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(FOUO 10/82)

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SCIENCE AND TECHNOLOGY

LAGGING OIL DEVELOPMENT VIEWED

Tokyo JAPAN QUARTERLY in English Vol 29, No 1,Jan-Mar 82 pp 97-104

[Article by Tonedachi Masahisa]

[Text] OVER the past more than 30 postwar years, Japan has achieved a rate of economic growth that has been the most spectacular in the world. Growth in the so-called "heavy-and-chemical industries," such as steel, shipbuilding, automobiles and chemicals, and in the electronics industry has been unparalleled. In another important basic industry, however, Japan has lagged painfully behind other advanced countries—petroleum, and in particular, the upstream processes of exploration and development.

The history of Japan's oil development is relatively short, the oil industry in Japan having taken shape only a little more than 10 years ago. During these 10 years, the Ministry of International Trade and Industry has pursued policies for oil development, both domestically and outside the country, premised on the relative weakness of the Japanese upstream sector due to the overwhelming emphasis given to the downstream operations of refining and sales.

In 1967, the Comprehensive Energy Research Council, an advisory organ to the Minister of International Trade and Industry, with an eye to overseas oil development, recommended a target of 30 percent as the proportion of domestic oil demand which was to be met by crude oil explored and developed by Japanese companies. Attainment of a stable supply of this dimension was considered to be both desirable and feasible. In the autumn of the same year, therefore, in response to the Research Council's recommendations, the Oil Development Public Corp. was set up, financed by the government, to provide financial and technological assistance to overseas oil development projects by Japanese companies.

Today, 15 years later, the number of oil development companies has reached 70, but their performance has not met expectations. Oil from fields developed by Japanese companies and imported into Japan accounts for only 9.8 percent of Japan's total crude imports. It seems impossible to bring this figure up to the target of 30 percent by 1985.

What has made Japan, a major world industrial power, lag so far behind in its crude oil exploration and development? At a time when fears are held about the future of the world's oil supply, it is Japan's international responsibility to take part in overseas oil development to help ease that situation. What should Japan be doing? This article attempts to review the present situation and the problems of Japan's efforts in this vital area.

One-Project-One-Company Formula

The oil industry consists largely of the upstream activities of exploration and development and the downstream industries of transport, refining and sales. The international oil majors and most of the world's leading oil companies engage in an integrated

operation which includes both upstream and downstream activities, from exploration and development to refining and sales. Japanese oil companies, however, with only a few exceptions, engage mostly in downstream and not upstream operations. Generally speaking, downstream operations require considerable capital and a high-risk investment. Most oil companies elsewhere, therefore, try to balance their operations by channeling earnings from the downstream to the upstream sector. It is only in this way that risky operations like the oil industry can survive.

However, because of a separation of these operations, Japanese oil development companies have no refining or sales facilities. This results in some basic drawbacks. The greatest of these is that because individual Japanese companies cannot raise funds for oil development overseas themselves, they depend on industry at large to set up separate companies for each development project, in what is called a "one-project-one-company" formula.

This formula, where risk is confined to a specific project, has the following problems:

First, it hampers the long-term development of companies capable of raising such funds in the future.

Second, because the perspective is limited to immediate projects, it hampers the growth of companies capable of conducting effective investment on a worldwide basis.

Third, scarce engineers and technicians are mobilized for each specific project, causing a shortage in their numbers.

Fourth, if the company is successful in striking oil, it can survive, but if not, it either has to dissolve or at least become dormant, as a result of which any experience gained from a particular project is unable to be put to use in other projects.

Against this background, eight so-called "integrated companies" have been set up, composed of major banking groups and trading firms, charged with playing a central role in oil development projects. However, although they have the necessary financial backing, these companies do not have enough experience or engineers to promote oil development by themselves nor to cope with the increasingly severe competition with foreign companies.

In Western countries, the international oil majors utilize their worldwide networks—funds, technology, information, bargaining power and expertise—to promote development. State policy corporations such as ENI of Italy, CFP of France, DEMINEX of West Germany and BP of Britain are also giving full play to their capabilities.

In Japan, the Oil Development Public Corp. has filled some of the gap but not sufficiently. Most oil companies, centering on refining and sales, are weak in their management setup because of excessive competition, and it is only recently that they have moved into the area of exploration and development.

The reason why the Japanese oil industry has developed in this way stems from the fact that upstream and downstream operations were separated as national policy during the war, and that neither government nor industry was very concerned about exploration or development: crude oil was available at the low price of about $2 per barrel for many years until the first oil crisis of 1973.

The two oil crises of the 1970s brought home to Japan the instability of its oil supply due to its lack of upstream facilities. The medium-term outlook for the 1980s cannot be called reassuring either. Japan should therefore become more active in the field of oil development, both from the point of view of its own national interests and also from that of fulfilling its international responsibilities.

Only 1 Percent of Total Japanese Demand

Japan is the world's second-largest consumer of oil after the United States, accounting for approximately 10 percent of total consumption in the West. Over the past year or so, Japanese demand has been declining rapidly. Imports of crude oil have dropped from 270 million kiloliters in 1979 to about 250 million kiloliters in 1980. Yet in 1980, the nation's real economic growth reached a healthy 5 percent. There are at least three

reasons for this decline.

First, soaring oil prices have prompted energy-saving efforts in both the industrial and non-industrial sectors.

Second, the use of alternative energy has been accelerated: The switch to coal has been particularly marked in such fuel-consuming industries as steel, cement, paper and pulp. Kerosene oil is also being replaced by service gas or electricity.

Third, while the overall economic growth rate has risen steadily, the oil-consuming industries such as steel, chemicals and cement have cut down on production sharply because of excessive inventories.

The first and second reasons can be expected to have a continued and growing effect. Taking this into account, in May 1981 MITI worked out an oil supply plan for fiscal 1981-85, which represented a sharp downward modification of the previous oil import plan. According to this revised plan, approved by the Oil Council, Japan's total imports of crude oil in 1985 are set at 331 million kiloliters or 5.71 million barrels per day (1 barrel equals 159 liters), an amount much smaller than the 6.3 million barrel target declared at the Tokyo Summit in June 1979.

Nevertheless, there is little sign of Japan's oil situation improving in the immediate future because the crude oil developed by Japanese companies overseas or domestically accounts for such a small portion of the total Japanese demand.

Japan's first oil development overseas was undertaken by Arabian Oil Co. Ltd. in 1960, in the neutral areas of Saudi Arabia and Kuwait and in the sea off Khafji. In 1961, a total of 1.45 million tons of crude oil was shipped to Japan from these fields. This was an exceptionally successful example in the highly risky industry of oil development. The first oil well produced 1,000 kiloliters of first-grade oil a day, and all the succeeding wells were similarly successful. Encouraged by the success of the Khafji oil fields, more and more Japanese companies launched oil development projects overseas.

In 1981, these companies including the eight "integrated companies" number about 70. Of these, however, only 15 actually import oil of their own production into Japan—Arabian Oil, North Sumatra Oil Development Corp., Japan Low Sulfur Oil, Indonesian Petroleum, Abu Dhabi Oil, Japan Oil Development, C. Itoh Energy Development, United Petroleum Development, Zair Petroleum, Japan Iraq Oil Development, Nato Oil, Indonesia Nippon Oil Corp., Mitsubishi Oil Development, Sumitomo Petroleum Development and Japan Peru Oil. Some others—Mitsui Oil Development, Fuyo Oil Development and Egyptian Oil Development—do not directly import oil of their own production into Japan.

Of these 15 companies, only four imported more than 10 million kiloliters apiece, 1961 to 1980—Arabian Oil (250 million), Japan Oil Development, Indonesian Oil and Japan Low Sulfur Oil. The combined total of the 15 companies was 364 million kiloliters, or only 9.8 percent of Japan's crude imports (3.7 billion kiloliters) during these years.

Japan's domestic production of crude oil has continued to decrease from a 1970 peak of 900,000 kiloliters to 480,000 kiloliters in 1980, or about 0.2 percent of the total imports of crude oil for 1980. In other words, Japan's oil production both in and outside the country amounts to only about 10 percent of total demand.

Between 1958 and 1979, the 15 Japanese companies spent a total of ¥1.2 trillion (¥660 billion for exploration and ¥538 billion for development), a much larger amount than was invested in any other industry. By contrast, the eight international majors spent ¥4 trillion for such purposes in 1979 alone, or more than three times the Japanese investment over about 20 years. According to an informal estimate, Japan's investment in the upstream oil industry amounts to only 1 percent of the world total. Seen from the point of view that Japan consumes 10 percent of the oil in the West, these figures are clearly small. Undoubtedly Japan's interest in oil development is much lower than that of other countries which center on the international majors.

Why Is Japan Behind?

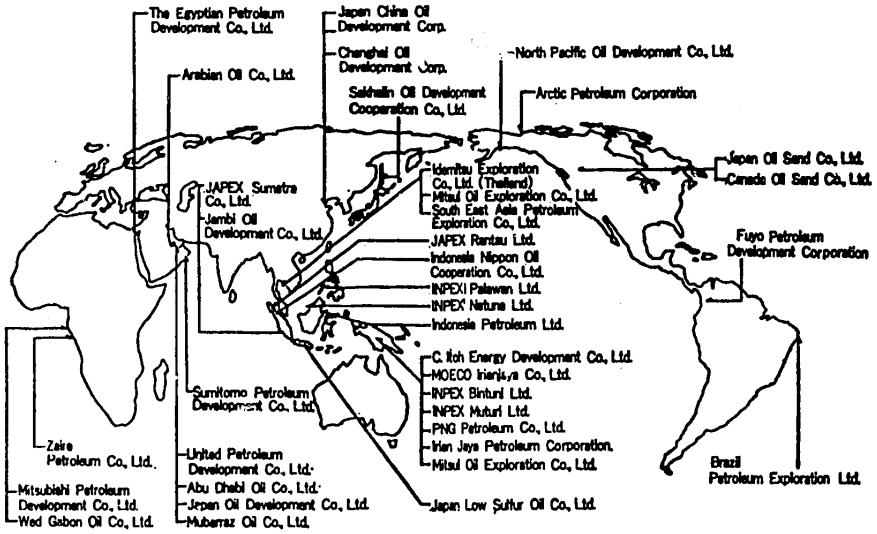
There are three main reasons why Japan lags behind other countries in oil development.

First, because of the small scale of domestic production, the government and industry have not been inclined to invest in oil development since prewar days. Another energy source—coal—attracted attention early on and Japan's major financial groups such as Mitsui, Mitsubishi and Sumitomo all made considerable investment in this field. However, these companies had little interest in oil because of the limited possibilities for production and the considerable funds necessary for exploration and development. Oil is probably the only industry that was overlooked by those major financial groups which invested in almost all other industries in some way or another. The one exception was the Japanese Navy which, heavily influenced by Britain, was looking toward oil as their fuel in the late Meiji Period and consequently placed emphasis on oil development in Taiwan and areas further south.

Second, the Teikoku Oil Co. Ltd., 50 percent capitalized by the government, was set up in September 1941, just before the outbreak of the Pacific War, in line with the national policy of development and promotion of oil resources. The company played its role of securing oil resources during the war, but its establishment marked the separation of upstream from downstream oprations because it integrated only the mining operations of other oil companies which previously had been engaged in more comprehensive operations, ranging from exploration and development to sales. This was the beginning of the unique form of operation of Japanese oil companies.

After Teikoku reinstated itself as a private company in 1950, there were plans to set up "Japanese oil majors" by combining upstream with downstream activities. However, these plans were stillborn because the oil companies, which, postwar, had achieved rapid growth in the downstream sector on the strength of foreign capital, were all reluctant to take the risk of operating in the upstream sector as well which required a vast amount of investment. The continued separation of upstream from downstream delayed

Worldwide Projects of Japanese Companies and Their Affiliates



Source: Petroleum Producers Association of Japan

Japan's advance into exploration and development.

Third, the successive development of large oil fields after the war, mostly in the Middle East, caused a glut of crude oil worldwide, stabilizing its price at about $2 per barrel for many years. As a result, the oil industry had little interest in the highly risky venture of oil development; the rate of successful exploration was only 2 or 3 percent.

Japan's oil development overseas was begun by Arabian Oil in 1960, but most people who joined this project, including its president Yamashita Tarō, were laymen in the oil business and ironically the industry-at-large paid little attention to the project. In retrospect, the success of Arabian Oil at that time was the last chance for Japan to vest its interests in the Middle East.

Japan's Efforts at Oil Development

Against such a background, the Japan National Oil Corp., wholly subsidized by the government, began investment in the exploration and development of oil around 1965, aiming to establish oil development companies overseas. In the private sector, Oil Resources Development and Teikoku Oil led others in the research and development of exploration techniques, the fostering of oil engineers and indirect investment in overseas oil development companies.

In October 1967, the Oil Development Corp. was set up, based on the suggestion of the Comprehensive Energy Council, an advisory organ to MITI. Then, in line with the increasing need for stockpiling of oil, the ODC was renamed the Japan National Oil Corp. and the legislation relating to its establishment revised in June 1978. The main business of the corporation is set out as follows: investment and provision of funds for oil exploration overseas and in the seas near Japan, loaning of machines and equipment, technical guidance, geological surveys, the stockpiling of oil and financing.

The rates of the corporation's investment and financing are set at no more than 70 percent for overseas operations and no more than 80 percent for operations in the seas near Japan. Investment is required to be made through the acquisition of equity, and financing terms are set at an annual interest rate of more than 6.75 percent for a period of no more than 18 years. Investment and financing as of the end of 1980 amounted to ¥500.6 billion (¥232 billion for investment and ¥268.6 billion for financing; ¥453.9 billion for overseas operations and ¥26.7 billion for those in Japan's surrounding seas). So far 16 companies have succeeded in the exploration and development of oil and either are already producing or are in the process of preparing to produce oil with the assistance of investment or financing from the corporation. Six other companies, also with the corporation's financial support, have discovered crude oil or gas and are studying the feasibility of production, and 31 other companies are in the process of exploration with the corporation's backing.

In December 1955, the Oil Resources Development Co. was set up as a state company, but was disbanded in 1967 when the Oil Development Corp. was established; its business was thereafter taken over by the business department of the corporation. In 1970, the company was reinstated as the Oil Resources Development Co.

The company's predecessor had launched ocean exploration in 1960, as the first Japanese company to do so, and an oil field was discovered in the Japan Sea off Akita in northern Japan. In 1971 and later, the company discovered Japan's first large-scale oil and gas fields in the sea off Aga, Niigata Prefecture. This exploration was conducted jointly with Idemitsu Oil Development, through Japan Sea Oil Resources Development. Production commenced in 1976.

In September 1941, Teikoku Oil Co. Ltd. was established with 50 percent government capital. Prewar Teikoku Oil was an entirely upstream company and incorporated the mining operations of a number of oil companies. In 1950, it began operation as a private company. Its ocean

mining area extended over an area of 340,000 square kilometers, or 40 times the land mining area, from the vicinity of the Japanese archipelago to the East China Sea. In 1973, the company discovered a gas field in the sea near the Japanese islands on the Pacific continental shelf, and as the result of a joint study with Exxon for commercial production, it was decided in May 1981 to develop the field. The excavation of gas wells is scheduled to begin in 1983.

Recent Examples of Success

Even though somewhat belated, Japan's development of oil has in fact progressed considerably in recent years. During the 25 years from 1955 to 1979, test drilling wells for oil and natural gas in inland Japan numbered 1,186, of which 296 proved successful. A total of 45 oil and gas wells were discovered. Investment for exploration amounted to ¥128 billion and that for development ¥121.5 billion. Production of crude oil reached 16.2 million kiloliters and that of gas 28.7 billion cubic meters. The discovered deposits equal 53.8 million kiloliters in terms of crude oil.

As for ocean exploration, 112 wells of oil and natural gas were drilled on a trial basis in the seas near Japan, of which 22 were successful. Four new oil and gas wells were also discovered. Investment for exploration amounted to ¥100.9 billion and that for development ¥24.2 billion. Production of oil reached 700,000 kiloliters and that of gas 2.3 billion cubic meters. The discovered deposits are equal to 15.9 million kiloliters in terms of crude oil.

In the past one or two years there have been some promising projects undertaken by overseas development enterprises. One is the development of oil in Po Hai Bay. In April 1980, the Japan-China Oil Development Corp. and the Changi Oil Development Co. Ltd. were established for these projects. The two companies discovered promising oil deposits in their trial well No.1 in May 1981 and then struck a 2,700 bbl/day (430 kiloliters) oil field in their trial well No. 2 in October of the same year. China also pins great hope on this field where full-scale production is scheduled to start in two to three years.

Recently it was decided that the production of oil and natural gas on the continental shelf off Sakhalin, developed jointly by Japan and the Soviet Union, will begin in 1988. According to the announcement of the Sakhalin Oil Development Cooperation Co. Ltd. in July 1981, the two countries agreed: (1) to begin full-scale production of oil and liquefied natural gas (LNG) in 1988, (2) to decide on development and production programs by the autumn of 1982, and (3) to complete an LNG plant by the end of 1987. Under this agreement, Japan will receive 300 tons of LNG and 50 percent of the crude oil produced for 20 years.

In May 1981, the New Japan Oil Development Co. Ltd., an affiliate of Idemitsu Kosan, announced that it had hit a 1,500 bbl/day (240 kiloliters) oil deposit in its North No. 3 well off Aga, 15 kilometers off Niigata in central Japan. In this well, 88 meters under water, the excavation ship struck an oil stratum 2,200 meters deep.

Japanese companies also take part in some overseas projects. Idemitsu Kosan, Oil Resources Development and Mitsubishi Corp. take part in oil and natural gas development projects which are booming in the United States. In 1980 Oil Resources Development set up JAPEX US, made a 50-50 investment in a development project promoted by a Canadian Oil concern, and struck a 1,400 bbl/day (223 kiloliters) oil field in Utah. The company is participating in a trial gas excavation in Alabama and plans to join an oil field development on the continental shelf off Louisiana. Mitsubishi Corporation set up MIC Petroleum in March 1980 and made a 20 percent investment in an oil project run by Aminoil in Texas and Wyoming. It will conduct trial excavation in 15 wells, two of which are now producing oil.

Probably because of these successful examples, the outlook for oil development in Japan has become brighter. According to a report made by the Petroleum Producers

Association of Japan in May 1981, Japan's own production of crude oil continued to decrease from an output of 519,000 bbl/day (509,000 bbl from overseas operations and 10,000 bbl from domestic operations) in 1978 to 435,000 bbl/day in 1980. However, the output since then has been increasing. In 1990 it will reach 799,000 bbl/day (780,000 bbl from overseas operations and 19,000 bbl from domestic operations), accounting for 14 percent of crude oil imports. This will be due to the new projects in Po Hai Bay, North America, Indonesia and the North Pole Sea. The Petroleum Producers Association expects to increase Japan's own production in 1990 to 1.3 million bbl/day or 20 percent of total imports. For this purpose, the Association estimates it will need to spend ¥2.56 trillion for exploration and ¥4.7 trillion for development.

Problems for Future Plans

Problems with Japan's own production of oil in the future are threefold.

The first is funds. As natural conditions worsen in the future, development cost will escalate. According to the Petroleum Producers Association, an oil well 1,000 meters deep costs about $80,000 to drill; a well 6,000 meters deep, however, costs $3 million, or greater than 35 times more. Similar estimates show that an oil well in the jungle of a developing country would cost 4 to 10 times more to dig than one in the United States. Submarine pipelines in the North Sea cost more than 10 times similar pipelines laid on the ground. In places of intense cold, the cost rises more than 20 times. For example, the investment necessary for production of 1 bbl/day of oil is $500 in Saudi Arabia but $13,000 to $15,000 in Alaska. These examples show how the costs of oil investment will increase in the future.

The National Petroleum Institute of France (IFP) estimates that the world will invest $426 billion in oil between 1977 and 1990. This means an investment of $30 billion is necessary every year from now on. This financial need is a great concern for Japan which is poorly endowed with natural resources and has to conduct exploration and development under severe natural conditions overseas.

The Petroleum Producers Association has calculated that in order for Japan to secure 300,000 bbl/day of oil of its own production by 1990, an investment of ¥7.2 trillion would be required. How to raise such vast funds for exploration and development is a big headache.

The second problem is the issue of personnel, praticularly the raising of exploration and development engineers. The Oil Engineering Association has a membership of about 900 oil engineers, but of these only about 100, with more than 10 years experience in exploration and development, are capable of negotiating with their counterparts overseas. This situation contrasts with the international majors which retain 400 or 500 oil engineers each.

At present there are about 70 oil development companies in Japan, but only a few of these retain their own engineers. Instead, when they come to the stage of trial excavation and production, they seek help from engineers of the Oil Resources Development and Teikoku Oil companies. This is because oil companies which engage only in upstream operations have weak management foundations and are not strong enough to raise their own engineers. This situation in turn discourages capable engineers from studying exploration and development techniques.

To cope with this problem it is important to increase the number of courses offered on this subject at universities. As another means of raising such engineers, the Japan National Oil Corp. has begun to send promising young Japanese engineers to international oil majors for training.

Third, it will be next to impossible to reinforce the upstream sector if nothing is done about its present separation from downstream activities. As it is, Japan's oil industry, heavily tilted toward downstream operations, may not deserve the name of oil industry as yet.

Under these circumstance, it will not be easy to dissolve the lag in Japan's energy

measures. Fortunately, there have been encouraging signs of late. For example, Idemitsu Petrochemical, an affiliate of Idemitsu Kosan, and Nippon Oil Development, an affiliate of Nippon Oil, both leading oil wholesalers operating mostly in the downstream sector, have set up wholly owned subsidiaries operating in the upstream sector.

Lastly, oil development has much to do with international cooperation. Oil development by the advanced countries in prewar years was based on colonialism. Since the end of the war, there have been drastic changes. Today Japan has friendly relations with the United Arab Emirates thanks to the fact that Japan Oil Development and Abu Dhabi Oil engage in oil development projects in the country. Arabian Oil, which has been operating in the neutral area between Saudi Arabia and Kuwait since 1960, also contributes to the promotion of good will and mutual understanding between Japan and the two countries. Through this type of oil development, Japan is expected to raise the rate of its own oil production and contribute to the technical improvement and economic and social development of the oil-producing countries.

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SCIENCE AND TECHNOLOGY

NATION PONDERS COMPUTER INDUSTRY, POSSIBLE WAR USE

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[Article: "The Electronics Revolution and the Ban on Export of War Materials"]

[Text] Japan's peace policy is being shaken by a silicon chip no more than 1 centimeter in area. Japan lost the Second World War; something like 3 million people lost their lives and the war brought to all parts of East Asia a calamity from which it has barely been able to recover. After the war, reflecting sincere introspection and via the medium of her new constitution, Japan determined to make herself unconditionally a power for peace. The Diet passed a resolution incorporating three principles concerning the export of weapons of war which basically pledged Japan never to engage in such export whatever the recipient country. Increasingly, however, modern warfare has taken on the aspect of a war of electronics. Electronics technology, centering on the silicon chip (semi-conductor), has become the center of attention for its potential military applications. Japan, whose present economic successes and social stability have worked to the benefit of her most friendly nation, the United States of America, is now being formally requested by that country to supply her with silicon chips for military purposes. However, the problem is that complying with such a request, even from America, would not only be in conflict with the three principles but would also be incompatible with the spirit of Japan's constitution. Thus, a situation has arisen whereby one wonders if it is possible, on the one hand, to continue to improve the economic circumstances by exporting products and technology which in large part involve electronics and, on the other, without endangering her alliance with the Western Powers, which is of paramount importance, to refuse to cooperate with any country in a war or to provide it with materials for war. Japan is suddenly placed at the mercy of the specter of "electronics."

The fact that the U.S. government has formally requested that Japan cooperate in the application of electronics to the military field and in the development and production of weapons became public knowledge in June 1981. High-ranking officials of the Foreign Ministry and Defense Ministry say that America has expressed an interest in receiving technology and parts in the fields of high speed processors for computers, laser technology and facsimile communications.

At first industrial circles tended to doubt the accuracy of this report. Ōuchi Atsuyoshi, vice president (and in charge of semiconductors) of Nippon Electric (N.E.C.), Japan's leading producer of communications equipment and semi-conductors and prominent on a world scale, said, "Japan's semi-conductor industry is well-advanced in production and particularly mass-production techniques, but lags far behind the United States in basic research and technology. Moreover, when it comes to rigorously strict military specifications for integrated circuits there is no way that Japan can comply. If the U.S. government really imagines that

military technology exists in Japan that it doesn't have at home, then there's some mistake somewhere."

Tanatsugu Tomio, vice president of Toshiba Corp. and a previous chairman of the Japan Ordnance Association, expressed a similar opinion: "If we were to spend enough time and money to that end, Japan probably could produce conventional weaponry, but even so not without licensed technology from the States. For instance, Japan is far behind in military aircraft."

