

Yayoi Seiki Co., Ltd.

In spring of 1973, the management of Yayoi Seiki Co., Ltd., a manufacturer of metal cutting tools, were concerned about the problems in meeting deliveries and declining market share.

Outline of the Company and its Sales Activities

Yayoi Seiki Co., Ltd. was a specialized manufacturer of cutting tools like metal cutting tools, blades for saws, slitters, etc. The company's products were delivered to precision manufacturers of cameras, watches, telescopes, microscopes and their parts subcontractors in Kanto, Chubu and Kansai areas. The products were distributed through its several dozen agents (dealers) and the company had a good reputation for its stable quality among its users. In 1973, there were over 1,000 kinds of product models, counting minor differences in their specifications, and the variety was gradually increasing. The prices also varied according to type, size and other specifications, ranging from several hundred yen to over 10,000 yen a piece.

The sales turnover and profit before tax in 1972 was ¥2,619 million and ¥253 million respectively and the company had been one of the five biggest in this line of industry. From around 1955, the company's annual growth took off to the level of 20-25% in accordance with the growth of camera and watch industries. In recent years the company maintained 20% level growth per annum because of additional demand from telescope and microscope manufacturers. (See Exhibit 1 for the past 3 year sales record.) However, the management was concerned at the slight downward trend in market share that the company had experienced for the past two years. The market share of individual product type seemed to range from 5 to 20%. Aoyama Seiki Co., Ltd., the top manufacturer in this industry was by far bigger than other companies of same trade in sales and profit (the sales turnover of Aoyama in 1972 was approximately ¥5 billion). And Aoyama's product line was quite different from others. Other major companies including Yayoi produced and sold mainly JIS (Japan Industrial Standard) specification products, whereas nearly 90% of Aoyama's product line was non-JIS specification products and it was by far the strongest in this field.

Yayoi Seiki was selling most of its products to its customers -- precision machinery manufacturers and their subcontractors -- through

This case was developed as basis for class discussion by Keinosuke Ono, then lecturer of Graduate School of Business Administration, Keio University. Figures and names used are all disguised (March, 1974).

Yayoi's several dozen agents (dealers). The dealer network covered Kanto, Chubu and Kansai districts and over 70% of the sales came from Kanto district, or the Greater Tokyo Area.

In autumn of 1970, the company decided to go into the substantial production of non-JIS specification items of which the company had little experience. Yayoi started to sell directly to customers in addition to using existing dealers and accordingly increased the number of sales staff from 59 to 67 (including the department manager). After several months, the orders for non-JIS items spec. products through both sales routes started to increase steadily and in the second half of 1972, accounted for over 10% of sales value. Since the company could charge 15-30% more for those non-JIS items compared to JIS products of the same size and type, the management expected that the growth in this field would greatly contribute to the improvement of profitability. And, the market for non-JIS items seemed to be growing at a slightly higher pace than that of JIS items, although there was no explicit data available to prove it. The management of Yayoi also expected that the company could have easier access to the overseas markets with its non-JIS product business. In fact, export orders through trading companies gradually increased. However, the export accounted for only about 2% of the company sales in 1972.

As of spring 1973, the company had 579 employees and a factory in Kawasaki City (a big industrial city adjacent to Tokyo) and sales office in Tokyo, Nagoya and Osaka (Exhibit 2 shows the number of employees in the past 3 years and Exhibit 3 shows the organization chart of the company as of March, 1973). At that time, the company's stocks were not open to public subscribers and 35% of the issued shares was held by Mr. Shonosuke Yayoi, the president, 15% by Mr. Isao Yayoi, the president's brother and managing director, 40% by their relatives and the remaining 10% by Mr. Ohfuna, the senior managing director and 4 other directors.

Reception of Orders and Delivery of Products

Over 1,000 models of Yayoi's products were classified in 3 categories from the delivery management point of view.

Group A : Production to orders

- *JIS spec. products whose orders from the past sales experience had been small in amount and very infrequent.
- *All of non-JIS spec. products (special spec.)

Group B : Keeping stock in the main office (the Product Warehouse Section).

- *JIS spec. products whose orders had been rather frequent according to the past experience but the volume of sales had been rather unstable.

Group C : Keeping stocks in sales offices as well as in the main office.
*JIS spec. products whose sales volume had been relatively stable (or steadily increasing).

The classification of product items was revised every March based on the previous year's record at the production/sales coordination meeting, and at the same time, the standard shipment prices of JIS spec. products were also revised. In 1972, 75%, 15%, 10% fell into Groups A, B, C respectively by number of models; approximately 10%, 30%, 60% by sales volume, and approximately 20%, 40%, 40% by sales value. Each sales office, upon receiving an order from a distributor, delivered, in principle, Group C products from its own stock, Group B getting supply from the Sales Section of the main office to the customers (dealers). As for Group A products, a request for the production was made for each order through the Sales Section of the main office.

