served to make the Management Operating System more effective in concrete terms. Through the introduction of this system, Okamura was able to improve on-line applications, particularly in connection with quantity planning and inventory control, and to work out better plans for the management of materials, machines and personnel.

(3) COPICS and the IBM 370 —1974—

Badly shaken by the oil crisis, the Japanese economy was forced to adapt to a low growth rate and the basic principle in production shifted away from large-scale mass production toward small-scale production of many types of products. Diversifying customer needs and the branching out of product lines led to increasing complexity in the flow of materials and products within the factory. As a result, it became ever more important to find ways of maintaining daily schedules and improving the operating rate of plant and equipment. On the other hand, it also became necessary for the production sector to respond more quickly to the various inquiries from the sales sector and to find ways of reducing delivery periods.

It was, however, impossible for the batch processing system to keep the files up to the constantly changing situation in the factories and a higher level system based on on-line communication became necessary. More-

over, the need also grew for a total system capable of interrelating the various independent systems developed on a function-by-function basis and of achieving harmony between local and overall efficiency. COPICS (Communications Oriented Production Information and Control System) had been developed by IBM to meet such needs of the times. It was a total system using a database for centralized information management and on-line communication.

The system was aimed at improving customer services and raising the profitability of the production sector through better planning and management of all aspects of production from sales forecasting and order entry onward.

In view of the economic and business situation prevailing at this time, Okamura used COPICS as a base for working out a long-term Management Information Control System (MICS) for higher level computer utilization. Work was then begun on the development of individual systems under the MICS concept, and in 1974, the company put into operation a comprehensive management information system which used CRTs and printers connected to the center general-purpose computer as the chief terminal devices and tied all divisions of the company together in an on-line communications network under the control of a centralized database.

(4) MICS and the IBM 3033 —1979—

The same system is currently in use but with various improvements made in the individual systems. The basic concept behind developmental work has not changed, however, and enhanced utilization has been achieved through an extension of the same line of thought.

The system objectives that were set in the planning of MICS were as follows:

① To make it possible to operate the company at the minimum of administrative cost.
   a) Minimum personnel expense.
   b) Improved turnover of assets.

② To contribute to customer services.
   a) To respond to customer interest in a wider variety of more sophisticated products.
   b) To reduce delivery periods and allow more accurate delivery data estimation.

③ To provide accurate and timely data and analyses for proper management decisions.

④ To be useful not only in internal management but also in deciding responses to market situations.

In reducing objectives of this type to concrete form, one of the major questions that comes up is that of computer system architecture. There is a tendency to overemphasize the theoretical aspects and come up with a system that is not matched to the actual operation of the business. In order to realize the objectives that had been set, Okamura further defined the architectural concept of the system.

① To establish an operational system to begin with.
   a) To handle as much business processing by computer as possible.
   b) To have a database system whereby data once inputted is without fail always turned around.

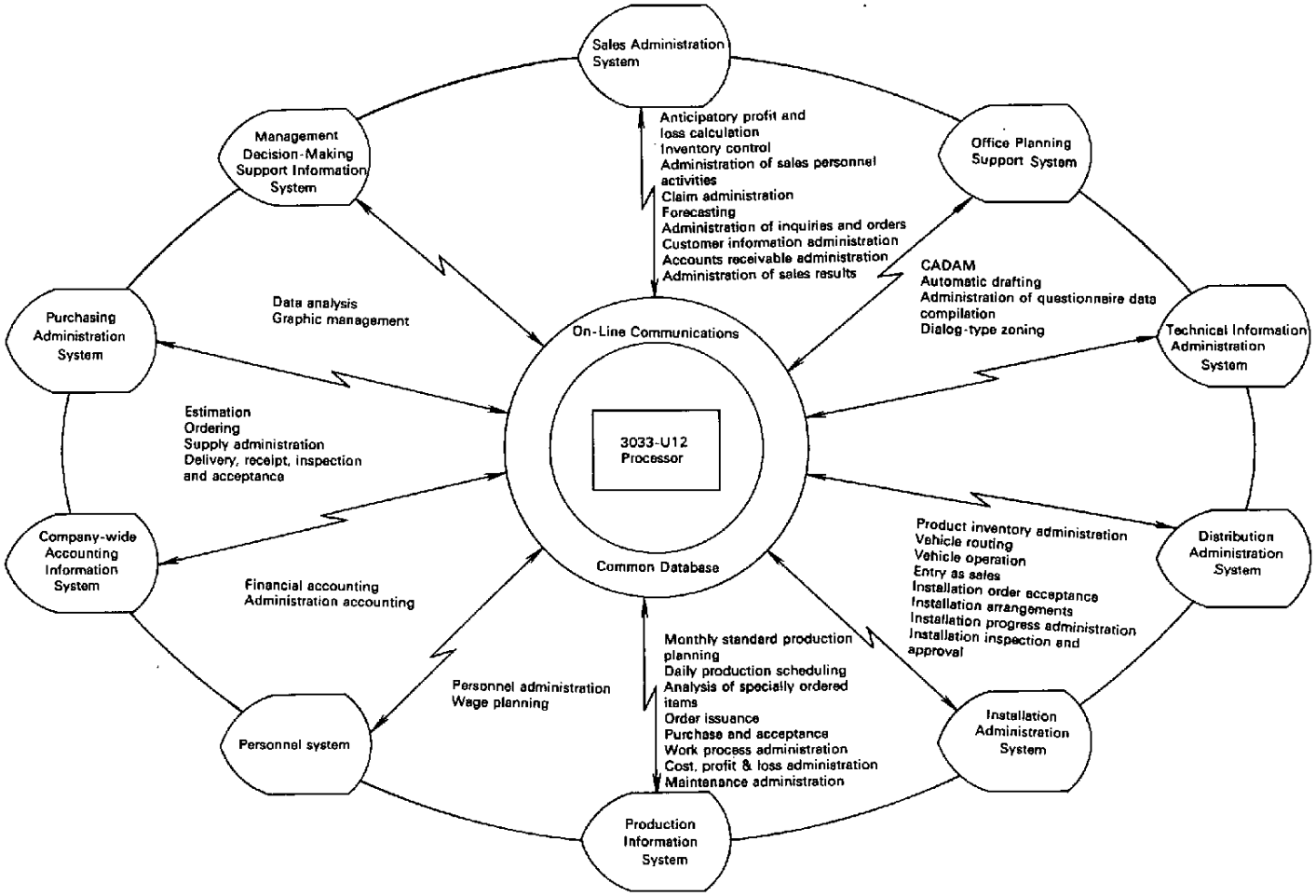


Fig. 1 Outline of Overall System

c) To keep system cost low by making the input system as simple as possible and at the same time making it possible to collect supplementary data to the extent that it does not become a burden.

② To make it possible for all members of the company to take action on the basis of the same correct data.

a) To provide an information supply system wherein the data is processed in various ways to provide information matched to the needs of various levels, which can cope with increasing volumes of data as the company grows in scale and can provide all members of the company with timely information on the basis of which they can all take action toward the same goal.

③ To provide a system that encourages all members of the company to participate in management.

a) To avoid making the operation of the computer system the job of a limited group of specialists and instead to foster a system whereunder all members of the computer using divisions can use the computer to actively participate in the rationalization of their respective divisions.

Working on the basis of the philosophy outlined above, the system was steadily developed until today there has been realized a computer application program constituting the overall MICS system illustrated in the figure shown below.

Features of Okamura-MICS

A general explanation will now be given of how the desire of management to efficiently carry out office work with the minimum number of personnel was realized mainly through the Okamura computer application system. It was not so much a matter of simply using the computer to carry out management jobs that had previously been carried out by people, as a matter of determining the best type of operating system and how the basic program of this system should be reflected in and related to the management decision-making system.

(1) Example relating to the production control system

The system for making arrangements for and managing the production of specially ordered items makes it possible to issue the job instructions and manage the work in the same manner as for standard articles. The special item for which an order has been received by a member of the sales division can be easily analyzed on the screen of a cathode ray tube (CRT) using a special database so as to obtain the data required for production.

Moreover, all information regarding such things as the progress in execution of the production order, the work load at the work site and the parts inventory situation can all be grasped from the CRT, and the instructions regarding the next action to be taken can be conveyed through a dialog.

In parallel with this, the sales division person in cahrge of the order can use his terminal to inquire about the arrangements and progress at the factory and confirm the delivery date.

The basic forms used in factory operation are limited to those for work orders, supply

requisitions and purchase orders, with all other computer output being read from the CRT and hard copies of the displayed information being made only when required.