However, when one talks with people in industrial circles, it soon becomes clear that a number of electronic parts developed by Japan for industrial uses most certainly have potential military applications. "That's absolutely true," says Kobayashi Daiyu, president of Fujitsu Ltd.—puffing out his chest a little. Fujitsu is Japan's leading computer maker with annual sales well ahead of those of I.B.M.'s Japanese subsidiary, Nippon I.B.M. Kobayashi adds: "The problems of using a computer system for military purposes are exactly the same as for civilian purposes. And it may well be that computer technology in Japan, which has the most-advanced banking on-line system in the world, is ahead of the United States. From that point of view, it isn't at all surprising that the U.S. government should think of using the accumulated expertise of Japanese companies for military purposes. In fact, Fujitsu itself has several times received direct requests for cooperation from the U.S. Defense Department!"

It may be that Kobayashi speaks with such confidence because he is one of the few Japanese to have visited the North American Air Defense Command (NORAD) facility in Colorado. NORAD is the facility which, with one word from the U.S. president over the hot line, can plunge the world into the holocaust of nuclear war. However, when, guided by U.S. officers, Kobayashi set foot in the computer control center at the heart of the facility, he was confronted by an incredible sight. Against a background of American officers explaining that the war of the future would be an electronics war, the issue being decided on the basis of superiority in electronics technology (an area where the West has an unassailable lead over the U.S.S.R.), what should he see humming away in front of him but a computer of Ford Co. manufacture and of a type which had disappeared from world markets some 20 years ago. Kobayashi says he was filled with sorrow that such splendid soldiers had to depend on out-of-date equipment in a country which gives home to I.B.M. and at a time when Fujitsu itself had computers with 10 million times the speed and memory.

During 1980, N.E.C. supplied 291 items of electronic equipment to Japan's Defense Agency, being in a normal year the agency's largest supplier. These items included radar equipment capable of picking enemy signals out of the multitude of electronic signals passing through the atmosphere, and other radar equipment capable of detecting and following enemy troop movements at a distance of several tens of kilometers. The technology and parts such as integrated circuits used in such equipment were developed and perfected by the company for industrial use.

According to Ōyama Giichi, general manager of the 1st and 2nd Japan Defense Agency sales divisions, a number of the integrated circuits and sensors produced in large volume for industrial purposes are concerned with environmental factors such as heat, humidity, cloud movements and shock detection, and as such it would be quite possible to incorporate them into electronic instruments for military use. Thus when N.E.C. Vice President Ōuchi says "Japan does not have integrated circuits designed for military use," he is not telling a lie. On the other hand, it is not a little confusing to read reports that the sono-buoy made by N.E.C. and used in joint U.S.-Japan military exercises, was more effective than its counterpart made by a specialist U.S. manufacturer.

There exist technologies developed entirely by Japanese corporations which can be put to military use without modification. A good example is the infrared charge coupled device (I.R.C.D) developed over the last 20 years by Fujitsu, Mitsubishi Electric and Toshiba.

This is made up of two devices—the low-level infrared detector device found in fire alarms, and the charge coupled device (CCD) found in video cameras or copying machines. The filmless electro-magnetic camera, a prototype of which has recently been developed by Sony and is attracting world attention, is another application of the CCD. But when the techniques of infrared detection and CCD are combined and controlled by a mini-computer, they can become the eyes of a missile pursuing its objective, immune to the vagaries of weather or any kind of jamming operation. Employed in aircraft, tanks or field glasses they can be used to observe enemy movements at night; they can be used in the sights of artillery pieces or rifles; and in medicine they can be used for detecting cancer or tuberculosis.

Japan is in a dilemma: how to reconcile the production of such parts and equipment, which have such important civilian uses, with the concept of the three principles regarding export of armaments—retaining the idea of Japan as a nation of peace, while at the same time pursuing the other national policy of promotion of exports in circumstances where the products in question have outstandingly high added value.

A notable recent development has been attempts on the part of certain members of business circles to modify the concept of "peace" to fit the realities of contemporary circumstances. In August 1981, at the well-known resort of Karuizawa, a forum was organized by the Federation of Economic Organizations (Keidanren), a body which brings together some 800 leading business organizations plus such industrial groupings as the Japan Iron and Steel Federation and the Federation of Bankers Associations of Japan. During the proceedings, Tanabe Bun'ichirō, president of Mitsubishi Corp., openly called for a removal of the restricitons on the export of arms, and there were many present who supported his demand.

In the past it has been only a few, such as Nagano Shigeo, chairman of the Japan Chamber of Commerce and Industry, and Kōno Fumihiko, president of Mitsubishi Heavy Industries, who have, in a small voice, called for some reconsideration of the ban on the export of arms. Recently, however, their voices have been joined of such people as Morita Akio, president of Sony, and others, leaders of companies with no apparent direct interest in the manufacture of armaments. Hitachi Ltd., the lowest bidder in a large plant tender in Iran, lost out to France when the latter offered to supply Mirage fighter planes. The Mitsubishi Group similarly lost a bid for a thermal power plant in Iraq when the U.S.S.R. offered to supply tanks and anti-aircraft missiles. Thus dissatisfaction with the "no arms export" peace policy has grown.

Some years ago, when the shipbuilding industry was depressed and threatened by unemployment, the unions petitioned the government to widen their interpretation of the ban to allow export of military vessels provided they were not equipped with armaments. Recently, one after the other, 10 special steel manufacturers applied to join the Japan Munitions Manufacturers Association. What surprised the association was that all the manufacturers said they expected limits to be placed on Japan's export of automobiles to the United States and Europe and that they feared for their future as manufacturers of automobile parts and wished to prepare to revert to their erstwhile function as manufacturers of munitions.

In the case of items such as computers or wireless equipment and even construction workers helmets, though legally-speaking they were not subject to the ban on export of arms, the Ministry of International Trade and Industry has used "administrative guidance" to prevent their export wherever there were grounds for suspicion that their eventual use was connected with military affairs. It is at the insistence of the Ministry of International Trade and Industry that Fujitsu has refused requests for technological cooperation from the U.S. Department of Defense. But, recently, the same ministry has given it's blessing to an agreement whereby Fujitsu extends technological cooperation without limit to International Computers Ltd. (I.C.L.), a company which the British government surely views in strategic terms. The ministry explains that while I.C.L. may be a strategic

company, it is not the military itself. Nevertheless, the technology supplied to I.C.L. will surely sooner or later be used in Britain's defenses against missiles.

How then to preserve the spirit of the "Peace Constitution" and the three principles regarding export of arms? The ripples caused by that tiny little silicon chip threaten to grow into sizable waves.

CSO: 4120/136

SCIENCE AND TECHNOLOGY

STATUS OF TOP COMPUTER, OA SEMICONDUCTOR COMPANIES STUDIED

Tokyo COMPUTOPIA in Japanese Nov 81 pp 16-61

[Article by the Editorial Staff of COMPUTOPIA]

[Text] Part I. Computer industry.

Fujitsu Ranks First

Sales in the information processing related area of the top 10 Japanese computer companies during FY-80 totaled more than 1.6091 trillion yen. This was roughly 15-percent increase over the previous year's sales. There was no change in the makeup of the top 10 companies in the information processing area, but among them some experienced a sales decrease and some, a 59-percent sales increase, and this very wide divergence in rates of increase may be considered a characteristic feature of the FY-80 record.

At the same time, Fujitsu, which had wrested the top spot from Japan IBM during FY-79, greatly surpassed its sales total over Japan IBM of 2.5 billion yen in FY-79 and expanded this margin more than 17 times to 43.8 billion yen in FY-80 to reconfirm its top position. The six Japanese companies which increased sales by double digits through skillful handling of the OA (office automation) boom displayed wide differences in their FY-80 performance compared with those companies with foreign capital which could not keep up with the changes in the market.

Three Companies Revise Computation Methods

The general outline of the FY-80 accounts of the six Japanese companies (Hitachi, Fujitsu, Nippon Electric, Toshiba, Mitsubishi Electric and Oki Electric) and four foreign-funded companies (Japan IBM, Japan Univac, Burroughs and Japan NCR) is given in Table 1. (The figures given in this article are for sales in the information processing related area. The standards adopted in compiling the accounts are given on another page.)

Before coming to the order in sales, we will report here that three companies, Toshiba, Oki Electric and Japan NCR, greatly expanded their classification of products in the information treatment related area, that resulted in an increase in sales in the area.

First of all, Toshiba's sales in the information processing related area had been limited to products handled by the electronic calculator industry department, and

Table 1. FY-80 Sales of the Top 10 Computer Industries (Million Yen Unit, Numbers in Parentheses Are Increases over the Preceding Year.)

	1 社名	2 売上高	3 営業利益	4 経常利益	5 利益	6 情報処理関連部門売上高	7 順位 8 全体	9 国産外資
17 国産系6社	富士通 11	581,678(16.1)	45,612(20.0)	32,417(△3.1)	18,453(17.9)	382,094(16.9)	1位	1位 10
	日立 12	1,947,029(14.7)	151,814(9.8)	117,738(10.4)	61,846(16.5)	250,000(15.7)	3	2
	日本電気 13	892,810(24.0)	53,702(35.6)	35,191(49.6)	18,045(37.4)	240,392(19.7)	4	3
	東芝 14	1,547,611(8.4)	139,323(4.3)	82,816(9.9)	44,238(7.7)	80,300(59.3)	5	4
	三菱電機 15	1,221,397(13.5)	86,534(8.1)	47,072(△3.6)	23,191(△7.6)	62,000(17.0)	8	5
	沖電気 16	186,075(12.4)	14,294(△9.1)	7,506(△24.1)	3,909(27.7)	78,793(25.5)	6	6
18 外資系4社	日本IBM 19	338,328(4.3)	-	73,643(0.9)	36,323(0.2)	338,328(4.3)	2位	1位
	日本ユニバック 20	78,605(6.8)	3,884(△7.7)	2,425(△23.8)	1,403(4.7)	78,605(6.8)	7	2
	バローズ 21	50,470(△7.5)	—	—	2,302(—)	50,470(△7.6)	9	3
	日本NCR 22	72,198(△7.3)	9,707(10.5)	10,010(△2.6)	4,574(△3.4)	48,214(40.6)	10	4

Key:
1. Name of company
2. Sales total
3. Business profit
4. Working profit
5. Profit
6. Information processing related sales
7. Rank
8. Overall sales rank
9. Rank among domestic and foreign companies
10. First place
11. Fujitsu
12. Hitachi
13. Nippon Electric
14. Toshiba
15. Mitsubishi Electric
16. Oki Electric
17. Six domestic companies
18. Four foreign-financed companies
19. Japan IBM
20. Japan Univac
21. Burroughs
22. Japan NCR

bank terminals of its equipment industry department and terminals of the electric communication industry department were not included. But starting in FY-80, the terminal equipment which was handled by these two departments was included in the information treatment related data. Incidentally, the sales of terminal equipment of these two departments for FY-79 totaled close to 19 billion yen. The sales total for FY-80 based on the past computational basis was 58.5 billion yen, which was a 16-percent growth over the previous year, but the addition of terminal equipment swelled this total by 21.8 billion yen for a grant total of 80.3 billion yen for the year (59-percent increase over the preceding year).

Through FY-79, Oki Electric was computing only the sales of the electronic business machines department as the sales in the information treatment related area, but in FY-80 it began to include measuring instruments, audio equipment, radio equipment and control instruments and called the entire ensemble the information processing equipment. As a result, starting in FY-80 the total sales of electronic

business machines and measuring and control instruments are classed as information processing related sales. When the FY-80 account was totaled only along the lines of electronic business machines, as had been the practice in the past, it was 69.5 billion yet, which was a 10.7-percent increase over the preceding year, but the inclusion of measuring and control instruments swelled this total by another 9.3 billion yen to 78.8 billion yen (25.5-percent increase over the preceding year) for the information processing related sales.

Japan NCR stated that because "distinction between products themselves was difficult as the result of changes in business structure and electronification of products, it decided to change the classification of products" so it abbreviated the former "computer," "terminal equipment," "general business equipment," "technological service," "accessory parts" and "computation center" to "electronic calculators," "terminal equipment" and "other information equipment." In the past this journal computed the sales total for the computer, terminal equipment and computation center. The company did not clearly show how sales for accessory equipment, technological service and computational center were distributed in this new system, so that comparison with the preceding year's sales is rather nebulous. As a result, the total of the electronic calculators and terminal equipment area will be treated as information processing area sales here. Other information equipment such as electronic cash registers were left out of this total.

Because these three companies modified their manner of computing total sales, it should be clarified here why the sales order for FY-80 underwent a big change in some part and why the increase in sales over the preceding year was so large.

A Look at the Order in Sales

The 10 companies with top sales are the same as before. The ranking and sales totals for the top 10 companies are given in Table 2. There is no change in the order of the top four companies from FY-79, but there is considerable change in the next six companies. Toshiba, which expanded its computation basis, made the great leap from ninth in FY-79 to fifth in FY-80 (fourth among domestic makers), and this was the greatest change. On the other hand, if the total basis is taken to be the same as in FY-79 as described in the Note for Table 2, this company ranks eighth. There was no change in the rank of Oki Electric and Japan NCR.

The changes in total sales rankings from FY-76 are shown in Table 3 and Table 4. The same names appear on these tables year after year, but their rankings change. The rankings among the last six companies show rather large changes. What stands out here is the trend to lower ranks of Burroughs and Japan NCR and the rise in rank of Mitsubishi Electric.

When the sales of the top 10 companies, which totaled 1,609,196,000,000 yen, are divided into those of domestic companies (six companies) and those of foreign-funded companies (four companies), the following is the result.

The domestic companies totaled sales of 1,093,579,000,000 yen and accounted for 68 percent.

The foreign-funded companies sales totaled 515,617,000,000 yen and accounted for 32 percent.

Table 2. Order and Sales of Top 10 Computer Companies for FY-80

1 順位	2 企業名	3 情報処理関連売上高	4 備考
1	5 富士通	382,094百万円	20
2	6 日本IBM	338,328	
3	7 日立	250,000	
4	8 日本電気	240,392	
5	9 東芝	80,300	16(約58,500百万円)
6	10 沖電気	78,793	17 (69,487百万円)
7	11 日本ユニバック	78,605	
8	12 三菱電機	62,000	
9	13 バロース	50,470	
10	14 日本NCR	48,214	18(不明)
総合計	売上高	1,609,196百万円	19

(Note) This ranking is compiled using the new sales computation standards for Toshiba, Oki Electric and Japan NCR. The figures in parentheses offered in the remark column are the sales on the old basis. The true data for Japan NCR are not known. This company also has greatly expanded its sales computation basis in the new account. Thus, the sales total on the old basis would not exceed these figures, and its position as last among these 10 companies would not be affected.

Key:

1. Rank
2. Name of company
3. Information processing related sales
4. Remarks
5. Fujitsu
6. Japan IBM
7. Hitachi
8. Nippon Electric
9. Toshiba
10. Oki Electric
11. Japan Univac
12. Mitsubishi Electric
13. Burroughs
14. Japan NCR
15. Total sales
16. (About 58.5 billion)
17. 69.487 billion yen
18. (Unknown)
19. 1,609 billion yen
20. 382.094 billion

The following are the rates of increase over the preceding year's sales for the domestic and foreign-funded companies.

Domestic companies: 20.2-percent increase

Foreign-funded companies: 5.9-percent increase

In this manner, the domestic companies showed a double-digit increase while the foreign-funded companies showed only a single-digit increase, indicative of the wide difference. These results are presented in graph form in Figure 1.

Table 3. Trends in Information Processing Related Area Sales of Top 10 Companies (Unit: 100 Million Yen)

企業名	51年度	52年度	53年度	54年度	55年度	56年度(見込み)
富士通	2,396	2,745	3,030	3,268	3,821	4,300
日本IBM	2,755	2,938	3,153	3,242	3,383	—
日立	1,420	1,600	1,900	2,160	2,500	2,850
日本電気	1,140	1,376	1,669	2,008	2,404	2,930
日本ユニバック	704	678	716	736	786	850
沖電気	483	444	479	628	788	887
バロース	435	450	470	546	505	—
三菱電機	320	380	450	530	620	730
東芝	592	591	430	504	803	950
日本NCR	343	369	343	343	482	—

(Note) Starting in FY-80, Toshiba, Oki and Japan NCR use the new computation basis.

Key to Table 3:

1. Name of company
2. FY-76
3. FY-77
4. FY-78
5. FY-79
6. FY-80
7. FY-81 (estimated)
8. Fujitsu
9. Japan IBM
10. Hitachi
11. Nippon Electric
12. Japan Univac
13. Oki Electric
14. Burroughs
15. Mitsubishi Electric
16. Toshiba
17. Japan NCR

Table 4. Changes in Rankings in Information Treatment Related Sales of Top 10 Companies

順位	51年度	52年度	53年度	54年度	55年度(注)
1	日本IBM	日本IBM	日本IBM	富士通	富士通(富士通)
2	富士通	富士通	富士通	日本IBM	日本IBM(日本IBM)
3	日立	日立	日立	日立	日立(日立)
4	日本電気	日本電気	日本電気	日本電気	日本電気(日本電気)
5	日本ユニバック	日本ユニバック	日本ユニバック	日本ユニバック	東芝(日本ユニバック)
6	東芝	東芝	沖電気	沖電気	沖電気(沖電気)
7	沖電気	バロース	バロース	バロース	日本ユニバック(三菱電機)
8	バロース	沖電気	三菱電機	三菱電機	三菱電機(東芝)
9	日本NCR	三菱電機	東芝	東芝	バロース(バロース)
10	三菱電機	日本NCR	日本NCR	日本NCR	日本NCR(日本NCR)

[Key on following page]

(Note) Data for Toshiba, Oki Electric and Japan NCR are on new basis. The rankings by the old computation basis are shown in parentheses.

Key to Table 4:

1. Rank
2. FY-76
3. FY-77
4. FY-78
5. FY-79
6. FY-80
7. (Note)
8. Japan IBM
9. Fujitsu
10. Hitachi
11. Nippon Electric
12. Japan Univac
13. Toshiba
14. Oki Electric
15. Burroughs
16. Japan NCR
17. Mitsubishi Electric

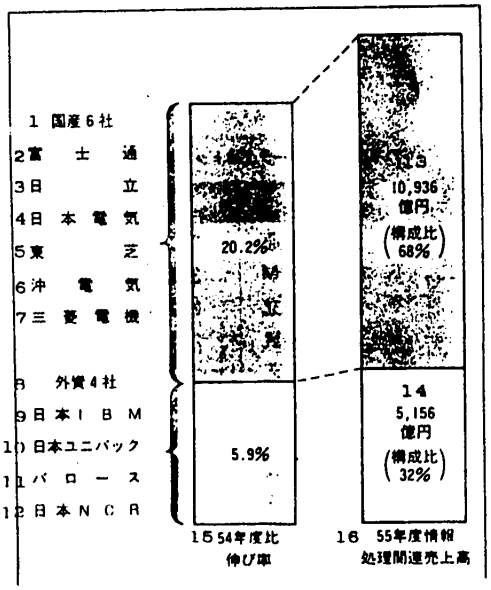


Figure 1. Rates of Increase in Sales of Domestic and Foreign-Funded Companies

Key to Figure 1:

1. Six domestic companies
2. Fujitsu
3. Hitachi
4. Nippon Electric
5. Toshiba
6. Oki Electric
7. Mitsubishi Electric
8. Four foreign companies
9. Japan IBM
10. Japan Univac
11. Burroughs
12. Japan NCR
13. 1,093,600,000,000 yen (68 percent of total)
14. 515.6 billion yen (32 percent of total)
15. Increase over FY-79
16. Information treatment related sales for FY-80

Differences in Extent of Sales Growth

The sales total, the rates of growth and the percentage of the sales total in the information processing area compared to the grand sales total of the entire company vary greatly between companies. We will first compare these companies according to total sales.

The changes in total sales in the information processing related area starting in FY-76 are shown in Figure 2. These companies can be clearly classified into three levels: top-ranking Fujitsu and Japan IBM, runner-up level companies Hitachi and Nippon Electric, and the ordinary level made up of the remaining six companies. At the same time, there have been great changes within each level, particularly during recent years. Where the margin in sales superiority of Fujitsu in FY-79 was scant, it grew to sizable proportion in FY-80. At the same time, Nippon Electric has been narrowing the gap between itself and Hitachi and has great potential for overtaking Hitachi in FY-81 and assuming second place in the domestic picture. In this respect, Nippon Electric has, in addition to the sales reported here, the personal computer area in the form of the PC-8000 (about 50,000 units in FY-80 estimated at total sales of 10-30 billion yen) which are computed in the electronic device department and not included in the above total, so that it can be said to have surpassed Hitachi in substance.

What will be watched with great interest in future is how Hitachi and Nippon Electric fare in total sales compared to Japan IBM.

Assigning a value of 100 to the sales of each company for FY-76, the trend of growth in information treatment related sales of each company is shown in Figure 3. This graph shows that each company has expanded greatly, and these trends can be put into the following three categories:

More than 2 times	Nippon Electric
1.5-2 times	Mitsubishi, Hitachi, Oki, Fujitsu
Less than 1.5 times	Japan NCR, Toshiba, Japan IBM, Burroughs, Japan Univac

Because Toshiba changed the ACOS computer business department to the Nichiden-Toshiba Information System (NTIS), which was set up by joint subscription with Nippon Electric in April 1978, its expansion in sales suffered considerably, but it has since enjoyed a very high rate of growth. Excluding Toshiba, the companies which have increased less than 1.5 times over the FY-76 level are all foreign-funded companies (four companies). These data show clearly the dull business of these foreign companies.

The August 1981 issue of COMPUTOPIA carried an article in the News Desk column entitled "Problems of Japan IBM in Expanding its Sales--Possibility of Falling to Fourth Rank Within a Year." This was an attempt to compare this company's sales in Japan obtained by subtracting the export value from the total information processing related sales. As seen in Figure 4 and Figure 5, this company has made only a single-digit gain over the past several years (the most recent information is that Japan IBM has set the goal of double-digit growth for FY-81). Viewing from the rate of growth of domestic makers, it can be said that it is only a matter of time before there will be great changes in the rankings at the upper level of the top 10 companies.