Standard lead time (delivery time) set from a receipt of order to its delivery to the customers (dealers) was 3 days for Group C items and 10 days for Group B items (7 days for Tokyo Sales Office's territory, ; 5 days for the Sales Section's territory). Delivery due-date for Group A products was negotiated each time according to product type, and specification (size, grade of finishing, requirements for special processing, etc.). In this case each sales office negotiated with its customers (dealers) keeping in mind the figures in Group A column of sales/production plan (see Exhibit 5) issued by the Sales Section of the main office at the end of each month and the outstanding order volume. However, the Sales Department had a principle "to deliver for Group A orders within a month as far as possible". Maximum efforts were made to comply with this principle. These standard delivery leadtimes, compared with competitors, were comparatively short and the head of the Sales Department attributed a big factor for the company's competitiveness to this short lead time and the reliability of products. Shipment of products in Groups A and B and replenishment of Group C products from the main office to each sales office were done once or twice a week by trucks (Monday and Thursday to Tokyo Sales Office, Tuesday to Nagoya and Osaka Offices). Stock levels at the sales offices for Group C products were determined based on the past sales records, and supply orders for the following week (the dead line was Friday) were placed so that Nagoya and Osaka Sales Offices would have their 2-week sales equivalent stock and Tokyo would have one week equivalent at the time of delivery mentioned above. For Groups B and C products, the Product Warehouse of the main office was expected to carry the stocks of 1.5 months equivalent to the previous year's sales figure, at the end of each month.

Production/Sales/Inventory Plan, Production Schedule, Material Procurement

Three sales offices of the company (Tokyo, Nagoya and Osaka) and the Sales Section of the main office (which also functioned as the

sales office for Yokohama and Kawasaki area) made sales forecast for the following 4 months in the middle of each month. The 3 sales offices sent their sales plans to the Sales Section of the main office by delivery to arrive by the 20th of each month. (See Exhibit 4.) The forecast or scheduled sales volume (shipment) was detailed by product model for Group B and C items and by kind and size (large, medium, small)*¹ for Group A items.

As for Group A, most of the products due to be delivered next month and a part of the month after were based on firm orders. Yet for others, the figures were sales forecasts determined by the sales offices based on their experience and customer's (dealers) information. For Group B and C products, due to their nature, almost all were sales forecast figures although a part of them were based on firm orders that had not yet been delivered owing to the lack of stocks. For Group C products, the requests for supply calculated from the sales forecast figures and the expected stock levels in each sales office were also declared.

The Sales Section of the main office, then, drafted a tentative production/sales/inventory plan of the month based on the previous month's production/sales/inventory plan and necessary shipment volume by product type. This plan was sent to the Production Department by around 23rd of every month. Then, a production/sales coordination meeting was held to review this (tentative) plan. Attended at this meeting were, Production Department Manager, the heads of No. 1, No. 2, and No. 3 Production Sections, the heads of the Production Control Section, the Inspection Section and the chief planning clerk of the Production Control Section from the Production Department side, and Sales Department Manager, the head of the Sales Section and the Product Warehouse Section, and the chief delivery control clerk of the Sales Section from the Sales Department side. First, an explanation was given by the sales side concerning the plan, followed by requests from the production side on the revision of the plan for certain models. Increase/decrease of these figures were negotiated. The requests from the production side were of two kinds --- one was to increase the size of batches of small volume models, and the other was to decrease the volume of the items whose production was unlikely to be completed in time. Negotiations resulted in compromise of both sides or concession of one side. It was more often the case that the Production Department's requests were accepted. However the planned figures for the Group A products for the following month were seldom changed because most of these production orders were already in progress. The changes in production plan were often adjusted by changing the planned inventory levels at the main office but it was sometimes adjusted also by changing the planned shipment volumes. Which adjustment to choose was left to the sales side. It was a common scene in this meeting to see the sales side making complaints about delays of actual production in the previous month whereas the production side pointing out the frequent

*1: Size is classified for each product accounting to dimension ranges (diameter, thickness, etc.) by the Production Control Section.

changes in production orders and many short-noticed orders coming from the sales side in the previous month.