(2) Example relating to the sales information administration system

The basic aim of the sales information administration system is to assist the sales personnel so that they will be able to devote more time to their sales activities. A system has been set up under which a support group consisting mostly of women can carry out on behalf of the sales personnel such jobs as order processing, collection administration and response to inquiries about delivery dates. Processing work encompasses inquiry information, information on competitors, profit and loss information, drafting of estimates and order processing. These systems are naturally integrated into a total turnaround system that operates interactively with subsystems for inventory control, vehicle routing and delivery administration and accounts receivable administration.

(3) Example relating to finance administration and accounting system

The main feature of the accounting system is that the financial accounting system and the administrative accounting system are integrated in their operation so as to make it possible to grasp the profit and loss situation from day to day or from month to month. More specifically, the subsystems for inventory, sales, revenue, salaries, fixed assets etc. and the accounting department's own systems for expenses and funds not only operate independently but are also organically interrelated so as to provide information starting with the profit and loss aspects of administrative accounting and developing into information for the monthly and annual closing of accounts.

Therefore, this accounting system does not prepare the slips required for accounting in the individual divisions but, by processing the results of the various subsystems for the processing of operations in the individual divisions (for example, actions taken chiefly for the supply of materials, the entry of job completion, the inspection and acceptance of merchandise), automatically issues journal slips and stores the data in the accounting database.

The accounting system is not limited to the clerical processing just described. It also functions as an anticipatory processing system capable of carrying out, at the time of inquiry and estimation, simulation on the basis of the cost estimate and price assessment so as to provide a profit or loss projection for use in order and profit administration, and in this way supports the decision-making process at the various levels.

(4) Other

Non-numerical information support systems including such graphic systems as an automatic drafting system employing CADAM and a Total Office Planning System (TOPS) contribute to the rationalization of sales personnel activities and design work in the factory.

Okamura Office Automation System

OA (Office Automation) has become one of the most frequently heard buzz words in Japan.

Still, the term has not been accurately

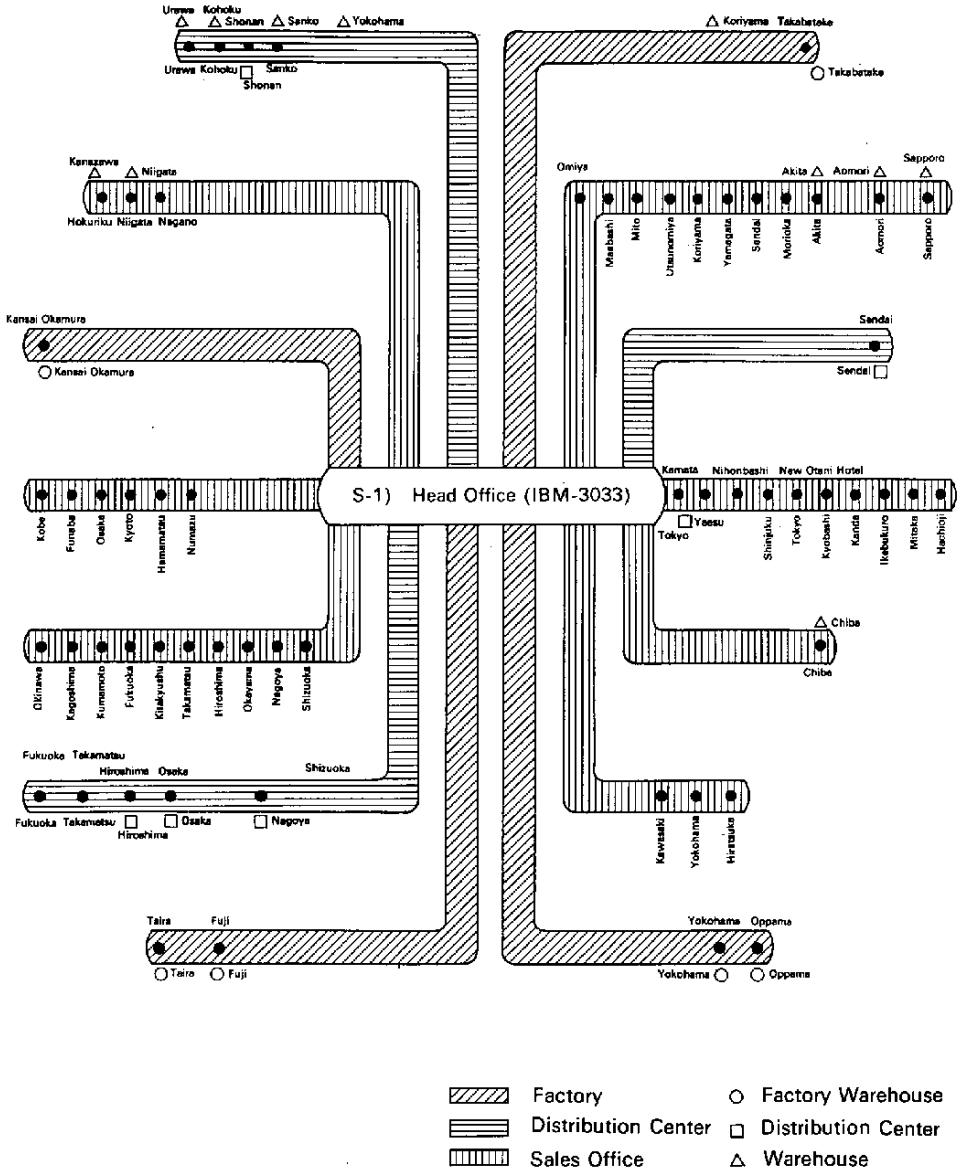


Fig. 2 Equipment Configuration and On-Line Network

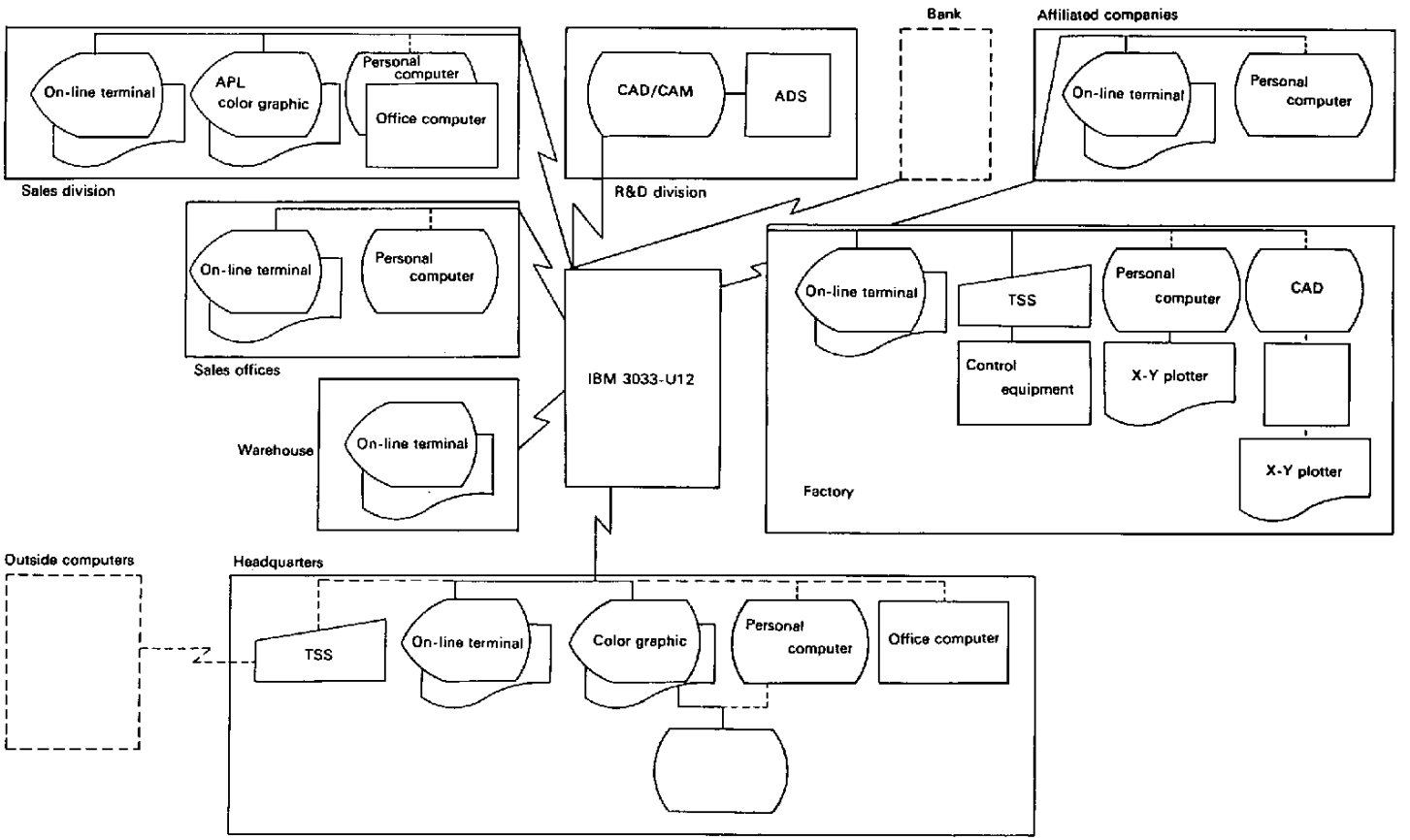


Fig. 3 Configuration of Okamura's computer network

defined and it is not even certain why all the fuss has come up over OA at this time. About all that is certain is that Japanese companies are striving desperately to maintain their profits in an age of low economic growth.