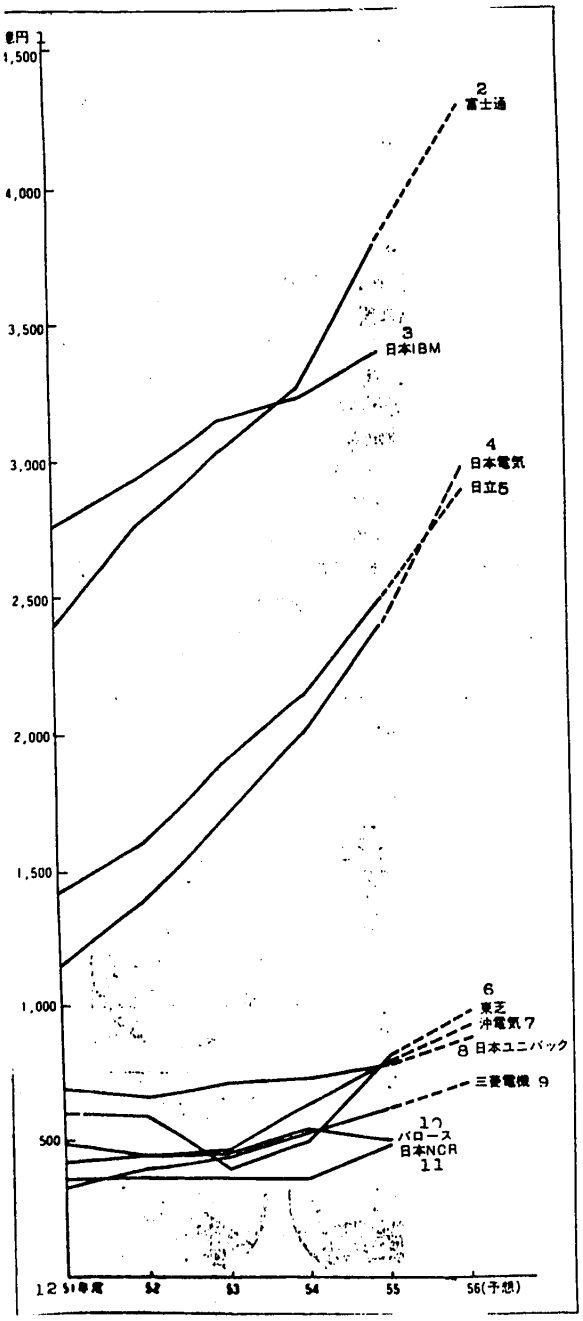


Figure 2. Trend in Information Treatment Sales of Top 10 Companies (Unit: 100 Million Yen)

[Key on following page]

Key to Figure 2:

1. 100 million yen
2. Fujitsu
3. Japan IBM
4. Nippon Electric
5. Hitachi
6. Toshiba
7. Oki Electric
8. Japan Univac
9. Mitsubishi Electric
10. Burroughs
11. Japan NCR
12. FY-76, 77, 78, 79, 80, 81 (estimated)

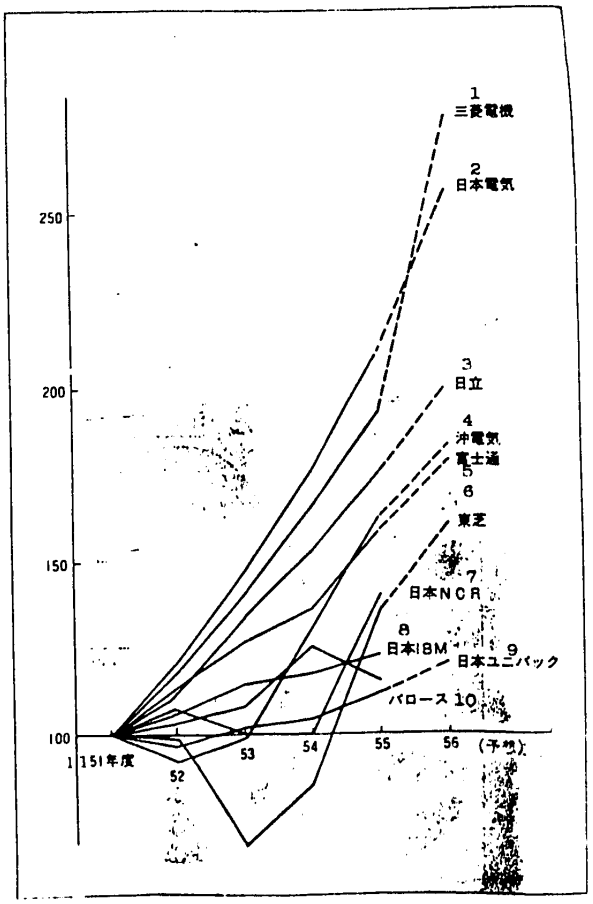


Figure 3. Expansion in Information Processing Sales Based on FY-76 Sales as 100

Key to Figure 3:

1. Mitsubishi Electric
2. Nippon Electric
3. Hitachi
4. Oki Electric
5. Fujitsu
6. Toshiba
7. Japan NCR
8. Japan IBM
9. Japan Univac
10. Burroughs
11. FY-76, 77, 78, 79, 80, 81 (estimated)

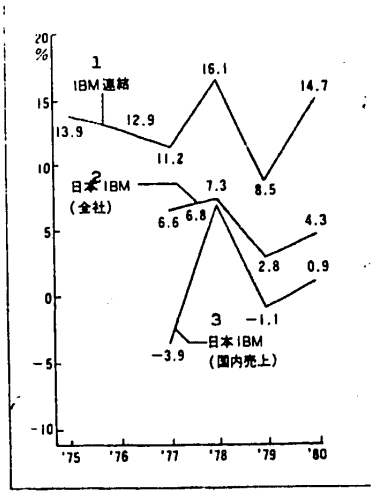


Figure 4. Trends in Growth Rate over Preceding Year in Sales
(Source: COMPUTOPIA (June 1981))

Key to Figure 4:
1. IBM combined
2. Japan IBM (entire company)
3. Japan IBM (domestic sales)

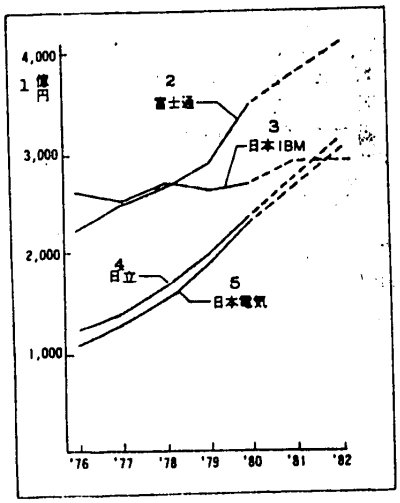


Figure 5. Domestic Sales of Computers (Computer Sales-Exports)

Key to Figure 5:
1. 100 million yen
2. Fujitsu
3. Japan IBM
4. Hitachi
5. Nippon Electric

The share of the total information treatment related sales of the 10 top companies for the different years is shown in the graph in Figure 6. There appears to be little change over the years, but the company which is clearly seen to be declining in its share of the market is Japan IBM.

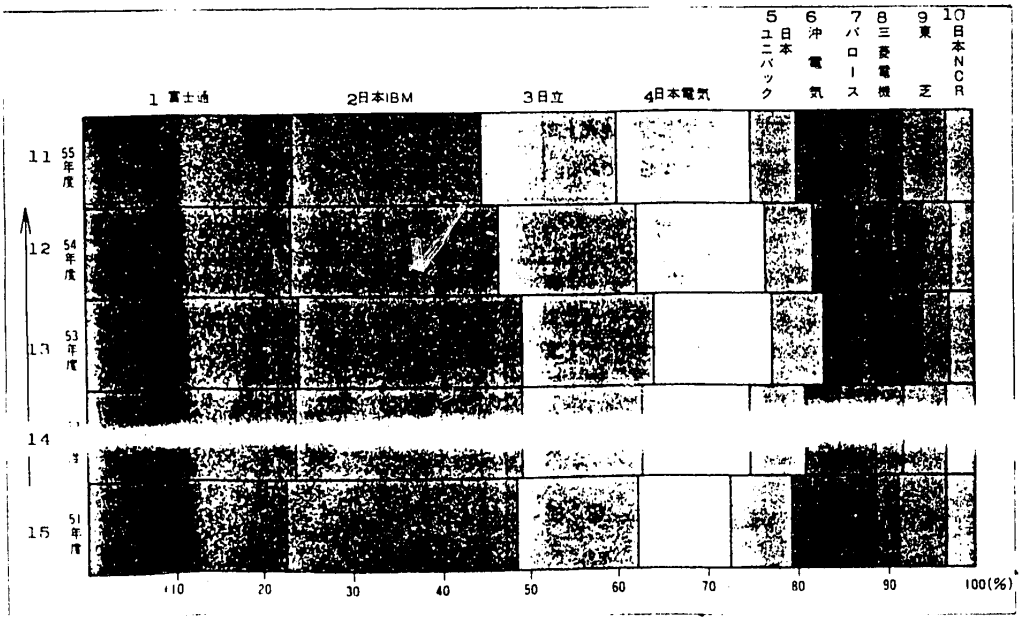


Figure 6. Trends in Share of Total Information Processing Related Sales by Year

Key:

1. Fujitsu
2. Japan IBM
3. Hitachi
4. Nippon Electric
5. Japan Univac
6. Oki Electric
7. Burroughs
8. Mitsubishi Electric
9. Toshiba
10. Japan NCR
11. FY-80
12. FY-79
13. FY-78
14. FY-77
15. FY-76

Fujitsu seems to have established an unchallenged position among the domestic makers. On the other hand, there are data predicting that Fujitsu may be surpassed by some other companies by 1985, and these data are offered here for reference. These are data put out by the U.S. Martin Simpson and Company, reported in ELECTRONICS magazine (14 July 1981). The data for Fujitsu, Hitachi and Nippon Electric from among the world's principal computer makers have been extracted and reproduced in Table 5. These figures project that Nippon Electric will run even with Fujitsu in 1984 and then will establish a 100-million-dollar difference in 1985.

Table 5. Predicted Sales of World's Main Computer Companies (For Three Japanese Companies)

メーカー名	1980	シェア	1981	シェア	1982	シェア	1983	シェア	1984	シェア	1985	シェア	成長率 1981/1980	成長率 1985/1980
富士通	1,446	2.3	1,600	2.2	1,800	2.1	2,000	2.1	2,200	2.0	2,500	1.9	10.7	11.5
日立														
日本電気														

出所：Martin Simpsom & Co.

Key to Table 5:

1. Name of maker
2. Share
3. Growth rate
4. Fujitsu
5. Hitachi
6. Nippon Electric
7. Source: Martin Simpson and Company

Business Dependence

The trends in growth rates in information processing related sales with respect to total company sales for the different companies are shown in Table 6. The three companies which altered the computation basis for their sales figures (Toshiba, Oki Electric and Japan NCR) showed large growth rates in 1980, which was only natural. No large changes are seen in the other companies. The percentage of the total sales accountable to the information processing related sales area during FY-80 is as shown in this table.

Table 6. Trends in Total Sales Taken Up by Information Processing Related Sales for the Different Companies

	51年度 (%)	52年度 (%)	53年度 (%)	54年度 (%)	55年度 (%)
富士通	73.1	70.8	68.7	65.2	65.7
日本IBM	100.0	100.0	100.0	100.0	100.0
日立	10.9	11.5	12.6	12.7	12.8
日本電気	23.5	25.6	27.1	27.9	26.9
日本ユニバック	100.0	100.0	100.0	100.0	100.0
沖電気	39.0	34.7	35.0	37.9	42.3(37.4)
バロース	100.0	100.0	100.0	100.0	100.0
三菱電機	4.6	4.8	4.8	4.9	5.1
東芝	6.1	5.6	3.7	3.5	5.2(3.8)
日本NCR	44.0	46.7	46.6	44.3	66.7(不明)

(Note) Figures in parentheses give ratio on previous computation base.

[Key on following page]

Key to Table 6:

1. FY-76	9. Nippon Electric
2. FY-77	10. Japan Univac
3. FY-78	11. Oki Electric
4. FY-79	12. Burroughs
5. FY-80	13. Mitsubishi Electric
6. Fujitsu	14. Toshiba
7. Japan IBM	15. Japan NCR
8. Hitachi	16. (Unknown)

Solely information processing business companies:	Japan IBM, Burroughs, Japan Univac
Quasi-single business:	Fujitsu, Japan NCR, Oki Electric
10-30 percent of business:	Hitachi, Nippon Electric
About 5 percent of business:	Toshiba, Mitsubishi Electric

Two companies, Oki Electric and Japan NCR, greatly enhanced the rate of their sales in the information processing related area with respect to the entire company's total sales volume during FY-81. Toshiba also has entered fifth rank among the top 10 companies, and it similarly enhanced its image as a company with high dependence on information processing related area sales.

Exports and Trends of Companies Not Ranked

Here we present the records of exports in computer related equipment by the major companies starting in FY-76 (see Figure 7).

Sales in the information processing related areas of companies other than the previously discussed top 10 are shown in Table 7 (please refer to the top 10 OA makers rankings in Part II on the Office Automation Industry for office equipment related items). It is seen that a considerable gulf exists between these companies and the lowest member of the top 10, Japan NCR, with total sales of 48.2 billion yen.

Basis for Estimating Information Processing Related Sales of 10 Computer Companies

Information processing related sales account for all the sales of Japan IBM, Japan Univac and Burroughs. The announced values in the information processing related area are given for the six domestic companies. Three companies--Toshiba, Oki Electric and Japan NCR--announced they had altered the basis of their sales tabulation for FY-80 (the breakdown for these companies was given in the computer section). Some companies include personal computer and numerically controlled equipment while others do not. Some companies report the account sales to JECC as their sales total, while others report only rental (or lease) income as their sales values. Because of these differences, there is some lack of uniformity. There are also differences in the designation of the fiscal year, and comparison on exactly the same basis is not possible. As a result, these are presented merely as reference material.

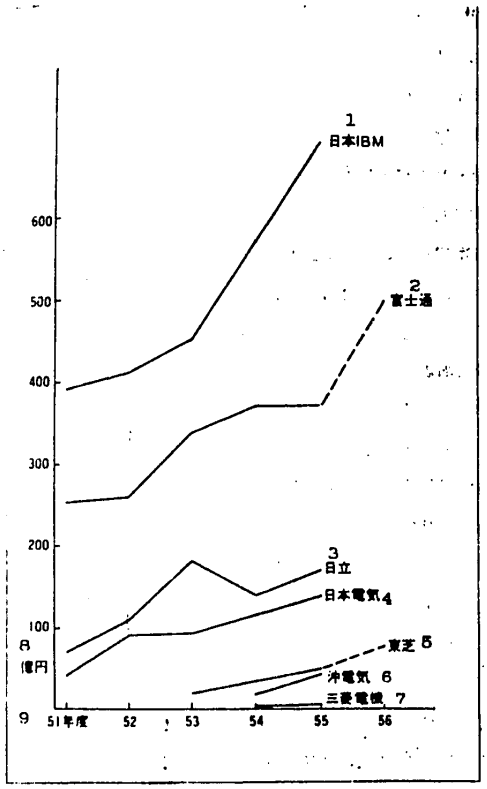


Figure 7. Record of Computer Related Exports of the Major Companies

(Note) Japan IBM covers January-December, domestic makers April-March.

Key:

1. Japan IBM
2. Fujitsu
3. Hitachi
4. Nippon Electric
5. Toshiba
6. Oki Electric
7. Mitsubishi Electric
8. 100 million yen
9. FY-76, 77, 78, 79, 80, 81

Sources of Sales Data for the Various Companies

Here are the sources for the EDP related sales for these various companies.

Japan IBM:	1980 (January-December) figures released by the company, others are estimated
Japan Univac:	Business report released by the company
Burroughs:	Estimated values (editorial section survey)
Six domestic companies:	Company stock report. Fujitsu and Nippon Electric from pertinent parts of sales report;

Hitachi, Toshiba, Mitsubishi Electric and Oki Electric from their announced sales total of their computer business departments.

Table 7

1 企業名	2 55年度コンピュータ関連売上高
3 日本オリベッティ	4 260億円
5 横河ヒューレット・パッカード	6 157億円 (全社売上高は465億円)
7 ＤＥＣ日本支社	8 115億円 (推定)
9 日本データ・ゼネラル	10 53億円 (54年10月～55年9月期の推定，今期は約70億円)
11 ソード電算機システム	12 48億円 (56年度90億円)

Key:
1. Name of company
2. Computer related sales for FY-80
3. Japan Olivetti
4. 26 billion yen
5. Yokogawa-Hewlett Packard
6. 15.7 billion yen (The combined sales of both companies total 46.5 billion yen.)
7. Japan branch of DEC
8. 11.5 billion yen (estimated)
9. Japan Data General
10. 5.3 billion yen (estimated for October 1979-September 1980, about 7 billion yen this year)
11. Sord Computer System
12. 4.8 billion yen (9 billion yen in FY-81)

The following are the fiscal years for the various companies.

Japan IBM, Burroughs:	January 1980-December 1980
Six domestic companies, Japan Univac:	April 1980-March 1981
Japan NCR:	December 1979-November 1980

Performance and Profile of Top 10 Companies

1. Fujitsu

This company attained top rank among the information processing related industries in FY-79, and expanded this difference from 2.6 billion yen to 43.8 billion yen in FY-80 to become undisputed number one. The sales in the different areas by this company and the items handled by its information processing area are given in Tables 8 and 9.

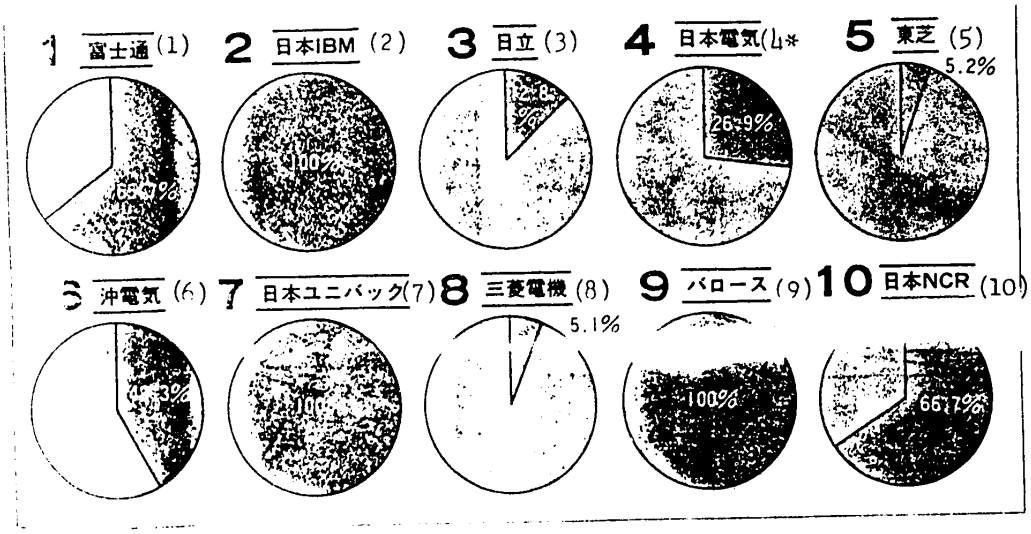


Figure 8. Fraction of Information Processing Relates Sales of Total Sales of Top 10 Companies During FY-80

Key to Figure 8:

1. Fujitsu
2. Japan IBM
3. Hitachi
4. Nippon Electric
5. Toshiba
6. Oki Electric
7. Japan Univac
8. Mitsubishi Electric
9. Burroughs
10. Japan NCR

Table 8. Sales of Different Areas of Fujitsu (Unit: Million Yen)

	部門	55年度(55年4月～56年3月)	54年度(54年4月～55年3月)	増減率
5	交換機器	48,908(8.0%)	46,696(9.3%)	4.7%
6	無線伝送装置	72,918(12.5%)	70,575(14.1%)	3.3%
7	情報処理機器	380,097(65.4%)	326,753(65.2%)	16.9%
8	電子部品	77,758(13.4%)	56,977(11.4%)	36.5%
9	合計	581,678(100.0%)	501,000(100.0%)	16.1%
10	内輸出高	81,636(14.0%)	79,422(15.9%)	2.8%

11 カッコ内は構成比率

Key to Table 8:

1. Category
2. FY-80 (Apr 80-Mar 81)
3. FY-79 (Apr 79-Mar 80)
4. Rate of increase
5. Switchboard
6. Radio communication equipment
7. Information processing equipment
8. Electronic parts
9. Total
10. Export value
11. Export value. Values in parentheses are constituent ratio.

Table 9. Breakdown of Information Processing Equipment

(1)

情報処理機器	電子計算機	汎用コンピュータ，オフィス・コンピュータ，ミニコンピュータ，通信制御装置(3)
	周辺装置	磁気装置（磁気ディスク装置，磁気テープ装置，磁気ドラム装置，大容量記憶システム），印刷装置（ラインプリンター，シリアルプリンター），読取・せん孔装置（紙テープ装置，紙カード装置），認識装置（光学文字読取装置，光学マーク読取装置），日本語装置，各種入出力装置 (5)
	端末装置	汎用端末装置(インテリジェント・ターミナル，ディスプレイ・ターミナル，データエントリー・システム，キーボードプリンター，ポータブル・ターミナル，カセット・ターミナル・システム等)，専用端末装置（金融端末，流通端末等），日本語電子タイプライター (7)
	応用装置	生産情報端末システム，定期券発行機，医療用機器，トータリゼータ・システム，各種表示装置等 (9)

Key:

1. Information processing equipment
2. Electronic calculators
3. General-use computer, office computer, minicomputer, communication control equipment
4. Peripheral equipment
5. Magnetic equipment (magnetic-disk facility, magnetic-tape facility, magnetic-drum facility, large-capacity memory system), printing facility (line printer, serial printer), reading, punching device (paper-tape device, paper-card device), recognition device (optical character reading device, optical mark reading device), Japanese character device, various input and output devices
6. Terminal equipment
7. General-use terminal equipment (intelligent terminal, display terminal, data entry system, keyboard printer portable terminal, cassette terminal system), special-use terminal facility (financial terminal, currency terminal), Japanese character electronic typewriter
8. Applied equipment
9. Production information terminal system, commuter ticket-issuing device, medical-use equipment, totalizer system, various display devices

This company, which celebrated 45 years of business on 20 June 1980, began expansion of its office automation business in 1980. Its aim is to expand its total information equipment industry centered on computers and including office equipment. In July 1980 it reorganized its electronic industry department's electronic business headquarters into the "Electronic Computer Business Headquarters" and "Office Business Headquarters." Then in July 1981 it abolished the two industrial departments--the communications industry department and the electronic industry

department--it had had for 20 years, and it is undertaking widespread organizational changes in order to cope with the OA age, with communications and electronics combined as a single system. Behind this reorganization is the realization that although this company has been able to overtake Japan IBM in sales, it will be difficult to maintain this sales edge without putting forth great effort on the OA front.

The main topics considered by this company from 1980 into 1981 are the following.

Change in president: At the business meeting of 26 March 1981, the decision was made to elevate Director Takuma Yamamoto to the post of president to replace former President Taiyu Kobayashi, who was informally appointed to be chairman with the representing right, and this change was made on 30 June. President Yamamoto, to whom the baton was passed by Chairman Kobayashi, who had succeeded in overtaking IBM, has plans to bring Fujitsu to the 1-trillion yen level by 1984-1985.

At the press conference during the presidential inauguration proceedings, President Kobayashi listed three jobs he left undone as "software unbundling reinforcement," "business policy for the OA age" and "revision in management systems." He meant that software sales need to be increased, that integration of communications and electronics is necessary to enhance the image of Fujitsu for the OA age and that the company needs to revise management system for the OA age. Coincident with the ascent of President Yamamoto, large organizational changes along such lines were put into effect.

OA market: The marketing of the OASYS 100 Japanese word processor in May 1980 was a specific sign of this company's switch from a data processing specialty company to an OA system integrated maker. In August 1981, the popular model OASYS 100 J costing 1.5 million yen was added to its list.

In another direction, this company marketed its 2-million-yen A4 20-second deciphering G III specification facsimile and switched its facsimile sales strategy from system oriented (high class) to popular low-priced units. This new organization for OA product sales and the office computers which it retained from the past is the OA Equipment Sales Promotion Headquarters (comprised of the Office Computer Sales Promotion Department, Facsimile Sales Promotion Department, OASYS Sales Promotion Department) which was established in June 1980. This new organization is the parent of the Fujitsu Office Equipment (100-percent funded by Fujitsu) which was established on 1 July 1981.

This new company plans to expand its list of 70 office computers, 117 OASYS and 43 facsimile retail outlets to 100, 200 and 80 outlets, respectively, in 1981.

Personal computers: In May 1981, the Semiconductor Industry Headquarters marketed the first personal computer, "FUJITSU MICRO 8," as the first Fujitsu entry in this field. The Personal Computer Sales Promotion Department of the Semiconductor Business Promotion Department took charge of the sales and plans to enter into single-sales type compartmented sales. At about the same time, the Parts Industry Headquarters initiated OEM production of the personal computer BUBCOM 80, based on the design specifications of the Systems Formulate Company. This company is also pushing plans to market personal computers

produced by its Computer Industry Headquarters and Office Industry Headquarters in the fall of 1981.

M series: The topmost machines were added to the M series general-use computer (May 1981). They are the M-380, a 15 MIPS machine, which has maximum 50 percent capacity over the IBM 3081, and the closely coupled multiprocessor version M-382. The processing capability is such that the M-380 has 2.1-2.5 times the capacity of the M-200, and the M-382 has 3.5-4.5 times the capacity of the M-200. These systems use two types of buffer memory between the CPU and main memory, and a new packaging method is used.

Software: To keep up with the arrival of the software era, this company has set out to divide the software department by type of industry and to establish subsidiary companies out of them. It is targeting to establish roughly 100 subsidiary companies and has established various software-related companies such as Fujitsu Financial Systems Engineering (December 1980), Fujitsu System Combined Laboratory (January 1981), Fujitsu Kyushu System Engineering (July 1981) and Fujitsu Kansai System Engineering (June 1981).

At the same time, it has started construction of a software building at its Numazu plant with completion targeted for March 1982. It plans to shift software technicians from its Kawasaki plant and set up a 1,300-man system.

Export: Its exports during 1980 totaled 37 billion yen. In April 1981 it estimated that its computer exports for FY-81 would come to 40 billion yen, but now the estimates appear destined to be widely exceeded and to reach 50 billion yen. In addition to its OEM export to the Amdahl Company of the United States and the Siemens Company of West Germany, sales activity of a TRW-Fujitsu joint venture with the TRW Company of the United States has started vigorously in FY-81.

The order situation for FACOM computers as of the end of FY-80 is shown in Table 10. This includes 1,424 units for export. They can be broken down into 618 units for North and South America, 376 units for Asia-Oceania and 430 units for the Near and Far East and Africa.

2. Japan IBM

Japan IBM has been making public a portion of its accounts since 1976, and its rate of growth in annual sales has remained in the single-digit range since that time. This was only 4.3 percent during FY-80. The rate of growth since FY-76 has remained at 22.8 percent. In the meantime, the entire IBM Corporation experienced a sales increase of 60.8 percent. During the same period, Nippon Electric increased sales by 2.19 times, Hitachi by 1.83 times and Fujitsu by 1.59 times. The June 1981 issue of this journal, COMPUTOPIA, discusses the problems of Japan IBM in its attempts to expand sales which the reader is offered as reference.

Japan IBM came down to this low level of growth somewhere along the line, but it announced that in 1981 it made preparations to increase its sales by at least 10 percent during FY-81. Between 1980 and 1981, the company put into effect various practices it had never used before in an effort to achieve this end. The main topics are discussed below.

Table 10. FACOM Order Situation (As of March 1981)
(Unit: unit)

区分 1	類 2. 56. 3末累計	355. 3末累計	455年度実績
5大型			
M-200	87	52	35
M-180	50	46	4
M-180II	154	104	50
6小計	291	202	89
7中型			
M-170F	66	—	66
M-160F	258	148	110
M-150F	254	133	121
M-140F	548	346	202
M-130F	634	448	186
8中小計	1,760	1,075	685
8小型			
V850	463	—	463
V830	1,705	1,078	627
6小計	2,168	1,078	1,090
9 オフコンシステム80	2,536	868	1,668
10 総計	30,812	26,328	4,484
11 JEFユーザー	456	150	306
OASYS 100	1,024	—	1,024

(Note) 1. The grand total includes types other than those listed here (230 series, minicomputer).

2. JEF users are not number of units but number of users.

Key:
1. Model
2. Cumulative total Mar 81
3. Cumulative total Mar 80
4. Total for FY-80
5. Large type
6. Subtotal
7. Medium type
8. Small type
9. Office computer system 80
10. Grand total
11. JEF user

Elasticity in price: The major activities of Japan IBM during 1980 are listed in Table 11. Japan IBM is undertaking a number of moves in order to revitalize its business, and these activities have been given added impetus in FY-81. The price strategy stands out. It is directed mainly at small computers and terminal devices which have high potential rates of growth. These include reductions for the 5256 printers (5-10 percent in rentals, 25-32 percent in sales), price reduction in the 4955 Model E of the minicomputer series 1 (about 16 percent in the purchase price) in January 1981; price reductions in the 3350 magnetic disk device, 3240 magnetic tape device, and 3203 printer (15-30 percent reduction) in February; 10-25 percent reduction in IBM System 34, 10 percent

Table 11. Business Breakdown of Japan IBM (On Jan-Dec Basis)
(Unit: 100 Million Yen)

	51年度	52年度	53年度	54年度	55年度
6総売上高	2,754.92	2,938.41	3,153.43	3,242.45	3,383.28
7課引前利益					
8		298.01	344.68	362.42	363.23
9輸出額	893.79	410.44	452.99	572.31	687.98
10売上高伸び率(対前年度比)		6.7%	7.3%	2.8%	4.3%

Key:
1. FY-76
2. FY-77
3. FY-78
4. FY-79
5. FY-80
6. Total sales
7. Profits before taxes
8. Profit after taxes
9. Export value
10. Sale expansion rate (ratio versus previous year)

reduction in the 5280 dispersed data system and 15-25 percent reduction in terminal devices such as the 5251 display device and reduced price for System 38 Model 3 (8-17 percent in rental, 9-17 percent reduction in purchase price) in June; and 20 percent price reduction in the 3250 image display system, 6-10 percent reduction in the 3370 information display system and 30 percent reduction in other options in July.

It also announced the application of volume discounts to purchases of the 5285/5286 program type data device, the 5288 program type control device, the 5281/5282 data device, the 5222 printer and the display writer as of June 1981. These were applied to the 5260 retail systems in September. Some of these are reductions solely for Japan IBM, which are lower than the prices on the American market, and this price strategy is contributing greatly to this company's efforts to achieve the double-digit increase in sales.

OA strategy: This company has decided to put major effort into the area of OA, where it was late in entering the field. It will engage in an all-out revolutionary change in its sales and development system. It announced on 4 August 1981: 1) the establishment of a new small computer and business equipment related product development department at its Fujizawa Laboratory, and 2) the establishment of a special team under the direct control of the president to study new sales methods, including the retail store mode. Because the product development system which is dictated by the main company in the United States does not match the Japanese market, the main American company gave the Japan subsidiary authority to develop its own products for the domestic market, which is why this new development system was started.

In addition, the change from direct sales to a retail store sales approach will be made with the GBG products. Plans call for studies during 1981 followed by an actual start in 1982. According to the most recent information, the Japan

GBG will be completely independent from the international GBG. It is planned to triple the GBG product sales by this move.

New products include a Japanese character type display writer (Japanese word processor), personal computer, data master and handling of the Canon facsimile and the Minolta coping machine.

Subsidiary companies, systematization: Japan IBM is eyeing a sales total exceeding 1 trillion yen in 5 years. The crux of this plan is the aforementioned retail outlet system, but there are also plans for establishing subsidiary companies. Although this is still in the talking stage, it is said that 14 subsidiary companies are being planned.

The first of these is System Development (100 million yen capital), which the government market development company established on 1 June 1981. One-year lease contracts for the government and municipal office market, major relaxation in penalties for lease cancellations and a special preferential treatment such as priority delivery system which will allow a short-term delivery to government offices will be put into effect by this new company.

While this item does not stand out, this company is greatly expanding its utilization of outside parties in its production area in order to improve its profitability. It is said that its Fujizawa plant already engages more than 500 firms. This is the so-called systematization.

In another direction, President Shiina said: "We will order software from outside companies in order to speed up product development" with respect to the software front. This company set up its "Software Center" (about 100 people) in Aoyama, Tokyo, centered on SE (system engineering) development in January 1981. This will be the strongpoint for software development to promote domestic projects to compete with domestic makers. It plans to expand this place to a 300-man system in 2 years. On the other hand, the software would become too expensive and lose the competitive edge if all software development were left in the hands of IBM people, so plans are underway to let out work to outside software houses. The greater part of the 14 subsidiary companies being planned seems to be in the software area.

There is no question but that the subsidiary companies and subcontracting companies surrounding Japan IBM, along with the above-mentioned sales outlets, will be greatly increased. These subsidiary companies have the special merit that they can be provided with flexibility not available to Japan IBM.

New movements: IBM of the United States and the Japan Telegraph and Telephone Public Corporation agreed to a cross-license agreement (technology information exchange) by which either party can utilize the other's patents free of charge. This involves technology interchange between giant companies each of which has more than 300,000 employees. It may be said that IBM squeezed itself between the Public Corporation and electrical companies closely associated to it up to then. President Opel [phonetic] of IBM announced that in 1981 the company will enter into the robot industry as well as product manufacture for the biomedical area.

Table 12. Japan IBM of 1980

Jan 80	大幅機構改革を実施，組織の簡素化を図る(データ・プロセッシングの販売組織をＤＰ営業企画統轄，ＤＰ営業推進，ＤＰ営業計画に再編) 経営諮問委員会設置（社外より牛場信彦外務省顧問，山本重信元通産省次官をメンバーに） 5280分散データシステム発表 1
Feb	5120コンピューティングシステム発表 稲垣平太郎会長退任を表明，相談役に就任（３月） 2
Mar	漢字情報処理サービス開始 4300と8100の価格をリースで５%，売却で３%値上げ 3
Apr	川崎事業所ビルの建設に着工（82／５月完成予定，投資額200億円） 4331モデル２発表 4
May	303Ｘ用大容量磁気ディスク装置3380を藤沢工場で国産化 野洲工場においてＩＣ生産を決定 5
Jun	システム／38出荷開始 6
Jul	中国事業開発部を新設（ＩＢＭ本社より中国向け事業を引き継ぐ） 7 欧文ワードプロセッサー「ＩＢＭディスプレイ ライタ システム」を発表 4341－２発表
Aug	堀場正人氏（前超ＬＳＩ技術研究組合専務理事），理事に就任 8
Sep	3081発表 9
Oct	3081の納入で抽選制を採用 日本的人事管理政策の導入へ 10

Key:

1--Put into effect large-scale organizational reform designed to simplify organization (divide the data processing sales organization into three and incorporate them into the DP Management Planning System, DP Business Promotion and the DP Business Planning)
--Established the business consultant committee (with company members such as Nobuhiko Ushiba of the Foreign Ministry and former Vice Minister Shigenobu Yamamoto of the Ministry of International Trade and Industry as members)
--Announced 5280 dispersed data system
2--Announced the 5120 cpmputing system
--Announced retirement of President Sanae Inagaki, who became a consultant (March)
3--Initiated Chinese character information processing service
--Raised lease cost 5 percent and sale price 3 percent on 4300 and 8100
4--Started construction of its Kawasaki business building (expected to be completed by May 1982, about 20 billion yen cost)
--Announced its 4331 Model 2

5--Domestic production of large-capacity magnetic disk device 3380 for use with 303X at the Fujizawa plant
--Decided to produce IC at its Yasu plant
6--Started delivery of System 38
7--Established China Business Development Department (take over Chinese business from main IBM)
--Announced Western language word processor "IBM display writer system"
--Announced 4341-2
8--Masato Nebashi (former managing director of VLSI technology research association) became a director
9--Announced 3081
10--Use of selective system for 3081 delivery
--Introduction of Japanese personnel management policy

3. Hitachi Limited

The companies which occupy the so-called second group, after top-ranking Fujitsu and Japan IBM, are Hitachi Limited and Nippon Electric. As shown in Table 3, there has been no change in the position of Hitachi as number 3 and Nippon Electric as number 4 for the past 5 years. FY-80 was this company's 70th anniversary. As one phase of the occasion's festivities, it is promoting an 80th decade product strategy theme policy in which all of its employees will participate.

Where OA is concerned, the "Office Automation System Promotion Department" has been added to the company organization, and full-fledged activities have been initiated. In the computer business department, the following policies have been established as the main items for FY-81: 1) reinforcing the product development system, 2) strengthening the business-SE (system engineering)-maintenance service system, 3) expanding sales of small computers and peripheral terminal equipment, 4) strengthening software products and 5) expanding exports. All-out development along these lines is planned. The following are the main topics which were observed from FY-80 through FY-81.

Presidential change: President Hirokichi Yoshiyama, who was in the presidency for 9 years after assuming the post in November 1971, will be 70 years old in December 1981, and it was decided to take this occasion to pass the baton to Vice President Katsushige Mita, who developed the computer business department to its present state.

When he was director of the Kanagawa plant, which produces computers and peripheral equipment, in 1971, he exerted great effort to switch over computer sales to rental of computers and put this business on the right track and thereby place the company's business in a good financial position, for which he is well known. This president said the attitude Hitachi will next strive for is "a combination of the American GE and IBM companies."

Oddly enough, President Mita was a classmate of Takuma Yamamoto, who ascended to the presidency of Fujitsu in June, at the Second Engineering Department of the University of Tokyo. While it is to be expected that an electronics man would be selected as president of a company such as Fujitsu, which is almost completely a computer-oriented company, the fact that Hitachi, which is an integrated

electrical equipment maker, breaking a past practice, selected a president who is a heavy electric engineer from the computer industry department is being noted with great interest both in Japan and abroad.

OA strategy: Hitachi thinks that the eighties will be an age in which the computer business will require all-out technology. Just as the computer business department borrows information from other business departments, it cannot do without the other departments' assistance in developing products using their computer technology. In other words, it will make it difficult to distinguish the borderlines between computer technology area and other various business areas.

This company takes the view that OA is a system that consists of overall technology with computer technology as the hub, and it established its OA System Promotion Headquarters as an integral part of the entire organization in August 1980. This is a section which assembles all companywide technology under the heading OA.

In FY-81 this company is marketing various types of OA equipment which Hitachi exhibited at its technology exhibit during FY-80. In May, it introduced the catchword "humanication" to consolidate the OA equipment image and also established a trademark. What is interesting here is the cooperative setup with other industries. There was the development (in April) of a movable-type Chinese character printer by a joint effort with Nippon Typewriter, the establishment (in June) of the "OA Research Group" for joint OA equipment research with the integrated commercial company Marubeni, the joint effort (in July) to establish common input mode for a Japanese word processor with Ricoh and the OA equipment sales cooperation with Pentel (in July), as examples.

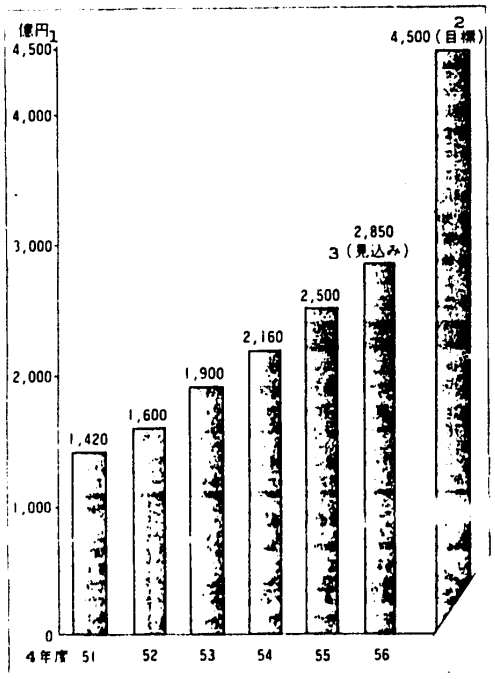


Figure 9. Trends in Total Computer Sales of Hitachi Limited

[Key on following page]

Key to Figure 9:
1. 100 million yen
2. (targeted)
3. (estimated)
4. FY-76, 77, 78, 79, 80, 81, 83

Software strategy: Hitachi recognizes that the top priority for an integrated electrical maker in the eighties will be "software development strength," and it is directing efforts to set up a system to implement this goal. As shown in Table 13, this company has already set up at least 15 affiliated companies in software related activities. More than half of these 15 companies, 8 companies, were established during the 2-year period, FY-80 and FY-81. There are plans for the Products Business Department to establish a solely OA software company in FY-81. It plans to increase software companies, according to product and business classifications.

Table 13. Software Development Companies of Hitachi

	資本金(億円)	設立年月	本社所在地	主要営業品目	
5 日立エンジニアリング	2	32／4	1 茨城県勝田市	原子力・火力発電システムなど	33
6 日本ビジネスコンサルタント	3	34／6	2 1 東京都渋谷区	情報処理，調査解析など	34
7 日立電子サービス	4	37／10	2 1 横浜市	コンピュータ，通信システム	35
8 日立ソフトウエアエンジニアリング	1	45／9	2 1 横浜市	コンピュータ用ソフト開発	36
9 日立コンピュータコンサルタント	0.5	53／9	2 2 東京都品川区	コンピュータ・システム設計	37
10 日立通信システム	0.5	53／9	2 3 横浜市	各種通信システムの設計開発	38
11 日立コントロールシステムズ	0.5	54／6	2 4 茨城県日立市	制御用コンピュータなど	39
12 日立マイクロコンピュータエンジニアリング	0.5	55 6	2 5 東京都小平市	マイコン，マイコン用製品	40
13 日立オートモティブエンジニアリング	0.5	55／6	2 6 茨城県勝田市	自動車用エレクトロニクス	41
14 日立コンピュータエンジニアリング	0.5	55／8	2 7 神奈川県藤野市	設計自動化システムなどの設計	42
15 日立京葉エンジニアリング	.0 5	55／10	2 8 千葉県習志野市	産業用ロボットなど	43
16 日立ビデオエンジニアリング	0.5	56／2	2 9 横浜市	ビデオ，音響，ホームエレクトロニクス	44
17 日立デバイスエンジニアリング	0.5	56 4	3 0 千葉県茂原市	電子部品の設計製造	45
18 日立計測エンジニアリング	0.5	56／4	3 1 茨城県勝田市	計測機，医用機器，理化学機器など	46
19 日立プロセスコンピュータエンジニアリング	0.5	56／7	3 2 茨城県日立市	制御用コンピュータなど	47

48 出所：日経産業新聞56年9月2日付

Key:
1. Capital (100 million yen)
2. Date established
3. Location
4. Main business items
5. Hitachi Engineering
6. Hitachi Business Consultant
7. Hitachi Electronic Service
8. Hitachi Software Engineering
9. Hitachi Communication System
10. Hitachi Control System
11. Hitachi Microcomputer Engineering
12. Hitachi Automotive Engineering
13. Hitachi Computer Engineering
14. Hitachi Keiyo Engineering
15. Hitachi Video Engineering
16. Hitachi Device Engineering
17. Hitachi Measurement Engineering
18. Hitachi Process Computer Engineering
19. Katsuta-shi, Ibaraki-ken
20. Shibuya-ku, Tokyo-to
21. Yokohama-shi
22. Shinagawa-ku, Tokyo-to

[Key continued on following page]

Key to Table 13 continued:

23. Yokohama-shi
24. Hitachi-shi, Ibaraki-ken
25. Kodaira-shi, Tokyo-to
26. Katsuta-shi, Ibaraki-ken
27. Hatano-shi, Kanagawa-ken
28. Narashino-shi, Chiba-ken
29. Yokohama-shi
30. Mohara-shi, Chiba-ken
31. Katsuta-shi, Ibaraki-ken
32. Hitachi-shi, Ibaraki-ken
33. Nuclear power, thermal power generation
34. Information processing survey analysis
35. Computer, communication systems
36. Software development for computers
37. Computer system design
38. Design development for communication systems
39. Control use computers
40. Microcomputer and its equipment
41. Electronics for automobile use
42. Design of automated design systems
43. Industrial robots
44. Video, audio, household electronics
45. Design and production of electronic parts
46. Measuring instruments, medical equipment, physico-chemical equipment
47. Control computers
48. Source: Nikkei Sangyo Shimbun, 2 September 1981

The reason for this is the rapid expansion in the application of semiconductor technology, which has made necessary software for each individual product. The microprocessor which has been the propulsion force has made the transition from an 8-bit unit to a 16-bit unit and will soon make the conversion to a 32-bit unit. This will make necessary software development on nearly the same level as a general use computer. In other words, the integrated electrical maker will be faced with gigantic software needs. Hitachi is shifting the nature of its business and moving into a software-centered company in anticipation of this period.

Export: As shown in Figure 7, Hitachi's computer exports are expanding in an orderly manner. In addition to the OEM export to the National Advanced Systems Company (NAS) of the United States, in 1980 it initiated OEM export to the BASF Company of West Germany and the Olivetti Company of Italy. The Hitachi machines handled by these three companies are as follows (the names in parentheses are the equivalent Hitachi designations):

NAS Company:	AS-9000 (M-200H), AS-7000 (M-180)
BASF Company:	BASF 7-80 (M-200H), BASF 7-70 (M-180), BASF 7-60 (M-170)
Olivetti Company:	OH 5500 (M-200H)

It is estimated that orders from these three companies will exceed 60 units by the end of 1981.

For example, it has been said that Olivetti is good for 20 units a year, and BASF for 40 units.

In another direction, this company is experiencing a sharp increase in computer orders from China and has become a maker with exclusive exports to that country. This export reached 44 units as of the end of December 1980. Very recently, the problem of Cocom (Coordinating Committee for Export Control) has arisen.

Mainframe computers: In February 1981 this company came out with its M-280H and the lower-level machine, the M-240H, to counter IBM's 3081. The 280H is a 12 MIPS, while the 240H is a 2 MIPS. What should be noted here is that it started to ask for payment for OS (operating system) for the first time and placed on the market 25 types of related software at one stroke.

4. Nippon Electric

This company's total sales for FY-80 reached 890 billion yen, and there is the possibility that the 1-trillion mark will be exceeded in FY-81. The catchphrase "C & C" (Computer and Communication) was coined for its 80th anniversary during FY-79, and since the catchphrase is so closely associated with NEC, NEC was almost identified with C & C in FY-80. There were also some alterations in its accounting system during FY-80. These included classifying sales according to different departments and changing the names of departments in the following manner:

Wired and wireless communication were combined into "communication equipment."
Electronic equipment became "computer and related electronic equipment."
Electronic devices remained as is.
Household electrical appliances became "home electronics and other equipment."

This journal has placed computers and other electronic equipment under the category information processing related sales. Names were changed, but types of products are still the same. (Table 15)

Table 15. Computers and Other Electronic Equipment Area Products

Computers and other electronic equipment:
General-use computers (ACOS series), office computers, control-use computers, various general-use and special-use terminals, Japanese word processors, communications control equipment, atmospheric pollution observation system, telemetry system, postal automation system, numerical control equipment, medical electronic equipment, data altering and renovating equipment, ultrasonic equipment.

The following are the main activities of this company from FY-79 into FY-80.

C & C: The C & C is not simply a catchphrase but the company set up an organ to promote business in the form of a "C & C System Headquarters" in July 1980. It has since been dissolved to make way for the "C & C Promotion Plan Office, " "C & C Business Systems Promotion Headquarters" and "C & C Public Systems Promotion Headquarters." There is need to coordinate, give support and systematize a number of industrial groups laterally in order to promote the C & C industry, and thus, the goal of the establishment of these organizations is to reinforce the capability.

In line with this, "Santopia" showrooms (24 sites) for supporting office computer sales which belong to the small-type information processing systems department were changed in nature into NEC comprehensive showrooms, to include products of

other departments such as facsimiles and personal computers. Eleven Santopia showrooms were set up during FY-81, and a nationwide system of 35 sites is established. Plans for a large-scale C & C comprehensive showroom (1,500 square meters) to be built at Hibiya in Tokyo were announced in July 1981, and preparations are underway for a public opening on 10 November.

Personal computer boom: While not included in the information processing related sales of this company, this company has become the gadgeteer of the personal computer boom for general business use. Every executive from Chairman Kobayashi and President Sekimoto down were mobilized for a massive demonstration on "the day the president used the computer." This was the opening wedge and was a beautiful demonstration that brought the businessmen's attention to personal computer, including executives of large personal computer users. The company also sponsored personal computer lectures on the radio starting in April 1981.

The PC-8000 of the microcomputer application department of the NEC semiconductor division was the showpiece of NEC personal computer, but 1981 saw this product being joined by a number of other companions. First of all, the Small Information Processing Systems Department, which handles office computer, put on the market business-use personal computer NEC System 20/25 in May 1981. This was followed by the appearance of the N5200 Model 05, which was marketed under the name of personal terminal by the Terminal Equipment Department in July. This resulted in the company's personal computer business becoming a three-equipment system involving three departments. In September 1981, the PC-8000 became part of the family joined by the higher-class model PC-8800 and the lower-class model PC-6000.

Table 14. Nippon Electric's Sales in Various Areas

	1 55年度 (55年4月-56年3月)			2 54年度 (54年4月-55年3月)			3 53年度 (53年4月-54年3月)		
	4 金額 (百万円)	5 構成比 (%)	6 対前年度増減率 (%)	4 金額 (百万円)	5 構成比 (%)	6 対前年度増減率 (%)	4 金額 (百万円)	5 構成比 (%)	6 対前年度増減率 (%)
7通信機器	348,288	39.0	+16.4	299,116	41.5	+ 5.7	283,106	46.0	+10.6
8コンピュータその他電子機器	240,392	26.9	+19.8	200,675	27.9	+20.3	166,851	27.1	+21.3
9電子デバイス	219,070	24.6	+31.3	166,842	23.2	+39.5	119,604	19.4	+16.5
10ホームエレクトロニクスその他	85,060	9.5	+60.1	53,140	7.4	+15.8	45,879	7.5	+13.6
11合計	892,810	100.0	+24.0	719,773	100.0	+17.0	615,440	100.0	+14.3

Key:
1. FY-80 (Apr 80-Mar 81)
2. FY-79 (Apr 79-Mar 80)
3. FY-78 (Apr 78-Mar 79)
4. Value (million yen)
5. Constituent ratio (%)
6. Increase over previous year (%)
7. Communication equipment
8. Computer and other electronic equipment
9. Electronic devices
10. Home electronics and other equipment
11. Total

Export: Nippon Electric has a goal of increasing its computer exports fivefold over than of FY-80, to 75 billion yen in FY-86. It newly established an "Information Processing Overseas Business Promotion Headquarters" in January 1981 as an organizational aid in this direction. Then, in April of this year, it newly set up an overseas department within its Information Processing Government and Municipal Office System Department, thereby consolidating its computer business directed at governmental offices in foreign countries. This company has put its strength into the computer front, where exports have been lagging in comparison with communications equipment, and at the same time, it is aiming at expanding and establishing its C & C concept and product sales overseas.

The company initiated export of its personal computer PC-8001 in March 1981. Then in July it entered into an agreement with the American Burroughs Company to supply production technology for the OCR.

Mechatronics: C & C, the coupling of computers and communications, corresponds to what other companies call OA, but during 1981 this company also began to take an all-out posture in the area called mechatronics. In 1981, it entered into a technological agreement for the purpose of joint development with the Japax Company, which is the top maker in the line of electric spark machine, and redirected strength to the car electronics area. In September 1981, it announced the new series NEDAC Z-30 in the area of NC (numerically controlled) equipment and immediately afterwards announced its entry into the industrial robot area. These mechatronics efforts feature the introduction of optical communications technology, which is this company's forte, in the various areas. In this respect, the company is considering mechatronics as one phase of the "C & C."

ACOS 250: The small general-use computer, ACOS 250 was put on the market in March 1979, shipments were started in July of the same year and shipments had totaled 1,000 units by June 1981. This company reinforced the performance of the ACOS 250 in July 1981 with the aim of greatly renewing the sales records. In addition, the ACOS 750 and 650 are introduced in June 1981 as new additions to the ACOS series.

In another direction, Nippon Electric is gradually shedding its designation NEAC: starting in May 1981 it changed the brand name of its office computer to NEC.

Software: QC (quality control) was introduced to improve quality and production of software, and this company hopes to double productivity within 2 years. This company, which started testing QC operation in the software area in November 1980, initiated QC operations in 60 businesses (about 4,000 people) in April 1981 and has embraced a new awareness revolution in what is called QC operations in the software age.

5. Toshiba

While the accounting standards may have been changed, Toshiba's rise from ninth rank in sales during 1978 and 1979 to fifth rank has become a major topic of interest. The company had been experiencing sales difficulties, which peaked

in FY-76, and the present rise is indicative of the situation that its new system centered on OA industries is on the right track. The company is targeting sales of 95 billion yen in FY-81 and 110 billion yen in FY-82, and it started construction of a new plant for peripheral equipment (within the Oume plant) in June 1981 as part of the plan to achieve these sales. It is also putting considerable strength into exports and has plans for 15-20 billion yen exports during FY-82.

The FY-80 sales record for various products and the targeted goals for FY-81 which the company released at the start of the year included the following items.