The simplest explanation would therefore seem to be that Japanese firms are trying to find something in OA that will help them increase profits, the lifeline of any corporation.

Having realized an appreciable degree of progress in their efforts to improve factory productivity, an area in which the relationship between investment and effect can be clearly judged, the companies have now turned to the rationalization of their indirect sectors as the next means of raising profitability. In other words, Japanese companies are now feeling an acute need to reappraise the efficiency of office work and the office itself as a source of profit.

(1) Further development based on MICS

Okamura's computer system was developed out of the need to realize efficient office work and has been developed into a total management information control system. Nevertheless, there still remain a large number of problems that cannot be completely solved solely through the use of a large general-purpose computer. For a company that is constantly striving toward more efficient business operation, this is only natural.

At present, 80% of the routine jobs that arise in connection with the management and operation of the company are handled by the company's large general-purpose computer

Reception Area of the Okamura Corp.
A "Secretary Computer" is installed at the main reception desk.

system via interactive type dialog conducted through the use of CRT terminals.

Why then is it necessary for the company to consider office automation? With MICS already broadened in scope from the operational level to the management level, why is it necessary to consider the introduction of other new systems?

(2) OA as a countermeasure for meeting new requirements

The scope covered by the present large general-purpose computer is, in view of the architecture of the system, centered on the processing of numerical data. MICS is also a numerical data system having a database as its nucleus.

The program making up the system is of the nature of a black box for which the support of programming specialists is indispensable, and is not capable of going beyond certain fixed limits. The demands of the users (in-house), on the other hand, are becoming increasingly numerous and diverse.

For example, the more progress that is made in the computerization of routine jobs, the stronger is the tendency for user require-

ments to spread into non-routine areas. Moreover, the very purposes behind these requirements are inconsistent, necessitating greater program complexity up to the point where the computer is forced to operate beyond its capability. At the same time, there is the irrational result that the effect of the computer can be enjoyed only by the specific sectors which have placed these requirements on the system. Also, the level of processing required by management can no longer be satisfied by numerical data alone and a strong desire has arisen for more graphic information.

In parallel with the above, there is being felt a stronger need in connection with interdivisional communications for greater speed and a solution to the problem of increasing data volume.

(3) Introduction of a distributed system using personal computers

Up to now, most routine jobs have been processed by a common standard system, namely an on-line system using a large computer. This system has been effective in its own way. Still, if one makes an analogy with air travel, what has been done is to make a major reduction in the time and distance between airports without providing a solution to the problem of how any one person can best get from a given airport to the airport of his destination. The best route for the person to take will depend on his destination and is best selected by the person himself.

This is similar to the large on-line computer system. It has been able to provid very good results in a system for processing routine jobs common to all sectors but cannot be easily used to support the special processing needs of the individual sectors. The job to be processed is handled by the person in charge using his experience and knowhow, making system analysis difficult. In computerizing jobs of this type, the programming is better done by the person actually in charge of the job than by a professional programmer specializing in computers.

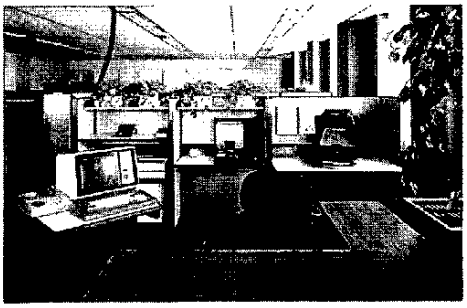
In recent years there have become available small computers which are low priced, have good performance and employ relatively simple programming languages. As a consequence, it has become possible for persons with no programming experience to do their own programming after a minimum of training.

The data generated from day to day by the on-line system are collected and accumulated in the database under the control of the center. The system best suited to the needs of the users in the individual sectors would thus be a distributed processing system in which these data are compiled in the form most appropriate for the sector requesting the data and then sent to the sector for storage in the file of its small computer. In this sense, Japanese personal computers are highly useful since they make it easy to develop a program for a color graphic display, and Okamura is therefore making use of them as one link in its office automation program.

(4) Standardization of business letters through use of word processor

Japanese business letters are fairly standard in form. Mechanization of letter writing has, however, been held back by the fact that the Japanese language uses a huge number of *kanji* characters. This problem has been

overcome by the recently developed Japanese word processors which are capable of handling almost all jobs in connection with letter composition, printing, production of form letters and production of product sales proposals. The word processor is thus playing an important role in raising office efficiency and productivity.



Management Workstation

(5) Use of electronics in long-distance communications

The mainstay of office communication is the telephone by any standard.

For a company like Okamura with offices and factories spread all over the country, the volume of messages exchanged within the company alone is exceedingly large.

1) Utilization of facsimile

The most important thing in communication is to be able to transmit a large volume of information accurately and instantaneously. Facsimile is an ideal tool for transmission of graphic information or written information accurately. In the case of transmitting simple messages, however, the capabilities of facsimile far exceed what is required.

2) Utilization of electronic mail

Okamura has a large on-line computer network connecting its branches throughout the country. The network is operated via exclusive telephone circuits leased from Nippon Telegraph and Telephone Public Corporation (NTT) and used solely by Okamura. The monthly charge for these circuits is a fixed amount. As a result, a reduction in cost can be realized by more effective use of these circuits and for this reason Okamura has developed its own electronic mail system using this network and the company's CRT terminals.

The use of this electronic mail system has resulted in a great reduction in the number of internal telephone calls. The monthly saving in telephone charges amounts to more than ¥10 million, which is greater than the amount paid for the exclusive circuits. The system thus contributes to company profits.

Aside from reducing the company's telephone bill, the electronic mail system also has another effect: by reducing the number of telephone calls, it reduces the number of work interruptions so that the office personnel are better able to concentrate on their work. More likely than not, success in raising office productivity will depend on small improvements such as this.

(6) Effect of increased office automation

By introducing and utilizing various machines thought to be most suitable for use in conjunction with the central on-line computer network system, the objective of office automation—the improvement of office productivity or getting work done efficiently and cheaply—has been realized to a fairly high degree.

This can be seen from the situation at the head office, for example. Thus, the company is operated using only 50 persons to manage 7 factories, 60 sales offices and 27 distribution centers.

Comparing the current situation with that which would exist if the company had no computer (but ignoring the improvements in efficiency and the quality of data attainable only through computerization), it is found that an increase in personnel by 860 persons has been prevented and that, taking into consideration the increase in stock turnover, the improved efficiency of financial operation etc., the total yearly effect amounts to ¥1,700 million.

Another look at office automation (Toward a more pleasant office)

Some say that the advance of office automation will lead to offices without people. Toffler contends, for example, that office work will be carried out at what he calls electronic cottages, homes equipped with office automation equipment operating via communications systems. Though this may be a dream for the distant future, offices will for some time to come be manned by human beings who will make the important decisions and engage in creative planning.

Japan is now in the midst of an office automation boom, and the introduction of electronic machines is proceeding at a rapid pace. Although individual jobs are being mechanized, has any thought been given to the office as a whole? With the noise created by electronic equipment and floods of paper as big as ever before, is it really possible for office workers to do creative, high-quality work?

The fact is that there can be no true office automation unless consideration is given to the office as a place for people to work.

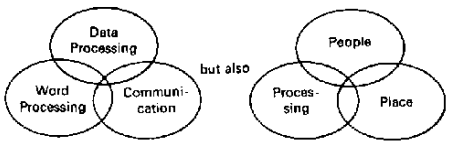
That is why, in moving forward with office automation centered on its computer system, Okamura gave considerable attention to im-

Accounting	2 men, 3 women	Annual sales of ¥60,000 million
Purchasing	5 men, 2 women	Monthly purchases of ¥2,000 million
Salary Calculation	1 man, 2 women	2,500 employees (including those of related companies
Software	18 men, 2 women	System engineers, programmers
Planning	3 men, 1 woman	Mid- and long-range planning
Administration of Companies	4 men	Analysis of sector profits, education
Other	3 men, 3 women	

On-line Workstation

provement of office environment.