Office computer: 4,400 units produced in FY-80; cumulative total to date: 24,000 units; targeted for FY-81: 6,300 units.

Minicomputer: 1,070 units (26.7 billion yen) during FY-80; cumulative: 4,920 units; targeted for FY-81: 1,300 units.

Peripheral equipment targeted for FY-81: magnetic disks: 8,000 units; printers: 16,000 units; floppy-disk facilities: 40,000 units.

Japanese word processors: 1,040 units sold in FY-81; cumulative total: 1,270 units; targeted for FY-81: 2,100 units.

The following are the major topics being considered from FY-80 through FY-81.

Expansion of the OA business system: The Office Automation Business Plan Office established in April 1979 was expanded to the Office Automation General Department in November 1980 and was further expanded to the "Office Automation Business Department" as of 1 October 1981. In addition to the planning, proposing and business supporting function of the OA business strategy, the OA equipment and system sales functions which the Electric Communication Business Department (such as facsimiles), Electronic Computer Business Department (such as office computer) and the Instrument and Equipment Business Department (such as ordinary paper reproduction equipment) had formerly handled were transferred and systematized in this new department.

This newly established "Office Automation Business Department" encompasses 15 departments including 8 sales departments, such as office automation accounting department, office automation plans department, office automation business department, office automation sales promotion department, office automation system sales department, first facsimile sales department, second facsimile sales department, office computer sales department, business personal computer sales department, word processors sales department, personal computer sales department, copier sales department, office automation system technology department, office computer technology department and office automation service department.

OA equipment: These instruments include PPC (plain paper copier), word processors, facsimiles, office computer, personal computer and button telephones. Among these instruments are the Japanese word processors JW-10 and JW-5 which have the confidence and record of a cleanup batter. These are followed in the

number 5 batting position by the business-use personal computer BP-100 announced in October 1980 and marketed in January 1981, and the low-cost personal computer "Pasopia" announced on 28 September 1981 by the OA Business Department. The company is also reinforcing these OA equipment sales network. A sales agreement was reached with Kokuyo in June 1981. Kokuyo has about 6,500 sales outlets over the entire country, of which 300 will be handling Toshiba OA equipment in 1981, according to present plans. According to this company, there are 27 sales outlets for office computer, 23 outlets for word processors, 27 outlets for BP-100 personal computer and 9 outlets for data entry equipment which represent the company in sales (special sales stores) as of June 1981. Twelve Toshiba household electric appliance service stations (260 sites) and 13,000 sales stores (Toshiba stores), under the umbrella will be mobilized for the sales of the new personal computer "Pasopia," and mass production and mass sales development are expected momentarily. The company has already started utilizing the household electrical appliances sales network for the sales of PPC (plain paper copier) since the spring of 1980.

Export: Exports of the company's computer related products during FY-78 did not exceed 2 billion yen, but then they sharply increased to 4.6 billion in FY-80 and 8 billion in FY-81. It initiated exports of business-use personal computer and word processors to Europe in June 1981. Since the summer of 1980, it has been exporting facsimiles to Europe in the form of OEM through the ITT (International Telephone and Telegraph) affiliate. Only the medium-speed models were exported initially, but OEM export of high-speed facsimiles to the West German SEL (Standard Electric Lorentz) Company was initiated in March 1981. Other OEM exports include the supply of Winchester-type medium-capacity magnetic disk devices to the American Ampex Company which started at the end of 1980.

Toshiba America initiated retail sales of the word processor EW 100 and the personal computer T 200/T 250 in July 1981 through an OA equipment outlet in Costa Mesa in the state of California, followed by another outlet at Westwood in October.

Dispersed processing: Product strategy regarding computers is based on "dispersed processing." The TOSBAC DP/6, which came out just before the IBM 8100 announcement, was followed in August 1980 by the DP/8, and then the appearance on the market of the small-scale dispersed processing system with Chinese character processing capability in September 1981. The company's cumulative record of delivery for the dispersed processing system came to 1,260 systems by the end of September 1981. Some large customers are Esso Standard Oil for 37 systems, Nada Kobe Livelihood Cooperative Association for 13 systems, Ministry of Construction for 24 systems, Japan Highway Association for 27 systems, Tokyu Construction for 2 systems and Alps Electric for 11 systems. The company has placed improvement in cost performance through sales of dispersed processing as one phase of its comprehensive OA.

Minicomputer: The company has expanded its 32-bit family minicomputers. The lowest member 7/60 of the TOSBAC series 7/70 which first appeared in January 1978 was put on the market in November 1980, and the top level 7/70 E of the 7/70 series appeared in June 1981. These were followed by the 1.2 MIPS TOSBAC Data System 600 using a 32-bit high-speed computing device which was put on the market as a science and technology use computer. Furthermore, the 16-bit family

minicomputer includes the 2.1 MIPS and the TOSBAC series 7 Model 70 E which has the highest domestic performance (September 1981). The reinforcement of the lineup in high-performance minicomputers has been an eyecatching trend, particularly during 1981.

6. Oki Electric

Oki Electric Industries saw its business take a turn for the worse starting about March 1977, but President Masao Miyake, who came to this company from the Nippon Telegraph and Telephone Public Corporation in 1978, took such reconstruction measures as suspending operations of the Shinagawa plant and retreating from NC devices to eliminate unprofitable plants and departments and cutting back personnel by 1,500, and restructuring the organization to reinforce sales activities. The results, together with the conservation of power boom, caused a turnaround in the business by March 1980, and the greatest profit of all time was realized.

Sales were further increased in FY-80, totaling 186 billion yen. This company, which had been involved only in sales to government and municipal offices, is reinforcing sales to a large number of unspecified users. The OA boom which came at an opportune moment has been a good wind which expanded this company's commercial market, and the activity in the information processing equipment area is particularly eyecatching.

The sales breakdown for this company in the various areas is shown in Table 16. In FY-80 measurement and control equipment was added to its electronic busines equipment, and this is reported under the category of information processing equipment sales. Consequently, the sales reported under information processing related heading in Table 2 breaks down into 69.5 billion yen for electronic business equipment and 9.3 billion for measurement and control equipment. On the other hand, the increase in the measurement and control equipment area was only 300 million yen, and the increase was substantially due to electronic business equipment such as the online terminal equipment for financial institutions and OA equipment (personal computer, word processors) and new printer for export.

The company is anticipating expansion in consumer demand for its OA equipment from the private sector during FY-81, and it expects to amass total sales of 88.7 billion yen, or an increase of 13 percent over the previous year. The reason the company's rate of growth is so low is that it does not put out a general use computer, and its sales in office computer were initiated later than those of other companies.

The main activities of this company from FY-80 through FY-81 are the following.

OA policy: In the reorganizational change of 11 December 1980, a new sole OA department was created. That is to say, an "OA System Business Promotion Department" was newly created under the information processing industry department. This change was along the lines of the SUB (strategy business unit) which was adopted in FY-79. It consisted of the establishment of the OA system, which had been included under the computer business department, as an independent OA system as a SUB unit. At the same time, the second electronic computer sales department of the information processing business department was renamed the "OA system sales department," and a system with emphasis on OA was established.

Table 16. Sales of Oki Electric Industries in Various Areas
(Unit: Million Yen)

1 期別 / 4 機種別 / 5 区分	2 54年度 (昭和54年4月-昭和55年3月) 6 金額	7 月平均	8 構成比	3 55年度 (昭和55年4月-昭和56年3月) 金額	月平均	構成比
9 交換機・電話機	38,609	3,218	23%	40,837	3,403	22%
10 無線通信機	13,048	1,087	8	15,596	1,300	8
11 測定・制御機	9,038	753	5	9,306	775	5
12 電子事務機	62,808	5,234	38	69,487	5,790	37
13 部品	19,202	1,600	12	25,356	2,113	14
14 その他	2,999	250	2	4,471	373	3
15 工事・保守サービス	19,797	1,650	12	21,022	1,752	11
計	165,501	13,792	100	186,075	16,506	100

(Note) 1. The monetary sum represents the sales value.
2. Exports account for 12 percent of both the FY-80 and FY-79 sales. The principal export targets are North America, Middle East, Western Europe and Southeast Asia, and the major exports are data terminal equipment, switchboard and electronic parts.

Key:
1. Period
2. FY-79 (Apr 79-Mar 80)
3. FY-80 (Apr 80-Mar 81)
4. Type of equipment
5. Classification
6. Sales total
7. Monthly average
8. Constituent ratio
9. Switchboard, telephone equipment
10. Radio transmission equipment
11. Measurement, control equipment
12. Electronic business equipment
13. Parts
14. Other equipment
15. Installation and maintenance service

In addition, Oki Communication Equipment Sales underwent a change in company name to "Oki Electric Sales" as of 20 June 1981 in order to develop the strong points of OA product sales. This company in the past had conducted sales of Oki's OA equipment such as facsimiles, word processors and personal computer type OA equipment, and this change in name was an opportunity to intensify the effort.

Personal computer as main line of OA: Oki Electric considers OA in a different light from large main-frame computer makers which think OA centering on host computer. More specifically, it considers the personal computer to be the nucleus of its OA. That is why this company takes the attitude that these are products to be handled by the computer business department, while semiconductor and household electric appliance business departments handle personal computers in other companies. The personal computer which is the heart of this OA is the "IF 800" which was first marketed in May 1980. Delivery was started in October 1980, and sales are being conducted through sales companies which have signed sales contracts with five designated sales outlets (wholesale companies).

Software supply is being promoted together with this systematization in business pathways. A software registry system "AP Bank" has been established for software for the IF 800. Package software of very high general-use capability will be distributed through these wholesale houses. At the same time, sales of CP/M which is an OS of the Microsoft Company was initiated in the spring of 1981.

Export: Export of printers is taking place in orderly manner. It was announced that export of teleprinters and small printers totaled 5.8 billion in FY-80 alone. The sale of printers is undergoing a sharp increase in demand with the popularity of personal computer and terminal equipment, and this company is planning on business of 7 billion yen in FY-81 and 10 billion yen in FY-82. Of special note is the small printer Oki Typer Model 5200 (dot matrix mode, 80 characters/second). This is sold under the brand name "Microline 80" in the United States and Europe. Export of a large OEM export of this printer to the large computer maker Sperry Univac Company was initiated in 1980. The company anticipates exports will go up to 30,000-40,000 units in 3-4 years.

In addition, Oki started exporting facsimiles to the United States in FY-81. These are OEM exports to the 3M Company of the United States, and the contract calls for something slightly under 10,000 units over the next 2 years (OEM version of the heat-sensitive high-speed facsimile OKIFAX 7800). The company also has signed contracts with 4 companies, including the Muirhead Company of Britain to supply about 40,000 units over the next three years.

New products: The intelligent terminal "OKITAC-100 family" (six types) announced on 18 September 1981 which incorporates the 16-bit microcomputer may become the next hit product. It can be used as an online terminal for personal computer use or cluster terminal use. The cost ranges as low as 950,000 to 15 million yen, which is evoking great interest, and Oki is coming to be called the terminal people. The knowhow of this company in the area of man-machine interface has never been more evident.

The development of a heat-sensitive type small printer (announced in June 1981) which can print at the high speed of 2 milliseconds per line is attracting great interest in the area of printers.

Super LSI: The VLSI production plant "Miyazaki Oki Electric" constructed in Miyazaki Prefecture initiated operation in August 1981. Production of the 64-K RAM was advanced from the expected October to September.

7. Japan Univac

This company, which is targeting annual sales in excess of 100 billion yen in FY-83, had sales of 88.4 billion yen in FY-80 (2.5-percent increase over the preceding year) and residual sales agreements of 153.2 billion yen (6.8-percent increase over previous year). The profit-loss picture was essentially as projected at the start of the year, with sales totaling 78.65 billion yen (6.8-percent increase over preceding year), working profit of 2.425 billion yen (23.8-percent decrease from previous year) and profit after taxes of 1.43 billion yen (4.7-percent increase over preceding year). The reason for the decrease in the working profit is that the company shifted its emphasis from normal sales to rental sales in order to improve the company's financial structure, but in the process the company experienced an increase in cost due to high interest rate.

Table 17. Sales Groups Which Are the Components of Information Processing Equipmemt Sales

1	測機・制御機	2 計測機	通信用測定器，工業用測定装置，気象測定装置，地象測定装置，海象測定装置 7
		3. 音波応用機器	ソーナー，測深機，流量・流速・水位測定装置，遠隔誘導起爆装置 8
		4 電波応用機器	レーダー装置（船舶用，陸上用，気象用，港湾用），ロラン装置，ビーコン装置 9
		5 制御機器	テレメータ・テレコントロール（水道管理用，農業用水管理用，道路管理用，ダム・河川管理用，公害監視用，通信用，管制用，その他），船舶自動化装置，ビル管理システム 10
6	電子事務機		電子計算機システム（OKITAC－System50, OKITAC－System 9, OKITAC－4300, OKITAC－COSMOシリーズ，OUK90シリーズ他），周辺装置，データ作成機，データ通信システム，オンライン端末装置（汎用オンライン・ターミナル，バンキング・ターミナル，ＴＳＳ用ターミナル，ＰＯＳターミナル他），パーソナル・コンピュータ，ワードプロセッサー，医療端末装置，漢字装置，ソフトウエア 11

Key:

1. Measurement, control equipment
2. Measurement equipment
3. Acoustical equipment
4. Radio equipment
5. Control equipment
6. Electronic business equipment
7. Measurement equipment for communication use, measurement equipment for industrial use, meteorological equipment, geosurvey equipment, marine measurement equipment
8. Sonar, depth finders; flow rate, flow velocity, water-level measurement equipment; remote-control blasting equipment
9. Radar equipment (for ships, land, weather, harbor use), LORAN equipment, beacon equipment
10. Telemetry-telecontrol (water main control, agricultural water control, highway control, dam and river control, pollution monitors, communication control use, others), automated sailing equipment, bill control system
11. Electronic computing system (OKITAC-System 50, OKITAC-System 9, OKITAC-4300, OKITAC-COSMO series, OUK 90 series and others), peripheral equipment, data-making equipment, data communication system, online terminal equipment, (general-use online terminal, banking terminal, TSS use terminal, POS terminal and others) personal computer, word processors, medical terminal equipment, Chinese character equipment, software

Sales totaling 85 billion yen, working profit of 3.2 billion yen and profit after taxes of 1.4 billion yen are expected for FY-81.

The major activities of this company from FY-80 through FY-81 are the following.

Organization innovation: As of 1 April 1981, the company introduced an organizational change that consists of abolishing the headquarters system and switching to the Business Headquarter System based on the types of products lines. This is a stepping stone to the expected realization of 100-billion-yen sales in FY-83. The three newly established departments are: the first Business Control Department (in charge of large systems), the Second Business Control Department (in charge of medium and small general-use computers and complex systems such as POS and graphic systems and systems development) and the Customer Business Department (in charge of customer service). There are in addition the Comprehensive Plans Department (establishment of long-term and comprehensive business plans) and the Technology Plan Department (long-term technology development plan), which are newly established organs to establish the company strategy along these lines.

The reason for the establishment of the business headquarters system is to improve the quality in customer service by consolidating all activities, stocking, sales and maintenance service in one business headquarters and thereby clarifying where the responsibility lies. The reason for the establishment of the Second Business Control Department is to expand in the future the sales volume of the Department's products to the level of the main frame system (currently one-third).

Advance into OA: In the midst of consistent lateness in advance into the OA area on the part of the foreign-funded businesses, this company sponsored an OA symposium in Tokyo and Osaka during November 1980 at which time it introduced its concepts regarding OA, which it called IOS (intelligent office systems). Then, in May 1981, preceded by a business show, it announced its initial product based on the IOS concept, the Japanese-character word processor UW-10, the personal computer UP10E Model 10/20 and the UP10Q.

At the same time, it put on the market as related products the multiple-purpose office computer UNIVAC Series 8 Model 40 Chinese character in May. Still later, in July 1981, it opened its OA showroom at Shibuya in Tokyo. The company also calls this room an "office school" where it offers personal computer basic courses and instructional courses in the operation of word processors.

While the company was making direct sales of its OA equipment, it decided to adopt the sales-outlet mode just as the other Japanese makers in order to increase its sales. The first member the company tries to use is the Electronic Computational Center which uses the Univac-made computer. These will be organized as sales outlets for the sale of personal computer and Japanese word processors.

Fulfillment of product series: This company is promoting other product lines in addition to OA. It added its small computer OUK Series 80 and Chinese-character related products such as Chinese-character office computer during 1980. In August 1980, it introduced its POS system and marketed its UNIPOS 6000. Another outstanding product is its graphic display UNIVAC AGS 2000 series (August 1980).

Table 18. Breakdown of Sales of Japan Univac
(Unit: 1,000 Yen)

	区分	2 54年度 (昭和54年4月～昭和55年3月) 4繰越売約残金額	5売約高金額	7売上高金額	8売約残金額	6売約高金額	売上高金額	8売約残金額
9	電子計算機の賃貸	115,792,092	56,192,140	44,169,772 (3,680,814)	127,814,460	56,083,453	47,013,960 (3,917,830)	136,883,953
10	電子計算機の販売	6,834,938	19,601,488	18,604,468 (1,550,372)	7,831,958	20,657,580	19,985,509 (1,665,459)	8,504,029
11	保守サービス及び計算請負等	8,125,820	10,449,324	10,832,782 (902,732)	7,742,362	11,655,498	11,605,978 (967,165)	7,791,882
12	合計	130,752,850	86,242,952	73,607,022 (6,133,918)	143,388,780	88,396,531	78,605,447 (6,550,454)	153,179,864

(Note) The values in parentheses are average monthly sales. Electronic computer sales include quota sales of 20.637 million yen in FY-79 and 10.401 million yen in FY-81. Total sales include quota sales of 456.239 million yen in FY-79 and 182.537 million yen in FY-80.

Key to Table 18:
1. Classification
2. FY-79 (Apr 79-Mar 80)
3. FY-80 (Apr 80-Mar 81)
4. Carry-forward sales agreements
5. Monetary value
6. Total sales agreement
7. Total sales
8. Residual sales agreements
9. Electronic computer costs
10. Electronic computer sales
11. Maintenance service and computing contracts
12. Total

Table 19. Sales by Areas of Japan Univac
(Unit: 1,000 Yen)

期間 / 地区		3 54年度 (昭和54年4月～昭和55年3月) 売上高	構成比	55年度 (昭和55年4月～昭和56年3月) 売上高	構成比
公庁	7	7,038,122	9.5%	7,548,829	9.6%
銀・証券	8	32,378,249	44.0	33,404,870	42.5
製造工業	9	23,381,154	31.8	24,087,985	30.7
繊	10	7,635,097	10.4	7,809,895	9.9
その他	11	3,174,400	4.3	5,753,868	7.3
合計	12	73,607,022	100.0	78,605,447	100.0

Key to Table 19:
1. Sales area
2. Period
3. FY-79 (Apr 79-Mar 80)
4. FY-80 (Apr 80-Mar 81)
5. Total sales
6. Constituent ratio
7. Government and municipal offices
8. Financial and securities
9. Manufacturing industry
10. Business
11. Others
12. Total

This company put strength into the graphics area even at an early stage, and CAD [computer aided design] and business graphics are the most advanced industries. The business graphics displayed at its May 1981 business show were an excellent demonstration and drew much attention.

In the area of general-use computers, the multiprocessor system UNIVAC 1100/62E (July 1980) and a new model 61E of the UNIVAC 1100/60 bank-card system (October 1980) were announced.

Self-developed products: As one phase of the diversification in products, self-developed products of Japan Univac made their debut in 1981. The first to appear was the information control terminal system, SF-7000 Shopfloor Terminal System, for working sites, which was announced by the composite system business section of the Second Industrial Control Department on 11 July 1981. This product was developed with the confidence of export to the American Univac Company.

At the same time, it announced its UNIVAC Model 65 which is a general-use computer in September 1981.

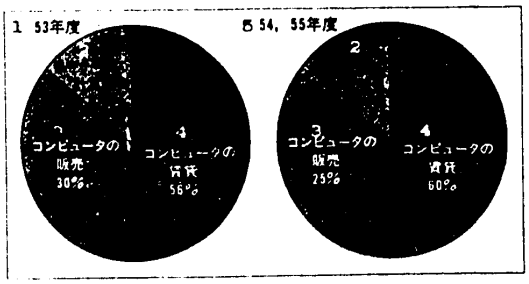


Figure 10. Sales Makeup Ratio for Japan Univac

Key:
1. FY-78
2. Maintenance service, computer contracts--percent
3. Computer sales--percent
4. Computer lease--percent
5. FY-79, FY-80

Manufacturing industry market: The company announced its new production control use system package UNIS based on the MRP method in September 1979, and it expanded the use of the UNIS so that it can be applied to the 1100, 90, 7, 80, 8 and all the other computers handled by the company. In addition, it promoted CAD/CAM centered on the AGS 2000 and is nurturing its factory automation as one of its pillars through self-developed equipment such as the above-mentioned industrial site information management terminal.

Programless software: In May 1981 the company marketed the so-called OA-use software named the "MAPPER-1100" which is said to be able to perform information processing without the construction of a program. It can activate the functions of a large computer without programming through a dialogue mode. The English numeral Kana version release was slated for August and the Kanji version in January 1982. A new concept called electronic filing is the base for this

system, and Univac is placing all its bets on this software as the basic image in OA.

8. Mitsubishi Electric

Mitsubishi Electric is a company which is definitely on the way up to a higher rank in information processing area sales. Of the 10 companies, 3 companies included more products in their accounting of information processing area sales, but this company maintained its 8th rank through FY-80 just as in FY-79. Based on past methods of accounting, this company would have been in seventh rank. The magnitude of the rate of increase in sales of this company can be seen by a look at Figure 3. Although the sales of information processing area in total sales was only 5.1 percent, placing this company at the lowest rate along with Toshiba, its computer business has continued to shine with the fanfare of the OA age.

The following are the major activities of this company from FY-80 through FY-81.

OA policy: In June 1980 an office automation promotion committee was established which set up specific policies for OA business promotion by which means the OA policy of this company was initiated. According to a company survey, the OA related market scale will grow to 600 billion yen by 1985. Assuming this company is able to pick up a 10-percent share of this market, it will amount to 60 billion yen, so investment in this area will be profitable according to the decision that was made.

Emphasis is placed on office computers and facsimiles where OA equipment is concerned, but a test-produced Japanese word processor was displayed at the Information Processing Association's exhibition in October 1980 which appeared on the market in April 1981 as the Mitsubishi Japanese word processor M8510. The company also established its personal computer project section in January 1981 and announced its entry into the personal computer market. Its entry was displayed at the business show in May, and the project section was changed to a personal computer department during the same month. According to this company, its formal entry into the personal computer sales area will take place in the spring of 1982 in the form of a business-use personal computer with 8086 family 16-bit CPU and main memory of 128/256 KB class.

The company set up three direct sales shops during FY-81 and has acquired special contract sales stores for office computer, household electrical appliances, office equipment and stationery. It also started purchase of application programs from American software houses in the spring of 1981.

The company has set up an "OA Plaza" which is a showroom for all OA equipment in Marunouchi, Tokyo, which was opened to the general public on 8 June.

Office computer: In FY-80, office computer deliveries from Mitsubishi Electric passed the 4,000-unit mark, to total 4,300 units. Then, by the early part of FY-81, it achieved the remarkable record of cumulative deliveries of 20,000 units. The Kanji processing office computer which was put on the market in March 1980 has been accumulating good orders for a total of more than 20,000 units, greatly exceeding expectations. The feature here is the wide expansion in MELCOM office computer selections in both FY-80 and FY-81.

The company not only enhanced its image by exhibiting an "office computer which can understand human speech" even though it was a test product (business show of May 1980) and by demonstrating new technological strength in the form of "picture processing office computer" in May 1981, but it also strengthened its lineup by adding such practical models as the MELCOM 80 OCR (September 1980) which is an office computer with the OCR function, and the MELCOM 80 Model 4 Japanese-language unit (December 1980), MELCOM 80 Model 48 Japanese-language unit (February 1981).

For FY-81, the goal has been set to obtain 5,600 orders, partially because it rhymes with Showa 56.

IBM compatible equipment plan: October 1983 is the target date for starting delivery. Development of the IBM compatible general-use computer is close to completion. According to the releases, it is a dispersed processing oriented general-use computer and the architecture adopted is such that it can be used as a host computer or as a terminal controller. About 1.5 billion yen was invested for the construction of the new plant within the computer production plant site in Kamakura in Kanagawa Prefecture (completed in May 1981), and this is the new series development plant. Present plans include test production of the successor to the present COSMO 800, to be completed sometime in 1981.

COSMO series: The COSMO series computers have been completely switched to be bridge machines to develop IBM compatibles. These include the new 900 and its MP version (March 1981) in the case of COSMO 900 II, sales of COSMO 800 III and 800 S, and reinforced performance of COSMO 700 III and 700 S (March 1981). The entire 700, 800 and 900 series were provided with MP version, while dispersed microcode-type functional engines (high-speed mechanism for separate functions) were placed in the 700 and 800 series to be compatible with IBM machines as well as to be a weapon against the other competition.