Considering the concept of office automation as encompassing not only Fig. it can



be seen that the central role in the office is played by people. What is necessary is to arm these people with office automation equipment so as to allow them to increase their effectiveness and to have them engage in creative work in an environment that does not hinder human activity. This is the real meaning of office automation.

(1) Introduction of record management

The amount of paper in the office has been reduced by thoroughgoing efforts to eliminate unnecessary documents and to employ a micro-filing system employing electronic and magnetic storage means. As a result, much office space previously taken up by filing cabinets can now be used for other purposes.

(2) Noise reduction measures

In an effort to reduce overall office noise, special emphasis has been put on cutting down the noise produced by office automation equipment. Office floors have been carpeted and soft panels with high sound absorption have been incorporatd into open-type (landscape-type) offices. Also in order to brighten the office atmosphere, cheerful color schemes have been combined with large numbers of plants.

The thinking behind this is simple. People have to work in the office so the office should be given an atmosphere suitable for working people. This will allow these people to do their work with a higher value added. It is only when this is realized, that one can really speak of office automation.

(3) Conclusion

For an enterprise to achieve growth and progress, it is necessary for it to pay its employees wages that are up to industry standards and still secure enough profit to be able to pay a dividend to the shareholders. Doing this requires the enterprise to make every offort it possibly can.

Waste must be climinated wherever possible. New plans must be made for increasing sales. The production sector must constantly strive to improve, modify and automate with the aim of keeping costs down. For a company engaged in such intense competition it is only natural to want to achieve maximum work efficiency with the smallest possible number of workers in the indirect sectors.

Assuming that on the basis of a new awareness it becomes a natural desire for companies to want to achieve greater efficiency in their indirect sectors through mechanization, that is, through the utilization of electronic devices centered on the computer, then it is next necessary to con-

sider the office as a whole with the aim of realizing harmony between the equipment and the workers since it is only in this way that the desired effect and improvement in productivity can be realized.

Man-machine interface.

Man-place interface.

Machine-place interface.

In the end, effective office work will be realized only throug achieving harmony between the needs of the business and human nature.

Revolution in Office Automation

Introduction

On October 5, 1981, the Japan Information Processing Development Center (JIPDEC) together with the Japan Information Processing Center Association (JIPCA), co-sponsored the opening of the Information Week International Symposium in Tokyo. This Symposium lasted two days, ending on the evening of October 6, following a truly fascinating presentation by Professor Nicholas Negroponte of the Massachussetts Institute of Technology on Media Technology and its possible applications in office automation systems. In his presentation, Professor Negroponte described some small projects which illustrated a style of thinking about the quality of the human interface; introduced a specific management information system designed to be used by presidents of companies, Generals and six year old children; touched on some more recent developments in the advanced application of new media in computer systems; and gave a peek at some very recent work, almost science fiction type work, in the area of teleconferencing. The following article is an attempt to summarize that presentation and the absolutely incredible technologies and apparatuses introduced therein.[1]

Office Automation: a communications challenge

"Interacting with a computer is one of the most unsatisfactory and debilitating of experiences. A senior manager won't even come close to a computer . . . not only because it is hard to use, but also because the process of interacting with it is, in fact, one that counters creativity. What I would like to share with you today is a dream of the future where it is as interesting to communicate with a computer as it is to talk with other human beings."

With this brief introduction Professor Negroponte launched into his presentation on Media Technology: The Human Interface with Information Sciences. He began by making the statement that, to a certain degree " . . . the success of an office automation system will be the lack of offices themselves." He then went on to insist that office automation is not a word processing or document preparation challenge, but rather a communications challenge.

To stress his point he offered the example of computer aided design (CAD), which he said at its start was a "bad joke" being thought of simply as a technology to make drawings and thus automate the drafting process. With time and experience, however, CAD has been recognized as something much richer and more important, " . . . a continuum from design to the manufacturing process." Today CAD systems are being utilized not simply to produce drawings, but rather to go straight from design to manufac-

turing. This, Professor Negroponte claimed, " . . . should be a lesson in the area of office automation as well. Today's office automation research and practice, in my opinion, are too deeply rooted in the narrow problem of text processing. I suggest . . . that today's word processing is yesterday's drafting. There is a larger and more integrated challenge that has . . . to do with human-to-human communications, new styles of thinking and . . . the full gamut of presentational and interactive means."

This, then, is where Media Technology comes in. Historically, Professor Negroponte explained, there have been very well defined boundaries between the publishing, broadcasting and computer industries. Although there have been scattered examples of successful "couplings" such as the development of phototypesetting technology, these three areas have always been considered as distinct and separate fields. Media Technology, however, lies in the " . . . overlapping intersection of these three disciplines. It is a world of hard and soft copy, interactive and responsive interfaces, personal and intelligent machines."

Fonts and Fingers: the quality of interaction

One of the major problems facing us at this point, he said, is the fact that there is almost nobody equally well trained, equally comfortable in all three fields, and this can prove disasterous on certain occasions. Professor Negroponte raised the point of the television set, explaining that these were designed to be viewed at a distance equal to eight times the diagonal of the screen. However, today, personal computers, videotex and teletext systems are being introduced which require the viewer to sit much closer; to be exact, right in front of one of these TV sets. One of the common denominators of all videotex and teletext systems, and almost all personal computers, is the fact that the text displayed on the screens is " . . . outrageous, hard to look at, and, in my opinion, should probably be a legal violation." The reason these fonts are so ugly is that the "wrong people worked on the problem. It was computer people who developed the character generators for these TV systems, and in computer science we think in terms of very high frequencies. We are what I would label 'squarewave thinkers' and that is precisely what a television set does not need."

In order to improve fonts or texts for TV use the problem must be approached from both a typographic and image processing perspective, not merely a computer science one, he added. The technique for storing fonts in the character generators of TV sets and/or computer screens which when put out through the video domain would appear as beautiful, easy to read text is really quite simple. However, the job will require " . . . a new type of person, . . . one who is comfortable in all three fields (publishing, broadcasting and computer science), . . . and will not approach problems, even simple ones like trying to do quality text on a TV screen, from the point of view of computer science alone."

Following this Professor Negroponte described a project that he and his Group[2] have been engaged in with respect to graphical input devices. Their findings, he stated, indicated that most literature on the difference between data tablets and light pens in in-

teractive graphic systems " . . . is rubbish." In fact, he said, the best graphical input device is a finger which " . . . can be used multiply to interact with the system in ways that are very, very different . . . and can also introduce the aspect of pressure."

While texts for TV use and fingers as graphical input devices are not big ideas or projects, Professor Negroponte pointed out that they are good examples of " . . . ways of thinking about the quality of interacting with a computer, something which I think is very important."

Management Information Systems: storage, retrieval and interaction

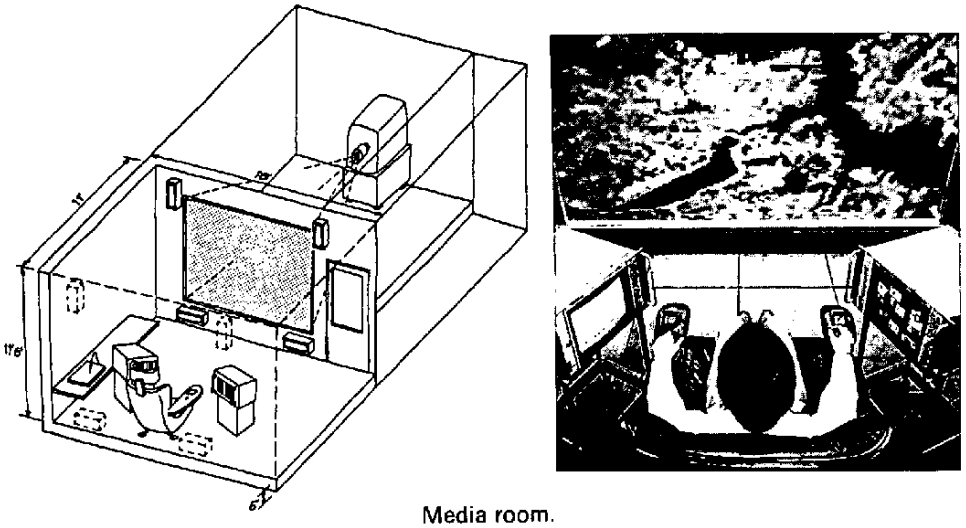
Here Professor Negroponte turned to the main topic of his presentation, Management Information Systems (MIS), and encouraged his audience to look at MIS in two ways, first, as a particular method of storing and retrieving information and, second, as an example of a style of interaction that in future may be very commonplace in our homes and in offices.