Software policy: This company is taking a stab at various areas in preparation for the day when software will play the major role. The "MELCOM Industrial Software" established on 1 July 1980 is the software development specialty company for process control for industrial-use computer systems. Demand for industrial-use computer systems increased 80 percent in FY-79 and another 30-40 percent in FY-80, so that dependence solely on external sources for software would make difficult quality control and improved productivity, and this prompted the establishment of the new company. Mitsubishi Electric put up 60 percent of the capital and Mitsubishi Engineering put up the remaining 40 percent.

In addition, the "MELCO Control Software," a design, production and sales specialty company in the area of microcomputer control system software, was formed on 1 October 1980. The software department of the company's control equipment manufacturing factory was separated from the company and became independent "MELCO Control Software."

Office computer export: The MELCOM Business System Company was set up as the sales company to conduct office computer export directed to the United States in December 1977, and this company has succeeded in exporting products under its own brand name to the United States. The new company, "American Mitsubishi Electronics" (located in Compton, California), formed from a merger with MELCO

Sales Company (in charge of sales of semiconductors, FAX, color-CRT), went into business in July 1980 at its present site to service the West Coast, and is selling about 100 units of office computers per year (MELCOM 80 Models 18, 28 and 38 with about 6 dealer companies). It plans to establish a sales office on the East Coast and expand sales in FY-81.

At the same time, there is need for a special-use office computer as a sales product for the American market, and development of a special-use office computer using the Intel 8086 family 16-bit CPU is being pushed with a target date of April 1982. With this introduction, American Mitsubishi Electronics plans to increase its sales to 300 units in FY-82.

9. Burroughs

The Burroughs Company of Japan (hereafter abbreviated to Burroughs) does not disclose its sales breakdown as usual, giving a reason that it settles accounts in combination with the parent company. This may be said to be one reason why the Japanization of this company has been delayed. Looking at the income tax return, which gives the only publicly available figures, the values are 8.5 billion yen for 1977, 10.6 billion yen for 1978 and 9 billion yen for 1979, followed by a sharp drop to 3 billion yen in 1980. According to a survey conducted by this journal, there was also a decline in sales of about 7.5 percent from the 54.6 billion yen in 1979 to 50.47 billion yen in 1980, while net profit decreased 48 percent to 2.3 billion yen.

The reason here is the delay in this company's response to the Japanese market, as a result of which the company found it necessary to invest large sums in 1980 to overcome the inadequacies. This involved the establishment of 20 support centers throughout the country to set up a support system, along with 12 demonstration centers for the B1900 small computer use DB/DC, the replacement of computers of data centers to new types and the new establishment of the Yokohama Engineering Center at a cost of 1.2 billion yen.

The Burroughs Company was a purely Japanese business back in the Takachiho Trading stage, and then it made an abrupt 180-degree turnaround to an American business with 100-percent capital outlay on the part of its parent company. It is under this American business management that it is trying to hammer out sales policy suitable for the Japanese market. The degree to which this conversion can be effected will be the key to its revitalization.

The following are the major topics from FY-80 through FY-81.

Blumenthal system: Blumenthal, who in August 1979 did not agree with President Carter and resigned his post as secretary of the treasury to enter the services of the Burroughs Company, became chairman of the company on 1 January 1981. Since he became the true number one in this company when he assumed the post of leading director in September 1980, he immediately introduced an organizational revolution. The spillover even extended to the Burroughs Company in Japan in 1980 and 1981.

Japanese market policy: The item which underwent a complete change with the Blumenthal system was the policy with regard to the Japanese market. After

Blumenthal had been in Japan only 10 days during a visit in November 1980, he signed the papers for the construction of a plant which had been stalled for several years. His comment was: "I would like to see us initiate production of computers in Japan early in the eighties." The plan involved, first of all, production of Kanji terminals and small computers aimed at the Japanese market; second, a buildup in plant capacity to let this plant serve as an export base for shipments to Asia, the United States, South America and Europe; and third, expansion of products to large computers, various types of OA equipment and data communication equipment, and even a jump into LSI production. This plan went forward as planned at the start of 1981, and it has been decided to establish a manufacturing engineering center in Japan to produce a Kanji processing system designed for the Japanese market and terminals for financial organization use. An engineering center for technological development (about 100 people) was established in Yokohama, and the plan is to construct a plant in Kanagawa Prefecture. This will be a final assembly plant, and it is expected to start soon on local production.

One other topic is the confirmation of the American Burroughs Company's policy to set up its first basic research laboratory outside of the United States in Japan. This will be an IC laboratory, and once it is completed, a comprehensive system will have been established in Japan from IC development to computer production and sales.

In addition, the Burroughs Company of Japan acquired a site for production of business forms related to computers in Tochigi Prefecture as its second volley into the Japanese picture.

New model: The B6900 large computer (July 1980), B5900 (October 1980), B900 (October 1980) and the CP9500 family of dispersed processing computers (November 1980) are the principal new additions. No announcements of new type equipment were made during 1981. In another direction, President Blumenthal stopped development of the BSP supercomputer. Along with this announcement, Japan Electronic Calculations, which had ordered a BSP to be the number-one user in Japan, switched over to the Hitachi large computer.

OA policy: In order to strengthen its office equipment area, the American Burroughs Company purchased the Reductron Company which makes word processors, the Graphics Science Company which makes facsimiles and the Context Company which makes OCR scanners, followed by the purchase of the SDC Company which is a large software company, and it has purchased the magnetic memory equipment maker Memorex during 1981. However, the present situation of the Burroughs Company in Japan is that it has not begun to realize any benefit from these acquisitions.

The company is fettered by previous agreements with Japanese industries and is unable to operate freely. The consequences of this situation are major problems which this company has to cope with.

10. Japan NCR

Japan NCR is fighting hard. Its total sales for FY-80 decreased 7.2 percent from the preceding year to 72.2 billion yen. The operating profit and net profit

decreased 2.6 percent and 13.4 percent respectively. In the midst of a situation in which computer companies have been expanding sales on the crest of an OA boom, this company together with the Burroughs Company are the only 2 members of the top 10 companies which have been experiencing a standstill. As mentioned earlier in this report, this company altered its sales departmental classification and switched printers and magnetic tapes, which previously had been classified under terminal equipment, to the electronic computer category; still, the sales for the electronic computer department suffered a decrease of 7.7 percent (Table 20). According to the company, Japan NCR had the highest sales of all the subsidiaries of the NCR Company of the United States, but it cannot be denied that there is the handicap of this company's delay in adapting itself to the Japanese market.

Table 20. Sales of Japan NCR by Departments
(Unit: Million Yen)

区分	54年度 (53年12月～54年11月)	構成比率	55年度 (54年12月～55年11月)	構成比率
5	30,578	39.29%	28,236	39.11%
6	15,421	19.81%	19,978	27.67
7	31,835	40.90	23,984	33.22
8	77,834	100.00	72,198	100.00

Key to Table 20:
1. Classification
2. FY-79 (Dec 78-Nov 79)
3. Constituent ratio
4. FY-80 (Dec 79-Nov 80)
5. Electronic computers
6. Terminal equipment
7. Other information treatment equipment
8. Total

Business Performance in 1980: The changes in sales profile during the past 2 years following the changes in sales classification are given in Figure 11. What are classified under electronic computer, terminal equipment and other information equipment are shown in detail in Table 21.

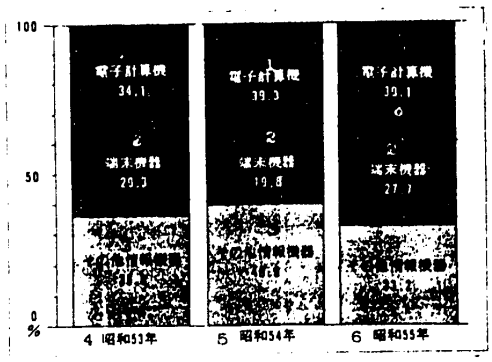


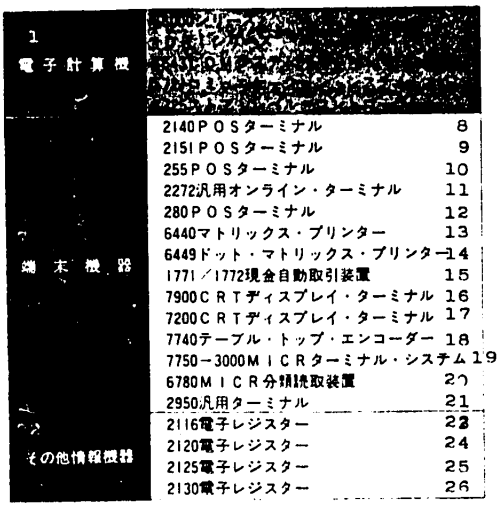
Figure 11. Trends in Sales by Departments of Japan NCR

[Key on following page]

Key to Figure 11:

1. Electronic computers
2. Terminal equipment
3. Other information equipment
4. 1978
5. 1979
6. 1980

Table 21. Information Processing Related Products of Japan NCR



Key to Table 21:

1. Electronic computers
2. 8000 series
3. DPI series
4. 643 COM series
5. 721 communication system
6. 725 store-level controller
7. Terminal equipment
8. 2140 POS terminal
9. 2151 POS terminal
10. 255 POS terminal
11. 2272 general-use online terminal
12. 280 POS terminal
13. 6440 matrix printer
14. 6449 dot matrix printer
15. 1771/1772 automated cash register
16. 7900 CRT display terminal
17. 7200 CRT display terminal
18. 7740 tabletop encoder
19. 7750-3000 ICR terminal system
20. 6780M ICR classification reader device
21. 2950 general-use terminal
22. Other information equipment
23. 2116 electronic register
24. 2120 electronic register
25. 2125 electronic register
26. 2130 electronic register

The electronic computer area was augmented by the Japanese information system I-8290 capable of Kanji processing and the communication control NCR Comten equipment for IBM users, and it has started to ask for payment for the software services. Terminal equipment, including the NCR 1771 and 1772 which are automated cash handling units admirably suited for an increased installation of "unmanned corner" at banks, and the POS for department stores and the POS in the form of NCR 2140 whose sale to specialty stores was initiated in May 1980, is seeing an increase in orders. On the other hand, its independent terminal and other information processing equipment sales have decreased greatly because of the price competition and the disposal of its pressure sensitive paper-making capsule production department.

OA equipment: At the outset of 1981, President Mitomi announced that Japan NCR was in the process of advancing the architectural structure of its OA and that a start would be made toward word processors during the course of the year, but nothing specific has materialized as of the end of September.

Assistance by US NCR: In May 1981, 14 of the directors of NCR of the United States assembled in Tokyo and held the first board of directors meeting in Japan. These people saw Japan's rapidly developing computer industry and market. Japan NCR told them that Japan's computer technology is advanced, the speed of development of new technology is fast and the competition for orders is fierce, and thereby asked for US NCR's assistance in swiftly establishing a system that could successfully cope with this situation and could develop products suitable for the Japanese market.

Software: Although Japan NCR was conspicuous for its lack of new product announcements, it showed an attitude of emphasizing the importance of software. In May 1980, it set up its Central Software Service Department to expand its software maintenance service. The software NCR TRAN-QUEST system for data base use introduced in August 1980, the online package system NCR STAR directed toward medium and small banks and trust companies introduced in February 1981 and the NCR ASK end user-oriented conversational information search system introduced in August 1981, are software of note despite their inconspicuous nature. According to Japan NCR, the American NCR received 500 orders for IMCS-II packages for medium-size manufacturing companies (as of February 1981). NCR is a company whose activities in the software area are noteworthy.

Favorably performing ATM product of NCR: Another good news for Japan NCR is the favorable performance of the ATM (automated teller machine) for bank use, which accounted for 998 units or 42 percent of the 2,400 units sold in Japan during the course of 1980. The company is aiming at sales of 1,000 units during FY-81.

Part II. Office Automation Industry

Diagnosis of Real Strength of "Top 10" OA Makers of Business Machines

OA Equipment Makers with Tremendous Growth

With the arrival of the OA age, business equipment makers, computer makers, communication equipment makers, household electrical makers and companies which handle such products all are fighting to be carried along by the tide regardless of whether they are makers or traders. But the strange thing is that when the time comes to come forth with cold figures, there is no clear-cut announcement: "These are the sales of this company's OA equipment." In other words, all these companies while professing themselves to be an OA maker have not come to establish OA as an integral department.

Two reasons come to mind with regard to this situation. The first is: "What is OA?" The definition of OA has not been clearly demarcated so that there are some fine differences between companies in what they consider OA to be. The other reason is that every company started to deal with a large number of products once the word OA became fashionable, and the products though loudly talked

about have not yet clearly demonstrated good sales performance. Thus, they do not wish to announce this fact out of their defense reaction.

It is difficult to define just what OA covers and what kind of products come under this category by a simple statement. First of all, when one mentions office, it can involve a variety of businesses with different contents, such as financial industry, stores, laboratories, factories, administrative offices and sales departments which also can vary widely in scope. Therefore, depending on the type of office there is a different method of OA application to it. In addition, there are wide differences in the reasons any business acquires OA equipment: to rationalize office work, effect cost reductions or to mechanize.

Depending on the reason, the scope for OA would be widely different. The first mentioned reason can be amplified by saying that OA encompasses everything used to facilitate office work and includes already present computers, copiers, electric desk calculators, steel desks, chairs, bookcases, files and writing equipment as well as the layout of this equipment.

On the other hand, the latter, while also having the objective of rationalizing office work, limits the use of OA to new type office equipment with intelligent functions provided through computerization and includes advanced equipment produced by the most recent technology such as office computers, personal computers, (Japanese) word processors, facsimiles and reproduction equipment.

Here, we will adopt the second definition, following our practice in last year's survey, in order to define the scope of OA makers easily and we will consider as OA equipment office-use computers and related equipment, word processors, facsimiles, reproduction equipment and related equipment and the associated expendable items.

The 10 business equipment makers discussed here do not include any company with a strong computer maker image. They are all superior businesses which either are already listed on the stock exchange or are well qualified to be listed. According to the "Industry Ranking Special Edition" put out in NIPPON KEIZAI SHIMBUN on 4 September, these 10 companies are all top-class companies and they are: 1) Matsushita Electric Industrial (10th rank), 2) Canon (17th rank), 3) Matsushita Communication Industrial (28th rank), 4) Casio Calculator (34th rank), 5) Ricoh (40th rank), 6) Sharp (46th rank), 7) Minolta Camera (107th rank), 8) Konishiroku Photographic Industry (140th rank), 9) Tokyo Electric (218th rank) and 10) Uchida Yoko (704th rank).

When ranked according to profitability, the order is 1) Matsushita Communication Industrial (46th rank), 2) Matsushita Electric Industrial (76th rank), 3) Ricoh (181st rank), 4) Casio Calculator (195th rank), 5) Tokyo Electric (271st rank), 6) Canon (271st rank), 7) Minolta Camera (313th rank), 8) Sharp (353d rank) and 9) Konishiroku Photographic Industry (394th rank).

The ranking according to growth is 1) Canon (36th rank), 2) Casio Calculator (47th rank), 3) Uchida Yoko (195th rank), 4) Matsushita Communication Industrial (235th rank), 5) Minolta Camera 342d rank) and 6) Sharp (399th rank). It is readily evident that the OA-related business equipment makers are all high-profit and large-growth-rate superior industries.

When the growth rates of these companies over the last 5 years were compared, the results shown in Figure 12 were obtained. This graph was constructed with the sales of each company during FY-76 being arbitrarily set at 100 and indexing the trends which followed. Casio Calculator with growth of 2.9 times heads this list, but all the companies are seen to have enjoyed great growth. Unfortunately, it was not possible to plot a comparison table for only the OA related area of these companies because they were mixed with the sales of related products by these companies. As a result, rather than compare these companies, each company's sales situation is individually discussed here.

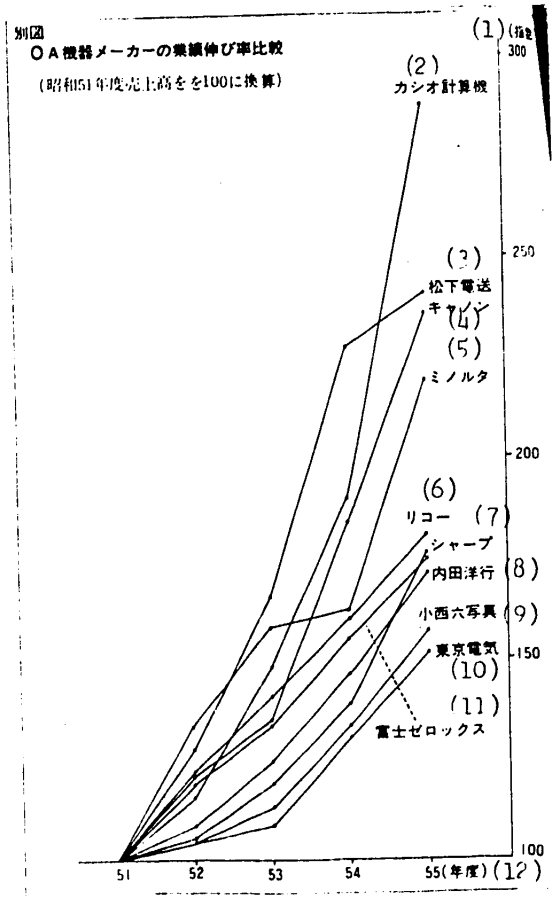


Figure 12. Comparison of Business Record of OA Equipment Makers (Calculated on Sales of FY-76 as 100)

Key:

1. Index
2. Casio Calculator
3. Matsushita Communication Industrial
4. Canon
5. Minolta
6. Ricoh
7. Sharp
8. Uchida Yoko
9. Konishiroku Photographic Industry
10. Tokyo Electric
11. Fuji Xerox
12. FY-76, 77, 78, 79, 80

Because of the tremendous growth in OA equipment, we hope that every company will release data which will make possible comparisons of OA sales among companies for the next survey.

Ricoh: Rationalization of "Four Functions" Through OA

This company prides itself on being the first company in Japan to espouse OA. It is the standardbearer for OA on the part of the business equipment makers.

Ricoh breaks down business contents into four major categories, by which it seeks to maintain rational interplay between the categories, improve business efficiency and effect cost reduction. The means to this end is the array of various business machines. The advent of the microcomputer and the large decrease in cost of memory and IC, the advances in making machines more intelligent, the combinations of the different instruments and systematization have taken place. This company says that now is the time to start office automation.

The "four functions" which Ricoh espouses as basics of OA are: 1) document composition; 2) reproduction, printing; 3) information transmission; and 4) storage, search. It proposes to introduce OA to enable the smooth flow of these functions and to further improve efficiency. Ricoh has a full stock of the various items of equipment necessary to this end.

First of all, the representative equipment for document composition is the Japanese word processor. Ricoh sells a unique word processor, "RIPORT 600," which has facsimile capacity at its output section. This unit can activate a facsimile located in a distant office to print out a copy directly in the other office. The printout is through a 32 x 32 dot matrix per character which produces highly dense and very readable characters. Once one becomes accustomed, he can use a two-stroke method which has higher input speed than any other method. These are some of its feasures. Ricoh is going to share the specifications of this input method with Hitachi and popularize and sell the instrument well.

Another representative item of document composition equipment is the office computer "Ricom series" which is of a component type and has a memory unit, display, keyboard and printer which are independent from each other. The design is such that each unit can be efficiently used depending on the type of work. The "RICOM 2600 series" will be added to the line in October, enhancing this product line even more. The M15 plan which envisions 15 percent of the market share is proceeding; at present it has 10 percent of the market.

The reproduction and printing related equipment is the dollar box which accounts for 85 percent of Ricoh's sales. The popular "DT series" is the mainliner here, but a high-speed PPC "FT 7500" with a speed of 60 sheets per minute has been placed on the market to meet the needs of large businesses for a large number of copies.

Ricoh announced its intelligent reproduction unit "GT-1000" as the model OA reproduction equipment last spring. This is a reproduction unit into which an original can be put, and then subjected to editing, additions, deletions, etc., before copies are made. Ricoh was the first to come out with an actual

reproduction unit which altered the role of a copier which simply "reproduced the same thing."

Table 22. Ricoh Sales

1 決算年度	2 売上高	3 経常利益	4 利益	5 複写機器部門売上高	6 複写関連消耗品部門売上高	7 電送機器部門売上高	8 電子機器部門売上高
9 昭和51年	1,407.9	95.7	42.5	837.3	371.9	44.6	84.7
10 昭和52年	1,715.7	130.0	62.2	1,081.5	402.6	70.4	98.9
11 昭和53年	1,974.5	174.1	77.6	1,279.4	433.1	92.7	90.7
12 昭和54年	2,243.3	219.9	118.4	1,424.9	464.8	132.2	87.9
13 昭和55年	2,534.0	201.3	110.1	1,599.7	541.0	142.5	135.6

Key to Table 22:
1. Account year
2. Sales
3. Working profit
4. Net profit
5. Reproduction equipment sales
6. Reproduction related expendable item sales
7. Facsimile equipment sales
8. FY-76
9. FY-77
10. FY-78
11. FY-79
12. FY-80

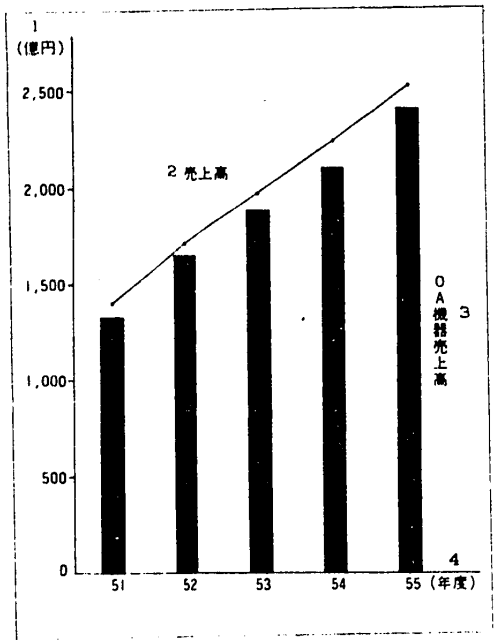


Figure 13. Ricoh Sales, OA Equipment Sales

Key to Figure 13:
1. (100 million yen)
2. Sales
3. OA equipment sales
4. FY-76, 77, 78, 79, 80

Ricoh is aiming for a 45-percent share in PPC, and it has but a little way to go before it will attain this goal.

In the field of facsimile, which is a representative example of the information treatment area, the company developed the world's first high-speed facsimile for business use, and has been concentrating its business on high-speed units. It is said that this company has 90 percent of the Western market share and 50 percent of the domestic market share. Increasing its share in the medium-speed market is its present goal, and it hopes to achieve a better balance by such a shift. The main equipment is the "RIFAX 6300 series" for trunkline network use and the world's smallest G3-G2 "supermini" "RIFAX 3300 series."

Ricoh's storage and search equipment includes microfilming equipment carried over from the past and a "Linac information search system" which retrieves documents required in computer searches from files. This system readily searches for and retrieves the desired document and makes possible a great speedup in business treatment.

Ricoh is trying to combine these various products to obtain even better and more convenient-to-use OA systems. The intracompany system has been altered to separate the plans section from the sales headquarters, made it into the plans headquarters and thereby reinforce the system so that it could quickly respond to the needs and develop new products.

Fuji Xerox: With OIS Which Incorporates Respect for Man

Fuji Xerox uses the term OIS (office information system) in the same manner as OA. It is said that this name is preferred because the term office automation creates an image of conservation of manpower and mechanization. This company wanted to introduce a term which describes an environment in which man can work in a more meaningful manner, and thus the term OIS was proposed.

This line of thinking is clearly represented in the company's work station communications network "Isanet." This is a process developed by Xerox Company of the United States, for which Fuji Xerox disclosed the patent in Japan in January. The various work stations within an office are connected to a coaxial cable (Isanet cable) for mutual communication. At the same time, work stations can be freely added, removed or altered without ever having any effect on the rest of the network, making for easy utilization which is the major feature of this system.

The Isanet can be freely altered in line with personnel changes and organizational changes and is an OIS with respect for man.

The handling of intraplant information transmission and collection at a work station may seem a long way off, but Xerox is treating it as an item of the present.

The single OA piece of equipment which Fuji Xerox is marketing is centered on PPC. The sales of PPC-related products account for 90 percent of the company's total sales. Fuji Xerox was established in 1962 as a PPC maker and went along for about 8 years with no competitor in this area, so that it was able to

proceed smoothly in product development and sales. As the domestically produced PPC centered on the popular model began to dominate the market, the product development based on the premise of rental of Fuji Xerox became inappropriate to the popular type PPC market, and a shift was made from minor changes to the American-made Xerox PPC to the development of a domestic original product.

As a result, there are a number of energy-saving PPC types beginning with the development of a 40-sheets/minute high-speed PPC "Xerox 3500" capable of operating on household 100-volt, 15-amp current, followed by the 32-sheets/minute "Xerox 3402," the "Xerox 4800," and the Xerox 2350" with two-stage reduction capability. These PPC not only have good performance but are also advantageous in the matter of the two items of cost and ability to be used with ordinary power sources, which make them appealing products to high-speed PPC users. This company has now begun to export units to Xerox companies in Europe and the United States. The Fuji Xerox popular PPC "Xerox 2300" is now being assembled in the United States as well as being supplied throughout the world.