He went on to explain that their particular version of an MIS came about in response to a challenge. Their sponsor[3] asked them to build an MIS that could be " . . . learned by a senior executive in less than 30 seconds. We built a room. The room is the terminal. All too often, unfortunately, people look at this room, the so-called 'Media Room,'[4] as a model for an office of the future. *It is not.* In fact, it would be a very terrible place to work. What it is for us is a laboratory instrument that we use to test a number of projects . . . "

When they first started this particular work, they discovered that nobody had ever thought of using space, the physical relationship of objects, as an organizing element in an MIS. That is when they came up with the idea of a Spatial Data Management System (SDMS). To illustrate the concept behind SDMS, Professor Negroponte gave the following example: You arrive at an airport and realize that you have forgotten so-and-so's telephone number. You call your office and say: 'Please look on my desk. To the left of the telephone is a pile of papers about three inches deep; about two thirds of the way down is an orange sheet of paper; on the back, in the lower left hand corner, written in blue pen, is a number. Can you read it to me?' He went on to say that people have these kinds of experiences all the time, at home and at work, in their personal libraries and file cabinets. Such spatial memory is strongly reinforced by the memory that you have put something someplace, *yourself.* Psychologists call this motor memory reinforcement and it is one of the basic tenets of SDMS.

The media room

From this evolved the Media Room, a terminal into which the user goes as opposed to in front of which one sits. Through the SDMS, this room took on the aspects of an informational surround. The user created a fictitious country called 'Dataland', a world with 'cities' and 'neighborhoods' of information constructed by himself and spreading over a surface which can literally extend for thousands of miles. "Over a period of three or four years, we evolved and made the environment increasingly sophisticated in terms of both sound and picture. A subtheme to this work is the important idea of having

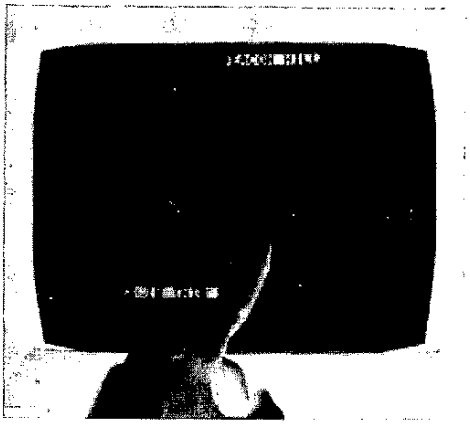


Media room.

the office automation system include new kinds of data, data that previously were of a form unavailable to people in such environments." As a result, Professor Negroponte showed how the surface of the 'Dataland' display screen can hold pages of text, color imagery, sounds, movies and an endless number of 'virtual machines,' all placed and clustered into 'neighborhoods' by the user himself.

Displays, joysticks and touch-sensitive pads

Utilizing a videotape of the Media Room, Professor Negroponte went on to explain that the user employs three displays simultaneously. He has a large screen in front of him which is the work space or area that he is working on; to his left is a near-field display containing his personal Dataland; and to his right another near-field display called a 'keymap.' The Dataland display never changes and the user always sees his entire world of information on that display, while the keymap display is a means of interacting with a specific piece of data or a particular 'machine' as the need arises. Both the Dataland and keymap displays are touch and/or pressure sensitive. The primary control system in this particular environment is an instrumented but comfortable Eames chair equipped with two joysticks and two small touch-sensitive pads. The joysticks are transducers which sense forces without displacement allowing for the user to indicate speed as well as direction. These are used to guide a graphical window over the user's world of information appearing on the Dataland display. As he 'pilots' this 'window' over Dataland, the specific 'neighborhood' of information contained therein at that time will appear on the large screen in front of him both in higher resolution and at a larger scale. "When the user 'zooms in' to this information, think of it as his being in a helicopter and moving closer to the Earth or Dataland. The information gains resolution at certain increments and the actual density of information is enormous. The user can head 'northeast' and 'hover' his 'helicopter' (graphical window) over some electronic



Touch-sensitive Screen.

mail . . . and if he zooms in on it, it is possible to read the contents of the mail on the large screen."

Continuing, Professor Negroponte then ran a tape depicting the touch-sensitive pads installed in the Eames chair and how they are used to interact with a specific piece of information called up by the user and displayed on the keymap. The keymap allows the user to access data and virtual machines in their Z-axis. Aided by the videotape, the professor verbally explained that " . . . everything we've been discussing (thusfar) has involved simply moving up and down, left and right over the surface of Dataland. Now we're going to . . . go 'through' the information and find some specific data we need. Here we have retrieved a 'book' (virtual book) and on the right is the keymap of the book where the picture of the book is generated by the computer to show the user how much information is stored in that file. The table of contents is touch sensitive so that when the user touches a 'chapter' he gets all the subchapters, and, if he touches one of the subchapters, if there are any, he will get all the sub-subchapters. More important in my opinion is that little 'marker' shown in the book which tries to show the user where he is in the book. This gives the user a sense of place in this material. In many computer systems, the terminals 'scroll' text, and as the text rolls (scrolls) by, it is actually very uncomfortable because the user doesn't know where he is with regard to the whole amount of text. (Utilizing the touch-sensitive pads installed in the arms of the Eames chair our) . . . user can literally 'flip' the pages.[5] We've tried very hard to preserve this 'sense of page' because we believe that pages are not (simply) irrelevant chunks of information."

Another example of accessing data in the Z-axis and one which is more closely related to office automation might be the following:

The purchasing agent of a company might arrange his Dataland to have the various manufacturers with whom he deals clustered in neighborhoods that reflect their functions, geographical locations, or known reliability. The president of the same company could have exactly the same data available to him, but his Dataland might show the purchasing department as a single icon among a broad panorama of other departments, and manufacturers of the purchasing agent would then be in the Z-axis.

Three meas of navigation

Returning to the Dataland display, Professor Negroponte informed his audience that there were three ways to navigate through this information. One was a little bit like flying a helicopter-moving the graphical window over the surface of Dataland by means of a joystick. The other two ways

names and each one is recallable. When the user touches any of the phone numbers it (the computer) will automatically 'dial' or place the phone call."

From the soundtrack of the videotape a telephone conversation between the user and a business associate was then heard. During the conversation the name Bill Donaldson, a name the user did not recognize, came up. "Now the user," Professor Negroponte explained, "is going to talk 'to the machine' instead of 'through' it."

The voice on the tape then asked the computer "Who is Bill Donaldson?" and data on that person stored in the computer was immediately displayed on both the key map and big screen. The user then commanded the computer to "Call him at his office!" and the computer did so instantly.

"This is absolutely critical," the Professor exclaimed, "What you've seen is an interface that is very redundant. It is both controllable by touch as well as voice . . . and as a general axiom I think it is very important to . . . make the interface be as redundant as possible."

To stress his point the Professor allowed the tape to continue, showing the third means of 'navigating' around Dataland which simply involved touching the surface of the Dataland display screen and moving across that 'world' of information by finger.

Staying compatible with television

Following this, Professor Negroponte took time out to explain that everything that had been seen up to that point, including the large screen, was television compatible. He stressed that they were " . . . not high resolution displays, but, in fact, standard, 525 involve either talking or touching ones way around Dataland. He then showed a videotape demonstrating both methods. First came the voice recognition portion of the tape. From his seat in the Eames chair, the user simply 'voiced' that part of his information world which he wished to 'work on' and it immediately appeared on the large screen in front of him. He said, "Show me the mail!" and his electronic mail instantly flashed on the screen. He said, "Go to the map above and to the west of the calculator!" and the graphical window moved to that spot and the map he desired was displayed across the large screen in high resolution.

While the tape was running, Professor Negroponte interjected that the voice recognition system utilized in the Media Room was the Nippon Electric DP 100 model. The user appearing in the videotape at this point said he would like to make a phone call, and a picture of a telephone appeared simultaneously on both the large screen and the keymap display screen.

The Professor then went on to explain that " . . . the user has pulled up a very familiar machine that is stored in the same database. It is a touch sensitive 'virtual' model of the real thing, a telephone. (It may) look very old fashioned . . . but . . . that picture is so familiar to the user that (like the book before it and the calculator to come) if it is displayed on a touch sensitive display screen (like the keymap), it is not necessary to teach the user how to use it because his own real world equivalents are very familiar to him and he needs no instruction whatsoever. Associated with this (virtual) telephone is a less obvious set of addresses with tens of thousands of

line video. We've devoted a great deal of effort to remaining compatible with television technology for a number of reasons, but most of all because the consumer marketplace is so large that we anticipate the major breakthroughs in display technology, in sound equipment, to be in that area and not necessarily in the high technology industrial community. As a good example of this, one very specific and absolutely important innovation has been the optical videodisc."

Random access

The Professor then showed one of several movies in SDMS that had been stored on an optical videodisc. In it Inspector Colombo moved freely between English and Japanese in conversation with an Arab guard and suspect. This was possible due to the fact that there were two soundtracks on the optical videodisc, one in English and the other in Japanese. The user had simply to indicate which language he prefered by touching the keymap display screen at the designated spot. Also in the example, a graphical clock was visible on the key map display, one revolution of which was the duration of that particular film in the database. By touching the 'clock' at any point the user could bounce to that section of film (in relative time), effectively randomly accessing the movie. This small function of SDMS (the movie) was singled out, he said, for two reasons: one, it was an example of random access interaction with a medium that has been historically sequential and passive; and two, because it was achieved by means of an optical videodisc player which was integrated into the system.

Combined voice and gesture recognition

"This particular work was in fact concluded about two years ago," Professor Negroponte added. "We were asked to do something different at this point. That was, to look at the opportunities for interacting directly with the large display. Again, using the Media Room as a laboratory instrument, we discovered a technology that had previously been limited to military applications for 'head tracking'." He continued by explaining that this technology revolved around a simple magnetic '3-D' sensor[6] that knows where it is in a room in terms of X, Y and Z, the three orientations. By utilizing this sensor, the user is able to point his finger and interact directly with an electronic display some distance away. Once again, since they feel redundancy to be a prime requisite of interface, the Professor and his Group decided to develop connected speech concurrent with the sensor technology. This, he said, has made the system redundant enough to up the success rate of the speech recognition system enormously.

To make his point visually, Professor Negroponte then ran a videotape of this system in action where the user first moved simple objects by speaking and pointing, and then successfully moved a complex 'scene' of ships in the Caribbean. The latter part of this example of combined voice and gesture recognition went something like the following:

User: "Pay attention!"
Computer: "Go ahead."
U: "Create a red oil tanker!"
C: "Where?"
U: "There!" (Pointing at desired location)
U: "Create a sailboat!"

C: "Where?"

U: "East of the red oil tanker!" (No pointing)

U: "Put that . . . " (pointing at the sailboat)

C: "Where?"

U: "There!" (Pointing at desired spot)

"What I would like you to appreciate . . . is the fact that the perform- ance of that particular system was better than most," the Professor stated, "not be- cause of a major breakthrough in voice rec- ognition, and not because of a major break- through in graphical input. However, it was because of using both (simultaneously)—we were at once using the channel of communication of gesture and the channel of communication of voice." It is this redundancy, he reemphasized, that brings about an increase in performance.

Optical videodiscs and the 'news'

From here Professor Negroponte's presentation returned to the theme of optical videodiscs. He devoted the remainder of his time, in fact, to the premise that optical videodiscs are one of the few new technologies which really 'fit' into the overlapping intersection of publishing, broadcasting and computer science,[7] that area he has labeled Media Technology. Optical videodiscs, he stressed, combine print, broadcast and computers in a single medium the likes of which mankind has never seen before.

Relying on slides to help make his point clear, Professor Negroponte launched into an explanation of current and possible future methods of obtaining information about world events, i.e. the news.

He suggested that the two primary means of keeping abreast of world affairs are currently newspapers (" . . . a very high 'bandwidth' . . . very satisfactory medium . . . (which we) 'browse' and 'filter' (the information contained therein) further with our eyes . . . ") and TV's (" . . . not quite as satisfactory (as newspapers) . . . high bandwidth channel but not one that you can 'browse' . . . "), media which require that 'unknown' persons 'filter' the mass of events taking place in the world everyday for us—but not necessarily in a personalized way.

"An alternative," he proposed, "might be to have neither newspapers nor TV's, but rather, to enable people with their own terminals at home or in the office, or portable ones that they can take on the train or the plane, to access the entire database and ask questions."

This could still prove unsatisfactory since people won't necessarily know what questions to ask and therefore miss a lot of interesting news. To remedy this problem, a person might have " . . . a rather smart personal computer that knows him particularly well, the function of which would be to do what the newspaper and/or TV editor previously did, but to do it for him personally . . . to do a very personalized edition of this set of worldwide events, to 'filter' them just for him, to meet his particular needs and interests."

Professor Negroponte went on to admit that even this approach might not be very satisfactory since the channel of communication between the user and the machine would be a telephone and therefore very thin. The next step then, he submitted,

would be to expand that bandwidth. This, he said, could be accomplished with optical videodiscs used to store incredibly large amounts of data.[8]

"There happens to be a very interesting and not well understood tradeoff between bandwidth and intelligence . . . Two intelligent processors (can) 'talk' over a much thinner line of communication than, for example, what has to be the dumbest terminal in the world, the television set, which requires a very broad band signal to communicate from one to the other . . . What we have started to do . . . is to tradeoff bandwidth for intelligence, where its really a storage base intelligence and not the deeper and more challenging artificial intelligence . . . A TV . . . needs a very high bandwidth signal (but) if you can add a computer and make your terminal (TV) somewhat smarter, we believe that you can trade that off for a very low band communications line for which the telephone serves a very handsome purpose because the telephone network is so incredibly large and goes everywhere."

So what they have done is built a " . . . personalized news information system that communicates over the telephone line and has in our opinion, the richness of both cable television and broad band communication. At the host machine, (there is) the entire incoming AP, UPI, Reuters and other wire services, plus a small process that 'worries about' information that it 'thinks' will be interesting to you . . . That information is transmitted to (your) terminal where an image appears on the screen which is, if you will, 'photocomposed on the fly' using an optical videodisc on which exists the entire photo collection of the Associated Press and a map of the entire world . . . (Thus) any international news story can be identified by means of a map and any illustration currently owned by AP can be incorporated into the text . . . What (is) transmitted over the telephone line is a normal communication at low band width but the image the user sees in terms of the richness of the medium is significantly enhanced by local (optical videodisc) storage and intelligence."

Videodiscs and computers personalized books, movies and 'travel'

Carrying the idea of optical videodiscs integrated with computing systems a step further, Professor Negroponte outlined the possibility of interactive and personalized 'electronic' books and motion pictures in the not too distant future. He suggested that this combo has the potential for an electronics publishing medium such as has never been seen before and the kind of interactive movies which could completely change the historically purely sequential concept of moviemaking. "In fact, if you suggest to a filmmaker that the motion picture process can become a random access process, they would not even know how to start thinking about that . . . This . . . I think has to change in the next 5 or 10 years."

The Professor rounded out his presentation with a videotape of another optical videodisc/computer system combo type project aimed at enabling people to 'travel' to places without actually going there, to experience a site or place almost as well as if they were physically walking around in the environment but without actually being in the environment. To prove the feasibility of

this they selected a small town and took movie footage, one frame every ten feet, traveling down every street, in every direction, taking every turn in every direction, during every season, night and day. They then stored that information on one side of an optical videodisc, and ran two optical videodisc players concurrently. What the audience saw was a " . . . system that allows the user to travel through this environment. Discplayer #1 shows him traveling down the street; discplayer #2 goes to the next road intersection and waits for the user. If, when the user gets to the intersection, he elects to turn right or turn left, we cut to discplayer #2, and while he's in in his turn, discplayer #1 is free to go off and get the street onto which the user will end up after the turn. The result is like freely driving through the environment. And it works, it actually works."

The applications for this system are numerous according to Professor Negroponte, with the Nuclear Regulatory Commission already making use of it for their power plants, other people using it as an anti-terrorist measure and museums utilizing it to allow visitors to explore places that are currently closed to the public or too difficult to get to.

This system also possesses special properties which make it compatible with MIS and SDMS as well. For example there is a knob for changing seasons and another for travel back in time to a particular year or event. The videodisc 'car' can be 'driven' by means of a touch sensitive screen and can be gotten out of, so to speak, for the purpose of (literally) going into buildings along the route. By virtue of its being compatible with TV, like the rest of Professor Negroponte's technology, it can be integrated and become yet another part of the MIS.

During his presentation of this particular system, the Professor used a videotape which at one point showed the user stopping the videodisc replay and pointing at a building. Professor Negroponte explained that this " . . . like in the SDMS, allows him to enter the building (access the Z-axis). The computer will identify what building he pointed to, tell him what it was, and then allow him to enter the building . . . (If) it is City Hall, the user can then access documents associated with the Police Department on file there. In fact, he can even have a 'conversation' with the Chief of Police if he so desires."