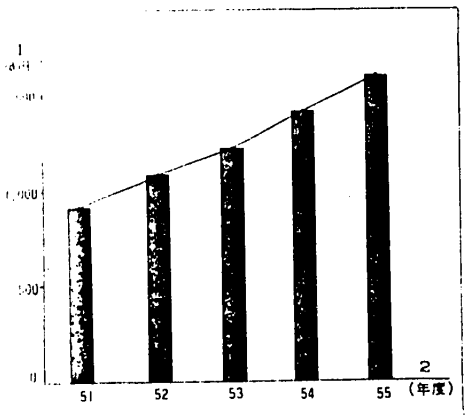


Figure 14. Sales by Fuji Xerox (All OA-Related Equipment)

Key to Figure 14:
1. (100 million yen)
2. (FY) 76, 77, 78, 79, 80

Table 23. Sales by Fuji Xerox (Unit: 100 Million Yen)

1 決算年度	2 売上高	3 経常利益	4 利益
昭和51年	909.0	97.2	41.1
昭和52年	1,078.9	144.5	53.4
昭和53年	1,213.4	164.9	61.6
昭和54年	1,408.1	163.6	68.4
昭和55年	1,593.4	176.0	80.8

Key to Table 23:
1. Account year
2. Sales
3. Working profit
4. Net profit
5. FY-76
6. FY-77
7. FY-78
8. FY-79
9. FY-80

The "Xerox 9200," which is a high-speed PPC for centralized copy treatment use, has been performing well with essentially no other competitor in sight. At the same time, it handles such large volumes that there is very great effect on profits, so that it has become the dollar coffer for the American Xerox Company. This same unit is also performing well in Japan and is a valuable product.

The medium-speed "Telecopier 485" and the high-speed "Telecopier 490" are the main items in the area of facsimiles, and the "Telecopier 485" is being exported to Europe.

In addition, Fuji Xerox is establishing sales companies throughout the country with joint subscriptions from influential local enterprises; already 25 such companies have started sales.

Canon: Aims at developing OA as an independent business area through developing abundant OA products

Canon puts out a varied array of OA-related products. Some of the major products include reproduction equipment, office computers, desktop computers, laser beam printers, Japanese word processors and business facsimiles. The total sales of these equipment are listed in the table below as OA equipment sales by this company.

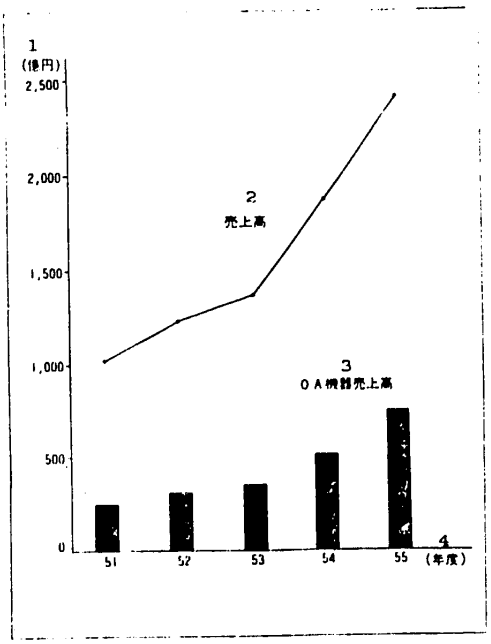


Figure 15. Total Sales and OA Equipment Sales of Canon

Key:
1. (100 million yen)
2. Total sales
3. OA equipment sales
4. FY-76, 77, 78, 79, 80

Table 24. Sales of Canon (Unit: 100 Million Yen)

1 決算年度	2 売上高	3 経常利益	4 利益	5 複写機部門売上高
6 昭和51年	1,019.7	74.4	36.0	230.0
7 昭和52年	1,239.9	99.2	59.8	285.8
8 昭和53年	1,369.6	116.5	74.6	322.4
9 昭和54年	1,874.7	185.9	113.3	458.4
10 昭和55年	2,407.5	258.0	147.4	665.3

Key:

1. Account year
2. Total sales
3. Working profit
4. Net profit
5. Reproduction equipment sales
6. FY-76
7. FY-77
8. FY-78
9. FY-79
10. FY-80

If we consider OA from an even broader viewpoint, desk calculators, microfilm equipment and electronic Kanji dictionary have to be included. Canon is a leading maker of desk calculators, and including this item under the sales total of OA equipment makes this sum slightly in excess of 100 billion yen by adding the calculator sales total of 23.3 billion yen for FY-79 and 27.2 billion attained in FY-80. Canon's business is split nearly equally between photographic equipment and business equipment (OA related), and it is proceeding with balanced growth between these two areas.

The list of Canon's OA-related equipment is large, but its main strength is in reproduction equipment, which account for 56 percent of the total sales in business equipment related areas. This is an important toehold in the OA department. The advent of Canon PPC sales in 1970 was this country's first competitor to the Xerox machine where reproduction technology was concerned. By producing and developing PPC, this company has developed enormous influential strength in the business machines market.

The company points to computers and laster beam printers as important future products which will become valuable system equipment, and it is putting great effort in these products and the establishment of their sales network. The two daughter companies, Canon Sales and Canon Electronics, were formed simultaneously on 24 August to make their appearance in the Second Stock Exchange. This was the first occasion in which sibling companies made applications to the Stock Exchange simultaneously and were accepted the same day. Although this is an episode reflecting the strength of these two companies, it is also a reflection of Canon's strength. Canon Sales is expected to double over the next 5 years, and it is pointing toward expanding the sales department which deals with office computers, facsimiles, word processors and laser beam printers and making the department an independent company.

Canon is also putting great effort into its production strongholds for these items of OA equipment: it has made its Toride plant in Ibaraki Prefecture the main plant for reproduction equipment production by expanding the plant. It

also established its Ami plant, which mainly produces desk calculators and similar equipment, at Ami, also in Ibaraki Prefecture. It also has its Ueno plant for production of PPC use toners and drums at Ueno in Mie Prefecture, and all of these plants have been completed between the spring and fall of this year.

Expansion is taking place in Canon's overseas plants as well: plant expansions are underway at the Giessen plant in West Germany and Canon Business Machines in the United States. In addition, Copia (its sales department became independent Copia Sales), which came under the umbrella of Canon 2 years ago, has established a cooperative system in both production and sales and has proven to be a powerful strategic strength.

Some princpal OA products of Canon are the high-speed "NP-400 RE with a speed of 40 sheets/minute, the super-highspeed "NP-8500," with a speed of 77 sheets/minute, as the PPC "NP series" representative products, the Japanese word processor "CANONWORD 55," the office computer "CANONAC 71K," the high-speed facsimile which can transmit enlarged or reduced copies "CANON Teleflex B401," and the laser beam printer "LBP-10SK."

Sharp: All-out in New Business Direction

Sharp is adopting the OA concept as "new business." This is a manifestation of the need to come out with a rapid, creative,high-productivity system to develop the capacity to win out in this industrial battle. In order to realize this goal, it has set up the two standards of "PRESTO Office" on the hardware front and the "CREATE Human" on the software front.

"PRESTO" consists of six elements designed to speed office operations, and it was coined from the initial letters of these elements: paper, record, energy, space, time and organization. This words means "rapid" in Italian.

At the same time, "CREATE" represents the six elements designed to turn man to creative efforts and is comprised of the first letters of comfortable, reliable, easily, active, taste and expert.

Sharp's OA equipment incorporates many man-oriented features. In addition, in contrast to OA Sharp has classified desk calculators, personal computers and electronic translators, which are deeply tied in with individual use, as PA (personal automation) equipment and given them a special niche.

Some items of Sharp's OA equipment are the office computer "HAYAC series," the Japanese word processor "Shoin," the reproduction equipment "SF series," and the facsimile "FO series."

The weight of OA equipment with respect to total sales is 12-13 percnet, which is small, but this is the result of great sales strengths in other areas such as household electrical units. The total sales of OA equipment exceeds 60 billion yen. The total sales of the industrial equipment sales headquarters which deals with OA equipment and PA equipment was 132.5 billion yen. There is already an active export of PPC, and export of office computers to the West has been growing this year.

Where domestic sales are concerned, Sharp Business, which was formed a year ago, is targeting sales expansion of 20 percent or more. This company was formed in December 1980 through the amalgamation of the regional business equipment sales companies.

At present, it has 17,000 SBD (Sharp Business Dealer) type affiliated stores throughout the country and plans call for expansion to 33,500 stores by FY-82.

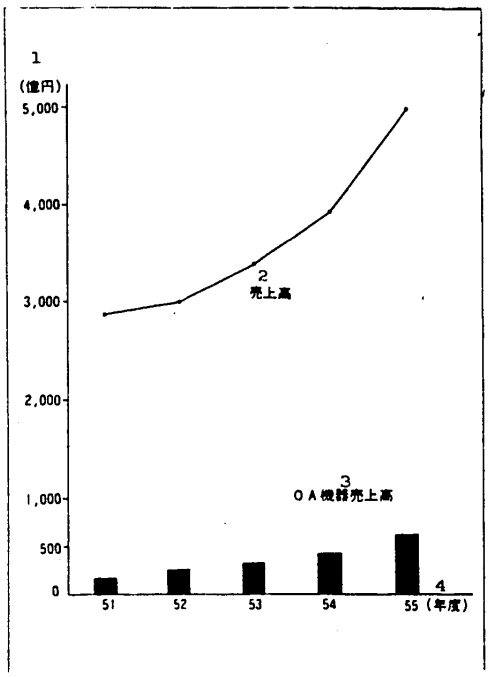


Figure 16. Total Sales and OA Equipment Sales of Sharp

Key to Figure 16:
1. (100 million yen)
2. Total sales
3. OA-related sales
4. (FY) 76, 77, 78, 79, 80

Table 25. Total Sales of Sharp (Unit: 100 Million Yen)

	1 決算年度	2 売上高	3 経常利益	4 利益	5 事務機・電子部品部門売上高
6	昭和51年	2,850.5	106.4	57.6	728.0
7	昭和52年	3,007.8	130.6	74.5	905.7
8	昭和53年	3,396.4	165.3	86.5	1,123.7
9	昭和54年	3,952.5	235.8	125.3	1,333.4
10	昭和55年	5,014.0	292.4	162.9	1,718.3

[Key on following page]

Key to Table 25:

1. Account year
2. Total sales
3. Operating profit
4. Net profit
5. Sales of OA equipment and electronic parts
6. FY-76
7. FY-77
8. FY-78
9. FY-79
10. FY-80

Minolta Camera: Rapid PPC Growth with MT Mode

Minolta Camera had sales of 52.5 billion yen in office equipment and special equipment, the greater part of which came from reproduction equipment, and what may be termed OA equipment such as computer-related items were limited to microfilm equipment besides PPC. This is an unusual case in the midst of this OA age when most of the makers are coming out with an increasing variety of OA products.

With the smooth growth in its PPC, this company is undergoing a rapid increase in exports, headed by the OEM supply to IBM in the United States. There was a 77-percent increase over the previous year in exports of business equipment and specialty equipment during FY-80.

The event which enabled Minolta Camera, which had been far behind in its PPC development, to enjoy such good growth was the development of a microparticle carrier reproduction method based on an MT (microtoning) mode and its use in the popular PPC "EP-310." The clear copies made by this product were well accepted, and there was a sharp increase in exports from the outset.

Furthermore, the "EP-310" drew IBM's attention, and as soon as Minolta Camera began the OEM export of this product to IBM, the evaluation of the MT mode rose one notch higher.

In good timing with this situation, Minolta Camera constructed a new PPC production plant and designated this new Mizuho plant the main plant for mass production of its "EP series," while it changed the existing Mikawa plant (renamed from the Toyokawa BM plant) into a production plant for small-volume lot products. In addition, it sensed the need to increase production of consumable items, and it is expanding its Itami plant to this end.

The Mizuho plant, where a mass production was possible starting this July, produces 11,000 units of 2 main models, EP 310 and EP 320, per month, and 17,000 units if including 4 other models, EP 520, new EP 530 and EP 530R, and console-type EP 710.

The company has also developed another OA product in the form of the general-use multifunctional printer "Minolta EG 30," [Intelligent Copier] which was announced last fall. This instrument is based on the static electricity latent image reproduction mode duplicator "EG 301" and exploits its image reproduction mode. It incorporates a high-performance multistylus head (needle electrodes) which is equipped with general printing capabilities. It can superimpose soft copies written in by electric signals on originals, and can be utilized as print mechanisms for a number of systems.

Some of its features are: the print mode is a very compact no-impact mode, there is essentially no printing noise and it is very silent.

Minolta is actively developing the applications area of these duplicators and has developed a no-impact lable printer "BLIP 103" and a high-speed address label printer "AP-T."

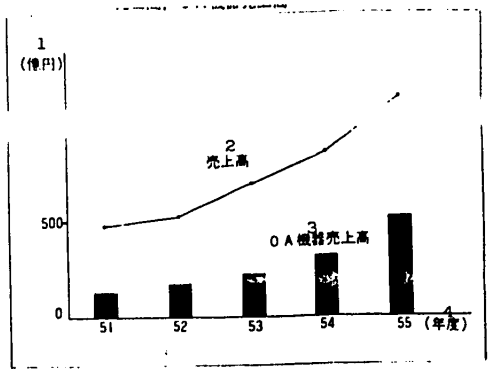


Figure 17. Total Sales and OA Equipment Sales of Minolta Camera

Key to Figure 17:
1. (100 million yen)
2. Total sales
3. OA equipment sales
4. (FY) 76, 77, 78, 79, 80

Table 26. Total Sales of Minolta Camera (Unit: 100 Million Yen)

1 決算年度	2 売上高	3 経常利益	4 利益	5 事務機・特機部門売上高
6 昭和51年	528.6	24.0	14.9	147.0
7 昭和52年	705.4	40.2	20.8	188.4
8 昭和53年	836.3	56.0	24.3	234.4
9 昭和54年	856.7	46.0	25.2	327.7
10 昭和55年	1,156.8	92.1	45.1	525.4

Key:
1. Account year
2. Total sales
3. Operating profit
4. Net profit
5. Business equipment, special equipment sales
6. FY-76
7. FY-77
8. FY-78
9. FY-79
10. FY-80

Konishiroku Photographic Industry: Aims at 15-Percent Share by Ubics

Konishiroku Photographic Industry has compiled a tradition as a maker in the image technology area which has specialized in photographic film and printing

paper, and it is therefore taking a determined look at the quality of copy reproduction in the area of reproduction technology. Its "Ubics" (with superior copy quality) was born from such a background.

Konishiroku's basic position is also the same with regard to OA products. It is engaged in development of the output areas such as a no-impact printer and an intelligent copier. Next, it proposes to develop OA systems to exploit these items of equipment by combining them with computer and communication technology. As a result, the present OA product situation of this company is such that the Ubics PPC accounts for the greater part of the business.

The "Ubics" has survived a full 10 years in the market since its first introduction in 1971. It is being exported to Europe and the United States in great numbers. It now has roughly 10-12 percent of the world's PPC market.

Konishiroku is planning to increase its share of the world market to 15 percent within the next 5 years. As one phase of this policy, the sales base Konishiroku Ubics signed a sales agreement with Plus for sales in the domestic market. It is considered necessary to expand its sales routes and number of sales outlets in order to attain a 15-percent share of the market, and this company plans to sell its "Ubics" at the roughly 3,000 stationary stores which Plus maintains throughout the country and hopes to achieve a 6,000-unit increase in sales per year.

On the product front, the "Ubics V" is proving to be a great hit in the United States; and it is a PPC of stable quality. The "Ubics V2," which is even further improved, has appeared on the domestic market, and the "Ubics 3000" and "Ubics 3000 F" with semidocument feeder attachment which appeared in July are becoming this company's main sales items.

The developer has been improved starting with this "Ubics 3000 series," and copy quality has been greatly improved by measures to increase the static electric retention property of the carrier.

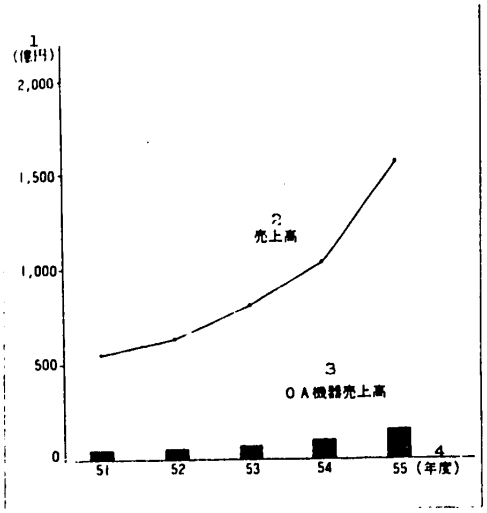


Figure 18. Total Sales and OA Equipment Sales of Konishiroku Photographic Industry

[Key on following page]

Key to Figure 18:
1. (100 million yen)
2. Total sales
3. OA equipment sales
4. (FY) 76, 77, 78, 79, 80

Table 27. Total Sales of Konishiroku Photographic Industry

	決算年度	売上高	経常利益	利益	電子複写機部門売上高
6	昭和51年	1,266.8	121.4	53.8	286.9
7	昭和52年	1,324.5	112.0	57.8	305.0
8	昭和53年	1,432.7	124.6	59.0	360.4
9	昭和54年	1,690.0	102.4	41.3	416.7
10	昭和55年	1,885.8	142.4	63.1	499.0

Key to Table 27:
1. Account year
2. Total sales
3. Operating profit
4. Net profit
5. Electronic duplicating area sales
6. FY-76
7. FY-77
8. FY-78
9. FY-79
10. FY-80

Matsushita Electric Group: Reinforces Unity with "OA Conference"

Matsushita Electric Industrial is trying to cope with the OA era with its total energy together with its daughter companies, Matsushita Communication Industry and Matsushita Electrical Transmission Equipment.

A concrete display of this effort is the "OA conference" started this spring in which five members--President Yamashita of Matsushita Electric Industrial, Director Nakai (head of the special equipment sales headquarters), Director Hayakawa (director of technology headquarters and director of central laboratory), President Ogama of Matsushita Communication Industry, and President Kino of Matsushita Electrical Transmission Equipment--meet at stated monthly intervals to establish overall policy on OA industry problems.

The suborganizations of this OA conference include a technology development committee, comprehensive design committee, public relations committee and OA promotion committee which are assigned to conduct the necessary functions to promote OA industry for the entire Matsushita group. Matsushita Electric Industrial and the group companies each has its own development organs and plans staff, and these have been planning industrial expansion as part of their individual responsibilities. However, this would make for poor investment efficiency, and the group efforts could not be properly coordinated. So they are trying to hammer out an OA area policy under the leadership of Matsushita Electric Industrial, and to develop OA as a new pillar enterprise.

The basic line of thinking with regard to OA on the part of the Matsushita Electric Industrial group is that "true OA is OA which brings forth creativity in the office with respect for man," and it seeks to attain all-out mechanization

of those daily office routines which can be mechanized, and to improve the overall efficiency of the business and management areas by a smooth operation of information treatment, storage and retrieval and communication. It further seeks the use of the extra time provided by the mechanization efforts for creative activities which make more effective use of a man's time as well as seeking to provide a more pleasant working environment. In this manner, it seeks to make the functioning of the working man more human and to create an ideal office environment where full activity takes place. This is the concept in a nutshell.

The following is the OA equipment which the Matsushita Electric Industrial group handles according to maker: Mutsushita Electric Industrial: PPC, office computer, HHC; Matsushita Communication Industry: office computer, word processors; Matsushita Electrical Transmission Equipment: facsimiles, word processors; Matsushita Industrial Equipment: gasoline POS; Kyushu Matsushita Electric Industrial: color slide production equipment, shredder; and Panafacom: personal computer.

All these items of OA equipment are marketed in Japan through the Matsushita Electric Industrial special equipment industry headquarters. Total sales were about 44 billion yen in FY-80 and accounted for one-twelfth of the total sales of this special equipment industry headquarters. The main items in this category were the facsimile of Matsushita Electrical Transmission Equipment and the office computer of Matsushita Communication Industry. A sales total of 70 billion yen is targeted for this year; efforts will be directed at improving the sales records of the PPC and office computer produced by Matsushita Electric Industrial.

The following charts show all the facsimile related sales included under the OA sales total, but the sales of Matsushita Communication Industry are not differentiated from the electronic equipment area, and this total includes electronic measurement equipment, control equipment, desk calculators and a number of other products.

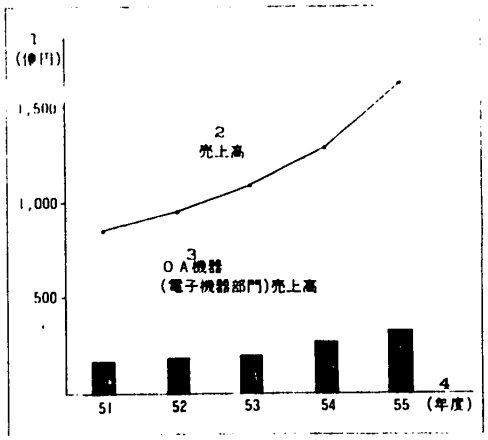


Figure 19. Total Sales and OA Equipment Sales of Matsushita Electric Industrial

[Key on following page]

Key to Figure 19:
1. (100 million yen)
2. Total sales
3. OA-related sales (electronic equipment)
4. (FY) 76, 77, 78, 79, 80

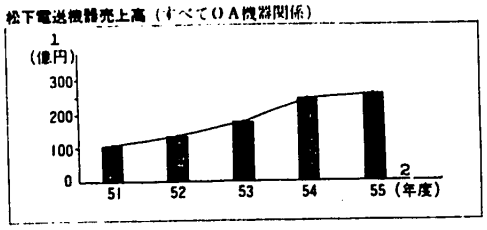


Figure 20. Sales of Matsushita Electric Industrial (All OA-Related Equipment)

Key to Figure 20:
1. (100 million yen)
2. (FY) 76, 77, 78, 79, 80

Table 28. Sales of Matsushita Electric Industrial (Unit: 100 Million Yen)

決算年度	売上高	経常利益	利益
5 昭和51年	13,106.3	841.6	413.3
6 昭和52年	14,345.2	976.8	486.1
7 昭和53年	15,980.8	1,032.7	568.5
8 昭和54年	17,344.6	1,166.6	655.2
9 昭和55年	20,153.0	1,382.3	731.5

Key to Table 28:
1. Account year
2. Total sales
3. Operating profit
4. Net profit
5. FY-76
6. FY-77
7. FY-78
8. FY-79
9. FY-80

Table 29. Sales of Matsushita Communication Industrial (Unit: 100 Million Yen)

決算年度	売上高	経常利益	利益	電子機器部門売上高
6 昭和51年	853.5	63.1	28.3	173.1
7 昭和52年	946.6	64.6	33.1	183.5
8 昭和53年	1,082.9	76.5	37.1	200.1
9 昭和54年	1,282.0	113.1	52.1	265.9
10 昭和55年	1,615.8	159.5	75.5	330.6

[Key on following page]

Key to Table 29:

1. Account year
2. Total sales
3. Operating profit
4. Net profit
5. Electronic equipment related sales
6. FY-76
7. FY-77
8. FY-78
9. FY-79
10. FY-80

Table 30. Sales of Matsushita Communication Equipment
(Unit: 100 Million Yen)

決算年度	売上高	経常利益	利益率
5 昭和51年	106.9	10.1	5.0
6 昭和52年	136.6	14.8	7.0
7 昭和53年	177.1	17.7	9.8
8 昭和54年	243.1	28.0	14.1
9 昭和55年	257.6	23.0	12.8

Key to Table 30:

1. Account year
2. Total sales
3. Operating profit
4. Net profit
5. FY-76
6. FY-77
7. FY-78
8. FY-79
9. FY-80

At the same time, the Matsushita Electric Industrial group has established OA centers in Osaka and Tokyo as one phase of its OA industry promotion, and these showrooms are jointly occupied by related businesses (mainly sales companies). This setup has brought favorable results to both publicity and sales records of Matsushita group, and plans are being readied to open many more OA centers in other major cities.

Tokyo Electric: Exploit Strength of Close Relationship with Financial Industry

Tokyo Electric is one of the satellite companies of Toshiba and has been active in a business with strength directed at financial equipment such as POS and registers. That is why the weight of the sales of this company differs greatly in the display of its scale in the OA industry depending on whether or not sales in the register area are considered as part of OA.

According to its financial report for FY-80, the main line of equipment accounted for more than 60 percent of the sales. A more detailed breakdown showed registers accounting for 27 percent, measurement equipment for 5 percent, office computer type information equipment related area for 3 percent and the rest for 25 percent, to make up this 60 percent.

As a result, when taken on a rough estimate, about 60 percent of the gross or 50.7 billion yen in sales was accounted for by OA sales, and this was 3 percent or 2.5 billion yen where office computer was concerned. Now, in addition Tokyo Electric has other equipment such as printers for computers and online window

terminal equipment for post office use which it lists under "other equipment," and if these are also included, the estimate becomes 17 billion yen or an increase of roughly 70 percent over the preceding year's sales.