At this point Professor Negroponte ended the first portion of his presentation to allow time for a scheduled panel discussion on the facts and technologies he had presented thusfar. The second part of his presentation, that dealing with teleconferencing, was taken up following the discussion. Prior to giving up the stage however, he addressed the audience, saying that he hoped he had " . . . succeeded in leaving (them) with a feeling that the opportunity for the richness of the interface and the quality of the displays, and the dynamic and interactive aspects of communicating with a computer, is not only possible, but in fact is very important. Some people look at these videotapes or come to our laboratory, and don't think that this is really serious information processing. I think (these people) are making a very grave mistake by not realizing that the pleasure, fun and quality of using a system, whether to travel or to manage information, is absolutely critical. I constantly marvel at how

much more interesting the electronic games that you can buy in stores are than the work of some of my colleagues in computer graphics . . . There is something gripping (about these electronic games), something that grabs you and engages you, which I think is absolutely critical to take advantage of in professional computer fields as well."

Teleconference: talking heads

Following the panel discussion, the Professor once again took the stage and this time held his audience even more captive with a fascinating presentation on teleconferencing where the 'channel of communication' was the primary concern.

He began by informing everyone that in Washington his Group has the reputation for doing the 'lunatic projects.' Thus, when talk of a teleconferencing system was begun about a year ago he and his Group were naturally selected for the job. They were asked to develop " . . . a teleconferencing system for five people. The task was that there would be five people at five different sites, each a part of the same conference and each had to be made to believe that the other four people were physically present at his site. Namely, we had to transmit the human presence in the teleconference."

Professor Negroponte utilized a videotape to show some of the solutions they had come up with to date concerning this problem. Although their ultimate plan is to make holographic telephones at a very low band width, the situation initially called for a solution to the problem of recreating the conference where the first rule was that the order around the table be the same at each site. The Professor explained that there are a number of ways of " . . . recreating a person so that when you sit at your desk and telephone your friend, your firend's head appears disembodied on top of your desk. We selected a technique where we build television sets in the shape of the people's faces. Now if I and the other members of a teleconference are arranged around the table in the same order at all sites, then the person to my right at my site will have me to his left at his site. Then using the technology you saw to track arms for gesture recognition, we track heads and actually move these heads in accordance with how the (real) person is moving at his site. What the final product is then, is a round table with one live human being and four plastic heads stationed around that table at decided positions, and these plastic heads nod, bob, talk and move in exact replication of what happens at the other sites."

The Professor admitted that videotapes could not possibly convey the incredible eye-to-eye contact and face-to-face communication capable of being simulated in this fashion. He said that when talking to one of these plastic heads you are " . . . glued to the person (plastic image) as if he were really there."

Lip synchronized speech

The more technical aspects of this program were also touched upon by Professor Negroponte. He mentioned that they had been successful in reducing the channel of communication down to very, very low bandwidth, and in one case, down to near zero bandwidth. They also found that they were able to transmit just eyes and mouths at incredibly low bandwidth. He stated that

in English there are only 16 mouth positions necessary to simulate lip synchronized speech. This makes it possible to transmit a number from one to 16, namely four bits, 30 times a second, in order to have a person's image 'talk' at the other end.

The Professor ran a videotape of two people talking to a video projection of a third person, hen another tape showing various experiments they had done using just 16 lip positions in order to process sound signals in real time, and get those signals in lip synch. These experiments included transmission of synthesized voice as well as real human voice, pictures of lips as well as images of the real things stored on a videodisc, and actual human speech as well as words automatically dubbed from a movie.

Professor Negroponte wound up this segment of his presentation with a tape which he called a " . . . very significant piece of signal processing," in which they had succeeded in actually processing the signal to generate the lip sychronization under computer control.

Office of the Future

Just prior to the close of the Conference, Professor Negroponte was asked if he would care to make any last comments. He responded by giving his opinion or view of what the office of the near future might look like. He said that the office of 20 years from now will " . . . weigh about two pounds, be battery powered, probably have a gigabyte of four nanosecond memory, will probably operate at a thousand MIPS, will communicate in the gigahertz range, will have access to probably all the information in the world, will be able to see, hear, and talk, will probably be flexible so I can take it to bed with me and probably be waterproof so I can use it in the bathtub. I think those would be my specifications."

Footnotes

1. This article is based primarily on tape recordings of the presentation itself. Therefore, since that presentation relied heavily on the use of videotapes and slides, any article based solely on the text of is bound to be incomplete. We have therefore, attempted to supplement that text with information gleaned from past articles written by Professor Negroponte on this topic wherever and whenever it was felt necessary to a better understanding of the subject matter.
2. The Architecture Machine Group was founded in 1968 as a Computer Aided Design Laboratory for architectural studies. It since has evolved into a more general computer graphics facility, most recently expanding into voice, gesture, and eye-tracking systems.
3. The sponsor for most of this work has been the US Office of Naval Research and the Defense Advanced Research Projects Agency.
4. The Media room is an 11 by 14 foot soundproof room with floor-to-ceiling, wall-to-wall display. It has octophonic sound, body sensing equipment, connected speech recognition facilities, and forthcoming, an eye-tracker. In an article Professor Negroponte wrote on this subject a few years ago, he described the concept as including " . . . total immersion of cognitive and sensory apparatuses into an information space, convincingly real or uncannily imaginary. The user is surrounded by presentational means sufficiently redundant to engage any one of a number of human senses for a particular message. Similarly, the user is offered many channels of input, with the conspicuous exception of a keyboard. The implementation is with television technology, octaphonic sound, and numerous touch-sensitive surfaces. It is a room; it is quiet. Future plans are an elaboration of the current place. The purpose is to go to the full extreme of human interfacing, at once transparent and ubiquitous, subsequently to evaluate cost effectiveness."
5. High-quality text is achieved by the use of graytone information to smooth the character sets. This work has included a simulated page flipper which makes pages appear to turn over, one by one, giving the user a real sense of

progress through the material, in contrast to the more proverbial technique of scrolling.

6. A satisfactory position/orientation sensing system was found to be produced by Polhemus Navigation Sciences, Inc. of Essex, VT. This system, called ROPAMS (Remote Object Position Attitude Measurement System), is based on measurements made of a nutating magnetic field.
7. Other appropriate technologies include teletext, videotex and a number of different, single-frame video technologies.
8. In fact, the Professor remarked that recently optical videodiscs have been produced which can store one billion characters—more information than the US publishes in one day in the entire family of newspapers and magazines throughout the whole country.

News in Brief

Council on Restructuring Telecommunications makes proposal regarding telecommunications policy for the 1980s

August 24, 1981

The Council on Restructuring Telecommunications, an advisory body to the Minister of Posts and Telecommunications chaired by Mr. Yoshishige Ashiwara (Chairman of Kansai Electric Power Co.), on the 24th presented Mr. Yamanouchi, Minister of Posts and Telecommunications, with its final proposals regarding telecommunications policy for the 1980s.

In its proposals, the Council took up the liberalization of data communication circuits as a topic requiring urgent attention. While stating that the guiding principle should be one of unrestricted utilization, the Council showed a strong tendency to favor regulation in connection with private information communications companies by stating that in the case of other-party utilization involving message switching "some form of check inclusive of an approval system is required."

The Ministry of Posts and Telecommunications (MPT) plans to use the proposals as the basis for drafting a bill for a "Data Communications Law" (provisional name) for submission to the next ordinary session of the National Diet.

Other proposals made in connection with telecommunications policy include a "Proposal at the Time of Revision of the Telecommunications System Regarding Prospects for a New Information Network Society" announced on June 16 by JIPDEC's Committee for Promotion of All Kinds of Networks (formerly the Committee for Promotion of On-Line Systems; Chairman: Mr. Hidezo Inaba), a "Request Regarding Improvement of the Communications Circuit Utilization System" made on June 25 by the Federation of EDP User Organizations (Mr. Fujio Suzuki, Director), and a proposal regarding liberalization of circuits for data communication made by the Federation of Diet Members for the Promotion of the Information Industry (formed by a number of Liberal Democratic Party Diet members with an interest in the information industry and headed by Mr. Tadashi Kuranari).

Survey shows peripheral and terminal equipment shipments for fiscal 1981 to be approaching ¥1 trillion

August 9, 1981

The Japan Electronic Industry Development Association (Director: Mr. Nihachiro Katayama, president of Mitsubishi Electric Corp.) recently completed compilation of figures on the shipment of peripheral and

terminal equipment during fiscal 1980. Results showed that shipments amounted to ¥909 billion, 25.2% higher than in fiscal 1979. The number of units shipped was double that of the preceding year. Shipments during fiscal 1981 are also maintaining a high level, with the predicted totals being ¥1.1 trillion and 2.05 million units.

According to results of the survey, the figures for the individual equipment categories during fiscal 1980 were: peripheral equipment, ¥575,794 million; terminal devices, ¥284,274 million; off-line equipment, ¥22,141 million; and transmission equipment, ¥26,825 million. The predicted figures for fiscal 1981 are: peripheral equipment, ¥727,954 million (up 26.4% from 1980); terminal devices, ¥344,949 million (up 21.3%); off-line equipment, ¥24,818 million (up 12.1%); and transmission equipment, ¥29,951 million (up 24.1%).

Minicomputer shipment figures for fiscal 1979 and 1980 announced

July 23, 1981

The Japan Electronic Industry Development Association has published a report titled "Japanese Minicomputer Shipments" Figures for fiscal 1979 show the number of units shipped to have reached 10,494. This is the first time shipments have gone over the 10,000 unit mark. Total value came to ¥130,200 million. Shipments during 1980 came to 12,651 units (partially based on estimates) valued at ¥147,400 million. These figures represent a slower rate of growth than in previous years.

A breakdown of units shipped by type of order for 1979 shows 6,004 OEM shipments (¥24,738 million) and 4,490 end user shipments (¥105,498 million). The corresponding figures for 1980 were 7,661 OEM units (¥27,336 million) and 4,990 end user units (¥120,030 million), meaning that in terms of number of units the growth in OEM shipments was greater.

A breakdown by class shows that as regards M-class machines (having a standard price of between 2 and 5 million yen for CPU and 64KB memory) shipments decreased from 4,260 units in 1979 to 3,970 units in 1980. On the other hand, the number of machines of the VL-class (ultra large minicomputer including those with 32 bit word length) and the S-class (having a standard price of over 2 million yen for CPU and 32KB memory) registered sharp growth, rising from 99 units in 1979 to 152 units in 1980 and from 4,066 units in 1979 to 6,251 units in 1980, respectively. The growth in value was also large.

Nippon Telegraph and Telephone Public Corporation (NTT) applies for approval of facsimile communications network service

August 7, 1981

NTT (Hisashi Shinto, President) on the 7th filed a petition with the Minister of Posts and Telecommunications, Mr. Yamanouchi, requesting approval of the sale of Minifax small facsimile machines and the initiation of a "Facsimile Communications Network Service" exclusively for facsimile.

The Minifax, which is capable of transmitting a page about twice the size of a postcard in ninety seconds, boasts operational ease and low price as its main features and will be

made available in receiver/transmitter, transmitter only and receiver only models. For the receiver/transmitter machine, the installation charge will be ¥5,000 and the monthly rental fee ¥3,700. The user also required to purchase a ¥130,000 bond.

Although facsimile transmission is possible over ordinary telephone circuits, NTT's "Facsimile Communications Network" will, once it goes into operation, provide a more economical method of transmission. The communication network will have store and forward exchanges so that messages can first be stored at the sending end and then transmitted at high speed (4 sec per page) to the storage exchange at the receiving end. The charge will be lower by the amount of transmission time saved. NTT plans to begin communication network services in Tokyo and Osaka during the current year and to extend the system to major cities throughout the country by 1987.

Users wishing to subscribe to the Facsimile Communications Network Service will be required to pay a contract fee of ¥300 and to purchase a ¥100,000 bond. The charge per page will be ¥40 for up to 100 km (for example, between Tokyo and Atami), ¥50 for up to 500 km (Tokyo-Osaka), and ¥50 for distances over 500 km.

Japan Institute of Office Automation established

July 20, 1981

Japanese office automation equipment users and manufactures have jointly established an organization to be called the Japan Institute of Office Automation (Director: Mr. Yuzo Yamashita, Chairman of Mitsubishi Shipbuilding and Engineering Co.). Foundation status for the Institute has been approved by the Ministry of International Trade and Industry. (MITI).

Although the Association was initially scheduled to start operation as an organization without legal status from March, it was later decided to set it up as a foundation at the suggestion of MITI, which was favorable impressed by the objectives set by the members.

The activities of the Institute are scheduled to include: 1) R&D in office automation (surveys on problems related to progress in office automation and development of model systems), 2) promotion of office automation and guidance for new users (procedure for introduction of office automation), 3) surveys on and supplying of domestic and foreign information and materials (including the publication of a white paper, survey reports, office automation manuals etc.), and 4) exchanges with other domestic and foreign organizations in the office automation field. The Association currently has 118 corporate members and 6 individual members (associate members) but hopes that its member recruiting activities will raise the number of corporate members to between 300 and 500 by the end of the year.

Ministry of Labor studies effects of microelectronics on employment

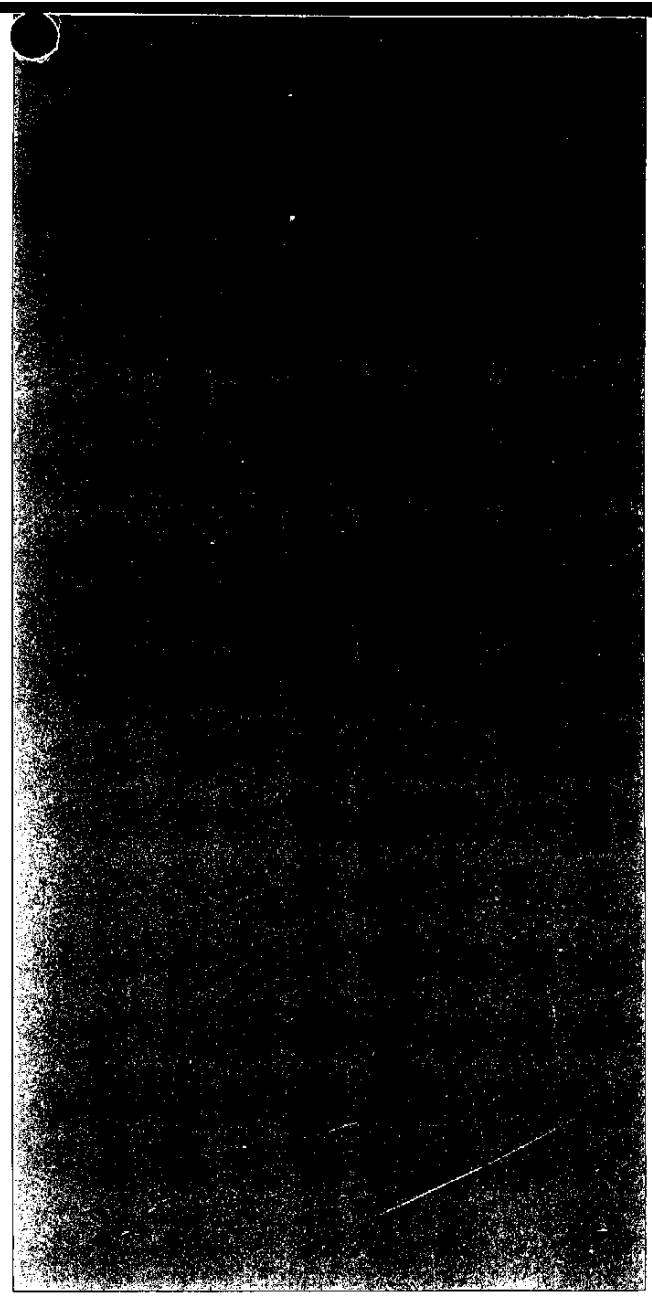
June 28, 1981

The Ministry of Labor recently announced the results of a survey it conducted regarding the effect on employment of NC machine tools and other microelectronic applications.

The study was conducted in respect of 4,897 shops engaged in the manufacture of general machines and instruments. It was found that 47.1% of the shops are using NC machine tools, transfer machines and other equipment employing microelectronics. Among these shops, the ratio of those answering that there had been an increase in the number of full-time laborers (48.4%) was greater than that of those answering that there had been a decrease (42.3%). Among the shops not employing microelectronic equipment, the situation was reversed with 42.7% answering that there has been an increase in full-time laborers and 47.5% answering that there had been a decrease. From this, it cannot be said that the introduction of NC machine tools etc. is having a major effect on employment.

The most common reason for decreases in the number of full-time laborers, aside from that of adjustment of workforce because of a smaller number of orders, was that given by 31.5% of the shops employing microelectronic equipment and having a decline in workforce that "a saving in labor had been made possible by introduction of NC machine tools and other new technology." On the other hand, 29.8% of the shops gave as their reason for an increase in the number of fulltime laborers that "there was an increase in number of job categories because of the introduction of NC machine tools and new technology."

As for countermeasures taken by the shop at the time of introduction of NC machine tools etc. the one most commonly mentioned was "transfer to the position of NC machine tool operator" (65.2%) and following this came "transfer to other division" (25.3%) and "hiring of newly required personnel" (24.4%). Only 3.9% of the shops mentioned "adjustment of labor force."



JIPDEC

Japan Information Processing Development Center