The sales of printers for computer use of Tokyo Electric have increased sharply, as described above. This is an area where major effort has been directed since FY-79. Riding on the wave of rapid growth created by office computer and personal computers, sales were increased from 2.4 billion yen in FY-79 to almost three times as much, or 7 billion yen, in FY-80, and the company expects to double this total to 14 billion yen this fiscal year. The company constructed a plant solely for printer production at its Oohito Oni plant in Shizuoka Prefecture and also expanded its lines at Mishima to establish a greatly expanded production system. Thus, the company is making its effort to promote this new popular product.

Along computer related lines, Tokyo Electric is showing good sales performance for its independently developed office computer and personal computers besides the Toshiba line. This computer exploits the expert knowledge of the financial world by this company, and its personal computer "Maitec T 555-20 series" can be altered to a POS depending on the terminal system.

Tokyo Electric entered into a sales agreement with Kokuyo this spring on the "Maitec T 550-20 series," and this event clearly displayed the reinforced agreement relationship between Toshiba and Kokuyo in the OA area.

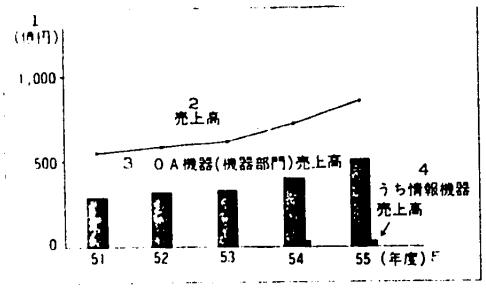


Figure 21. Total Sales and OA Equipment Sales of Tokyo Electric

Key:
1. (100 million yen)
2. Total sales
3. OA equipment (instrument area) sales
4. Part accounted for by information equipment
5. (FY) 76, 77, 78, 79, 80

Uchida Yoko: OA Door Opened by DOA

Uchida Yoko considers OA to be an overall office problem, and it has proposed "DOA" (design and office automation) as a concept which envelops OA. This term incorporates the feeling of an "OA door."

Table 31. Sales of Tokyo Electric (Unit: 100 Million Yen)

1	2	3	4	5
決算年度	売上高	経常利益	利益	機器部門売上高
6昭和51年	555.2	28.9	12.0	293.9
7昭和52年	582.3	24.1	11.7	318.5
8昭和53年	604.5	27.5	12.8	326.7
9昭和54年	725.4	43.8	21.0	397.2
10昭和55年	840.9	43.2	23.5	500.6

Key:
1. Account year
2. Total sales
3. Working profit
4. Net profit
5. Equipment sales
6. FY-76
7. FY-77
8. FY-78
9. FY-79
10. FY-80

DOA takes in three concepts--1) design automation, 2) office automation, and 3) office design--in an all-inclusive manner to cover all the elements necessary to OA directed toward research and development staff, OA for general pure office work and creation of pleasant office environment. For Uchida Yoko, which covers the entire OA area including business equipment, steel furniture, educational equipment and computers, this appears to be a goal that can be attained.

Its design automation is what is generally termed CAD "computer aided design." It is a system that enables a designer to manipulate two- or three-dimensional graphics simply, accurately and rapidly based on a small amount of data. The instrument used here is the high technology calculation personal-use computer which is combined with a digitalizer as input component and an XY plotter as output component.

The office automation units which comprise Uchida Yoko's DOA point toward a future work station which is a computer terminal with all types of capabilities encompassed within its network. At present, it has the single capabilities of a word processor and facsimile; it will gradually increase its capabilities as a computer is installed.

Office design is the creation of a pleasant working environment for people, who make up the single most important entity of an office. Uchida Yoko considers that office design is an important constituent of OA because the preparation of an environment in which OA equipment can be fully exploited and man can fully express his inherent creativity is an essential element in the development of OA.

According to the DOA concept, almost all of Uchida Yoko's sales will be OA related, but here only the computer-related sales which may be thought to represent the sales of the central nucleus were extracted to portray the trends of the computer industry department.

Uchida Yoko sells three original brands of computers--the brand "Uzac," "Seiko" and "Facom." The sales of these computers are: "Uzac," 58 percent; "Seiko,"

22 percent; and "Facom," 10 percent; however, only the sales margin of "Facom" is included here.

The Uchida microcomputer school was set up in July, and the company plans to develop a nationwide franchise chain of personal computer classrooms.

Table 32. Total Sales of Uchida Yoko
(Unit: 100 Million Yen)

1 決算年度	2 売上高	3 経常利益	4 利益	5 電算機事業部 売上高	6 事務機事業部 売上高
7 昭和51年	425.3	6.5	3.9	72.3	247.2
8 昭和52年	461.7	7.1	5.3	72.6	271.7
9 昭和53年	529.8	14.6	6.0	91.8	305.4
10 昭和54年	622.3	22.9	9.8	107.6	352.7
11 昭和55年	727.9	28.5	12.8	135.4	384.2

Key to Table 32:
1. Account year
2. Total sales
3. Working profit
4. Net profit
5. Computer industry sales
6. Business equipment sales
7. FY-76
8. FY-77
9. FY-78
10. FY-79
11. FY-80

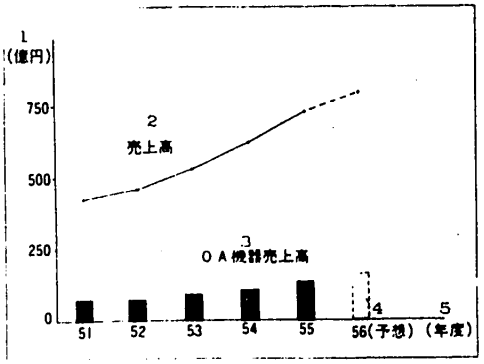


Figure 22. Total Sales and OA Equipment Sales of Uchida Yoko

Key to Figure 22:
1. (100 million yen)
2. Total sales
3. OA equipment sales
4. Estimated
5. (FY) 76, 77, 78, 79, 80, 81

Casio Calculator: Hope To Expand System Equipment

Casio Calculator is a company which was established with the objective of developing relay-type calculators, which may be considered to be the infant model of

computers. This technology gave rise to the desk calculators, and this company soon became the top maker in the field. The company also announced its Kanji office computer "Σ-8700 series" 2 years ago and opened the way for the age of Japanese language processing.

The desk calculator accounts for more than half of the total sales of this company, and this figure rises to over 90 percent if sales of the electronic watch department are included. Although its computer department makes up only 10 percent of this company, its growth since the advent of Kanji office computer has been spectacular. When this company's domestic business system was revised in January this year, reflecting the arrival of the OA age, this department was made one of the main pillars. This change divided this computer department into two: the "Digital Equipment Sales Department" which sells desk calculators and electronic watches which account for more than 90 percent of the total sales, and the "System Equipment Business Department" which sells office computer. This shows the company's solid resolution to promote office computer.

In May this year, Casio Calculator started to sell its small business computer "Σ-7 series" which is designed for economy. This is advertised as a desktop type full-fledge business computer which uses the same type hardware and software as office computer, and it is provided with a package program which is pointed toward gasoline station use.

In the area of facsimiles, in addition to its self-developed "Casio FAX 2000 series," it has the series of medium-speed to high-speed units which this company developed in cooperation with Hitachi Limited, giving this company an abundant array of equipment.

A Japanese word processor "Casio WP-1" was displayed at the business show held in May this year. This unit can use any of 3 input modes: 1) the self-developed Casio page tablet mode, 2) the Kana-Kanji interchangeable mode, and 3) the JIS 4 digit code input mode. Provisions have been made for the user to select whichever input mode he desires.

There has been talk that this company is to start development on plain paper copier, and it appears to be ready to go into all-out involvement in system equipment in readiness for the OA age.

Part III. Semiconductor Industry

[Article by computer/semiconductor journalist Tomio Uchida: "Real Strength Diagnosis of Japan's Top Semiconductor Companies"]

[Text] The Japanese semiconductor IC industry, which the phrase "a pleasant voyage with a favoring wind at the back" fits almost perfectly, while presently undergoing a temporary cloudy situation as the result of unfavorable domestic and foreign market environment, is still flourishing greatly as a basic industry for the 1980's decade. Each of the top makers of semiconductor is a part of a leading electronics company and is vertically integrated into the parent company. Thus, they possess unique overall strength (capital, developmental technology, mass production, manpower resources) not seen in foreign competitive makers, and are promoting a large-scale international market strategy.

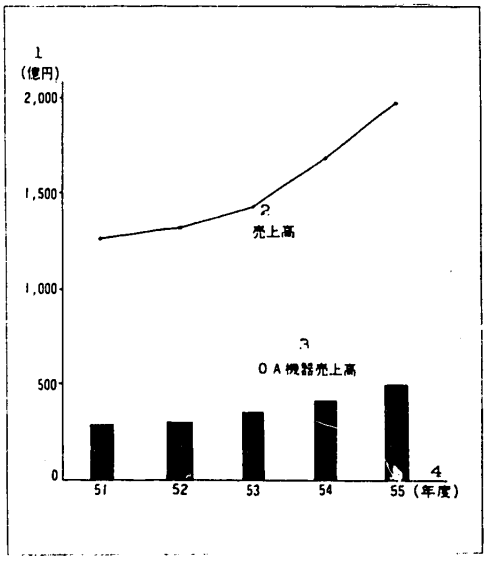


Figure 23. Total Sales and OA Equipment Sales of Casio Calculator

Key:to Figure 23:
1. (100 million yen)
2. Total sales
3. OA equipment sales
4. (FY) 76, 77, 78, 79, 80

Table 33. Total Sales of Casio Calculator
(Unit: 100 Million Yen)

1 決算年度	2 売上高	3 経常利益	4 利益	5 電算機, その他部門売上高
6 昭和51年	545.6	24.3	15.0	54.0
7 昭和52年	630.5	38.7	18.1	[illegible]
8 昭和53年	809.4	62.0	28.1	67.0
9 昭和54年	1,036.4	85.8	38.3	100.1
10 昭和55年	1,570.1	106.1	46.3	145.3

Key to Table 33:
1. Account year
2. Total sales
3. Operating profit
4. Net profit
5. Computers and related sales
6. FY-76
7. FY-77
8. FY-78
9. FY-79
10. FY-80

This onslaught is beautifully reflected in the growth rate in sales for the past 3 years of the top 10 companies which is shown in Table 34. These top 10 companies collectively chalked up growth rates of 32.3 percent, 31 percent and 30

percent during FY-78, FY-79 and FY-80. (The growth between FY-80 and FY-81 cannot be compared at this stage because the sales total and production totals differ.)

Table 34. Trends in Sales of Top 10 Semiconductor Companies
(Unit: 100 Million Yen)

	1 53 年度	2 54 年度	3 55 年度	4 56 年度*
5 日本電気	1,195 (31.8)	1,575 (29.8)	2,045	2,650
6 日立製作所	1,000 (30)	1,300 (27)	1,650	2,050
7 東京芝浦電気	850 (17.6)	1,000 (30)	1,300	1,850
8 富士通	286 (97.6)	565 (59,3)	900	1,200
9 松下電子工業	400 (25)	500 (30)	650	1,200
10 シャープ	384 (45.8)	560 (19.6)	670	856
11 三菱電機	385 (14.3)	440 (22.7)	540	800
12 東京三洋電機	250 (24)	310 (29)	400	530
13 沖電気工業	107 (63.6)	175 (48.6)	260	350
14 ソニー	—	—	—	250
15 合計	4,857 (32.3)	6,425 (31.0)	8,415	11,686

Source: Taken from a Nikkei survey and other data (The semiconductor products included are IC and individual semiconductor elements.)

(Note) 1. * is production value (estimated including intracompany consumption). Total sales for the other years.
2. Value in parentheses is rate of growth compared to preceding year.

Key:
1. FY-78
2. FY-79
3. FY-80
4. FY-81*
5. Nippon Electric
6. Hitachi Limited
7. Toshiba Corporation
8. Fujitsu
9. Matsushita Electronic Industrial
10. Sharp
11. Mitsubishi Electric
12. Tokyo Sanyo Electric
13. Oki Electric Industries
14. Sony
15. Total

The rankings and shares in the production scale for these 10 companies are shown in Table 35 and Figure 24; it can be seen that the top 3 companies (Nippon Electric, Hitachi and Toshiba) accounted for more than 50 percent of the total in each of the 3 fiscal years. (On the other hand, the share of these top three has decreased from 60 percent to the 50-percent level since FY-79.)

Considerable changes in rank are seen in the next four companies which comprise the middle level. Among these, the sales record of Fujitsu, which occupies fourth rank, has shown increases of 97.6 percent and 59.3 percent for FY-78 and FY-79. The following three companies (Tokyo Sanyo, Oki Electric and Sony) include one, Oki Electric, which has registered a large increase in sales through a plan dedicated to developing mass production and mass sales as its IC strategy.

Table 35. Order in Total Semiconductor Sales of Top 10 Companies

順位	53年度	54年度	55年度	(56年度)
1	日電	日電	日電	日電
2	日立	日立	日立	日立
3	東芝	東芝	東芝	東芝
4	松下電子	富士通	富士通	富士通
5	三菱	シャープ	シャープ	松下電子
6	シャープ	松下電子	松下電子	シャープ
7	富士通	三菱	三菱	三菱
8	東京三洋	東京三洋	東京三洋	東京三洋
9	沖電気	沖電気	沖電気	沖電気
10	—	—	—	ソニー

(注) *は推定生産金額ベースによる順位

Key to Table 35:

1. Rank
2. FY-78
3. FY-79
4. FY-80
5. FY-81
6. Nippon Electric
7. Hitachi
8. Toshiba
9. Matsushita Electronic
10. Mitsubishi
11. Sharp
12. Fujitsu
13. Tokyo Sanyo
14. Oki Electric
15. Sony
16. (Note) *rank on basis of estimated production value

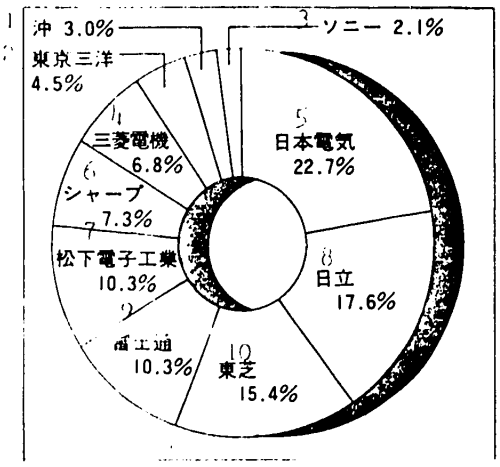


Figure 24. Share Distribution of Production for Top 10 Semiconductor Companies (FY-81)

[Key on following page]

Key to Figure 24:

1. Oki 3.0 percent
2. Sony 2.1 percent
3. Tokyo Sanyo 4.5 percent
4. Mitsubishi Electric 6.8 percent
5. Nippon Electric 22.7 percent
6. Sharp 7.3 percent
7. Matsushita Electronic Industrial 10.3 percent
8. Hitachi 17.6 percent
9. Fujitsu 10.3 percent
10. Toshiba 15.4 percent

The top 10 companies have developed strong and well-ordered marketing practices, but they all face common problems as they make the transition from this year to the next. There is considerable possibility that the counter policies and their execution with respect to these problems so important to the IC market strategy will greatly influence the directions of these 10 companies. The problems which will be faced are summarized in the following six examples.

Supply and demand of certain types of IC will vary with diversified product demand and supply: During the first part of this year, the IC market for desk calculators and watches was facing a dull business, while, on the other hand, IC for home-use VTR was experiencing an explosive demand. The makers are forced to estimate just how much demand for microcomputer and audio synthesizer LSI will increase for computer use (PA equipment and personal computers).

Timing of mass produced LSI memory replacement: The 64-K dynamic RAM (instant write-in and readout memory, which is expected to burst into its growth period in 1982, is presently undergoing a large reduction in price. (Where it cost 20,000 yen per unit last fall, it cost 2,000 yen per unit this September.) It is urgently necessary to develop a plastic package type (low-cost type), to establish a mass production and delivery system in line with the market situation and to lower its price per bit to match that of the 16-K DRAM by the end of 1982.

Responding to the dizzy changes in the IC trade: The IC trade with the United States, which had just begun to be black last year, once more turned red during the first half (January-June) of this year. The business recession in the United States and the accompanying stagnation of the IC market (particularly in the 16-K DRAM) is the underlying cause. Finally, in September some signs of recovery began to appear. Be that as it may, development of domestic demand and establishment of sales systems will probably be necessary for the time being in order to cover this lag in exports.

Promotion of "mutual entry competition" with foreign capital: Both Japan TI and Japan IBM are making good progress with their VLSI mass-production plants, and at the end of September the world's second largest semiconductor maker, Motorola, announced plans to set up a VLSI production plant. (Oita Prefecture in Kyushu is at present the leading choice.) On the American side, there are other companies such as Fairchild and AMM which are eyeing possible IC production in Japan. On the other side of the coin, Japanese companies including Nippon Electric, Hitachi, Toshiba and Fujitsu are digging in their spurs to finance the establishment of production sites in the United States.

IC import duty will be lowered to 4.2 percent starting next year: Put in the simplest terms, this is an advantageous change for the American IC maker in his entry into the Japanese market. The Japanese must maintain their sales routes

within the United States through reinforced mass production of IC in the United States in order to erase trade friction with the United States.

Pursuit of medium-size IC makers emerging with unique individual products: Companies which make IC for intracompany use or make custom/semicustom IC as their specialty are increasing. This is a market whose scale is not very large, but it is an area of large growth rate, and it is viewed that the top semiconductor IC makers will inevitably enter into it.

Profile of Top Five Companies

Nippon Electric

According to a survey compiled by the Dataquest Company of the United States, in FY-80 the IC production record of Nippon Electric, which is Japan's top semiconductor maker, was second only to Texas Instruments (TI) of the United States throughout the world, and when individual semiconductors are included, it ranked third behind TI and Motorola. The "Production Trends in the Electronic Device Area" and "Increased LSI Production Plan" which this company released in May of this year are given in Table 36 and Table 37.

Table 36. Production Trends in Electronic Devices at Nippon Electric (Unit: 100 Million Yen)

	1 54年度実績	2 55年度実績	3 56年度計画
IC	1,030	1,535	1,900
4 半導体	570	645	750
5 その他	505	630	750
合計 6	2,105	2,810	3,400

Key:
1. Results for FY-79
2. Results for FY-80
3. Plans for FY-81
4. Semiconductors
5. Others
6. Total

A goal of 300-billion-yen production is seen for the entire electronic device area, and the mainstay here is the IC (190 billion yen) which includes micon (microprocessor), memory, desk-calculator use LSI and watch-use LSI; in the latter area the long period of reduced production on the part of watchmakers such as Casio and Seiko are taking effect, so the sales for the second half of FY-81 are expected to decrease about 10 percent below last year.

In another direction, the micon (particularly the 8-bit and the 16-bit) is playing the tractor role for semiconductor products, while production of the highly visible memory, the 64-K DRAM, is planned to be "frozen" at the 200,000 to 300,000 units/month level, at least until the latter half of next year, at which time the computer makers who are the prime customers (market) will complete

Table 37. Plans for Increased LSI Production at Nippon Electric (Unit: 10,000 Piece (Monthly))

	1 55 年 度	2 56 年 度
[illegible]	350	500
[illegible]	500	650
[illegible]	350	450
[illegible]	350	400
[illegible]	300	300
[illegible]	1,850	2,300

Key:
1. FY-80
2. FY-81
3. Micon (without memory)
4. Memory
5. For desk calculators
6. For watches
7. Others
8. Total

their 64-K RAM trial and assessment. On the other hand, the 16-K DRAM market in the United States has been languishing and a situation of oversupply has existed since the end of last year, but about the end of August Nippon Electric judged that the oversupply situation in the United States no longer existed, and it restored its production scale, which had been in a state of temporary cut-back (1.6 million units/month), to the top monthly production level of 3 million units/month (Kyushu Nichiden 1.6 million, American NEC Electronics 900,000, NEC Ireland 500,000).

Hitachi Limited

Judging that VTR and OA will be the prime movers of the entire semiconductor demand, increased production of micon and linear IC has become the main force in the FY-81 plan. Sample delivery of the 16-bit 68000 micon was initiated in the first half of the year, and this product is expected to see increased demand. There has been a sharp increase in demand for linear IC since the start of this year for use in television, audio equipment, VTR/disk and automobiles. This company, which is the top maker of linear IC for VTR use, is expected to increase production.

In the area of the 64-K DRAM, which is expected to be the mainstay of the next generation memory, in October this company scooped all other companies by entering into a mass-production/sales system for plastic sealed units. In the past, this company used ceramic and cer-DIP (glass) as sealing material for the 64-K DRAM, but it is now increasing its plastic-sealed unit production with superior productivity, reliability and cost factor (production cost can be lowered by about 100 yen/unit over ceramic), and 10-20 percent of its production is expected to be plastic sealed by the end of the year. During the latter half of FY-81, Hitachi is expected to increase production of the 64-K DRAM at its Musashi plant

to 700,000 units/month. In addition, the Kofu branch plant in Yamanashi Prefecture is expected to begin production of the same RAM in the next fiscal year, and the 64-K DRAM production capacity is expected to break the million units/month level after the next fiscal year; this company seems about to take the lead role in this area.

Toshiba

Toshiba during the latter half of this fiscal year (September-March) is reinforcing the production systems at its Oita plant with the latest LSI production line which was completed in July, and at its Kitakyushi plant (bipolar IC mass production base) which is a transistor plant refurbished with a clean room, and it is going into all-out development in order to achieve its goal of 170 billion yen in sales. The market it seeks is the semiconductor for consumer goods such as the VTR audio line, for which high demand is expected to continue, and the computer (OA equipment) area; these are the areas where this company is expected to focus its attention. The important item for the latter half will be micon market development, where a monthly production of 1 million units is being sought including CMOS micon for automobile use.

Where memory is concerned, plans are underway to promote strengthening dynamic RAM production, an item which accounts for half of the market. (The combined production of its Oita plant and Toshiba Semiconductor USA is expected to reach 1 million 64-K DRAM units/month this year.) On the other hand, the price of this RAM dropped even before it entered mass production, and this company is expected to concentrate on its specialty area of static RAM (16-K, 64-K) while waiting to see how the market performs.

Fujitsu

Just as with the top three companies, Fujitsu had good sales record through the first half of FY-81 (April-September) with respect to semiconducturs for private use VTR and semiconductors in the computer related OA area. This compensated for the poor record of the memory department where sales increased but price dropped, and sales total dropped. On the contrary, in the latter half of the year, the company hopes for success in a logic product, the 16-bit micon (8086), whose sample was shipped out starting in September, followed by the 8-bit micon (8048, 8049), the popular bipolar high-speed memory and PROM in the memory-products area, and the Japanese Kanji ROM for OA systems.

The company is continuing mass production of the 16-K DRAM, which seems to be returning to market stability in the area of the dynamic RAM, but price competition in the 64-K DRAM is so fierce so that this company is preparing a set-up which can start mass production at any time while keeping a watchful eye on the market situation during the latter half of the year. Mass production of the 64-K has been increased to a monthly output of 300,000 units from 150,000 units in June, and the plan is to increase this production to 600,000 units by the end of next year. It is thought that this company together with Hitachi will serve as the prime movers for mass production of the 64-K DRAM.

Matsushita Electronic Industrial

Matsushita Electronic posted the enviable record of 50 percent increase in sales over the previous period, to 54.6 billion yen during the first half (January-June) of FY-81. It is aiming at a 20-percent increase to 65.5 billion yen during the second half, and it hopes to attain a 50-percent increase over the next year to 120 billion yen throughout this fiscal year.

This company's plans for increased semiconductor production (FY-80 to FY-81) are shown in Table 38; spectacular increases are seen in IC, discrete (individual) elements and micons. The growth of the micon sales of this company, which is said to hold 40 percent of the 16-bit market share, is tremendous within the framework of this plan; the company's micon production already exceeded the yearend goal of 2 million units to 2.56 million units by a little after the middle of the year, and this total is expected to come up to 3 million by the end of the year.

Table 38. Semiconductor Production Plans of Matsushita Electronic Industrial (Unit: 1 Million/Month)

	55年末 1	56年末 2	増加率(%) 3
4〈集積回路〉			
5バイポーラIC	22	36	63.6
LSI	5	9	80.0
6〈ディスクリート〉			
7			
8パワートランジスタ			
9ダイオード	80	150	87.5
LED	20	35	75.0
10〈マイコン〉			
11 4、8、16ビット	1	2	100.0

Key:
1. End of 1980
2. End of 1981
3. Rate of increase (%)
4. Integrated circuits
5. Bipolar IC
6. Discrete elements
7. Small signal transistor
8. Power transistor
9. Diode
10. Micon
11. 4, 8, 16 bit

This company's investments in semiconductor installations to back up its plans for increased production totaled 22 billion yen in FY-81, the same as in the preceding fiscal year. These investments are directed at the new construction of a VLSI Business Department (Kyoto Nagaoka plant) in February (plans are to produce 1.5-2 million VLSI by end of the year) and the expansion of the Arai plant in Niigata (monthly production of 40 million IC possible in September, currently producing 2 million LSI).

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END