When the adjustments were completed in this production sales coordination meeting, the Sales Section immediately made copies of the confirmed plan and distributed them to the Production Department and the Procurement Department. In the Production Department, a planning clerk in the Production Control Section, based on this plan and with the cooperation of the head and a progress clerk of the No. 3 Production Section, made a production schedule for the next two months for Group B and C products. This schedule showed the schedule of completion of each product at the final process of production, ready to be sent to the Inspection Section for final inspection. (See Exhibit 6.) To decide the production schedule, special consideration was made: (1) To minimize the changes in the portion that overlaps with the production schedule made in the previous month (the first month portion of the current schedule). (2) To give higher priority to the products that are already out of stock or short of end-of-month stock. (3) To group orders of same product type and try to produce them at one time. As a result of this, one lot usually accounted for one month's production except for certain very big volume orders which needed to be produced in 2 or 3 lots. Three Production Sections could predict from this schedule when and what sort of production orders they would get by use of the production control standards already furnished by the Production Control Section. Since each Production Section had its own inspectors and conducted in-process inspection, the Inspection Section was in charge of only final inspection, whose process lead time was set as 2 days.

The Procurement Department arranged the purchasing of materials, jigs, tools, cutting oils, etc. based on the production/sales/inventory plan and the production schedule already distributed. Both periodical (monthly) and reorder point systems were used for placing orders. It was rare that production was hindered because of material shortage except special cases for non-JIS spec. products. Some jigs and tools were made in-house based on special orders and recently the completion of these were often delayed.

The planning clerk in Production Control Section issued a production order for each product model based on the production schedule and the production control standards. The production order included production order number, product type, scheduled completion date for each process block, in-coming volume at each process, minimum usable volume expected at each inspection point, etc.*² Whenever they find this minimum volume unattained at the inspection points located at the end of each process block, it was immediately reported by a progress clerk to the control clerk of Production Control Section. In this case, the control clerk, consulting with the planning clerk, either revised the

*2: To obtain the required number of non-defective pieces for the Sales Section, the production order was enlarged with some allowance of defective production.

minimum usable volume expected for the following processes or issued an additional express small lot order to fill the gap. If the final completion volume was likely to be insufficient, they asked for the consent of the Sales Section.

Group A products were, in principle, produced to order. However, there might exist some small stocks of such products due to changes or cancellation in previous orders; or misarrangement by the Production Control Section; or as a result of previously making the volume of a very small order bigger [by the Production Control Section] with a consent of the Sales Section. Most of these were JIS-spec. products. The stock volumes of these products, together with these the Group B and C products, were constantly informed to the Sales Section by the Product Warehouse Section. The Sales Section, upon receipt of orders for Group A products from customers (of its own territory) and the sales offices, first checked whether there were such exceptional stocks for the items. It was not rare that a small order of one or two pieces were supplied from this kind of product stocks. However, when it became clear that this kind of stocks did not exist, the Sales Section sent a production request sheet for the order to the Production Control Section. On this sheet, request sheet number, name of product, drawing number, volume, desired completion date (delivery date to the Product Warehouse Section) were listed. And the drawing that had been prepared by the Engineering Department was attached to this sheet. In the case of an entirely new order, it took 3 days to one week for the Engineering Department to prepare the drawing.

According to the company's production control standards, most of their products were produced with production lead time of 20 to 30 days (including inspection process). Most of delivery lead time (delivery date to the Product Warehouse Section) specified by the Sales Section fell in 20 to 30 days range although in some cases they were longer or shorter than this range. The Production Control Section did not have any complaint for a longer delivery lead time but for a short-noticed order of less than 20 days, the section head or the chief clerk expressed a complaint to the Sales Section and often demanded a change of delivery date. However, when this change was not possible, "express order" was red-stamped on the production order sheet by the planning chief. Express orders of this kind accounted for 5 to 20 cases of about 150 orders for Group A products that came every week from the Sales Section. And the planning chief of the Production Control Section felt that such changes had been increasing recently.

Production control after the issue of production orders was done by the progress clerks. Five to seven progress clerks assigned to each Production Section controlled the progress of production orders keeping constantly in touch with the group-foremen (processes block chiefs) and foremen (process chiefs). For a slow moving production order, progressing behind the specified schedule, "red-tag" (eligible only within each Production Section) was attached with a clip. If a delay was unlikely to be caught-up within his own section, the progress clerk reported that to a control clerk in the Production Control Section.

There were 8 control clerks (including the chief). When they were informed of this, they made utmost efforts to make adjustments with progress clerks in the next section. And when they found production orders that would inevitably be delayed, they named the production order to an "express orders" with permission of their chief. At that time, over several hundreds production orders (about half were for Group A products, the remaining half were for B and C products) were constantly flowing in the factory and 10-20% of the orders were red-stamped "express orders", and other 20-30% had "red-tag" attached. Consequently, each month, 10-20% of the orders could not meet the scheduled completion dates specified in the production schedule.

Production Activity

The products of Yayoi Seiki Co., Ltd. were tools like cutters, blades for saws, slitters used for metal machine tools in manufacturing precision equipment such as cameras, telescopes, microscopes and watches. There were over 1,000 kinds of product models counting the minor differences in their specifications. Take milling machine cutters, the company's main product, for example, the product sizes ranged from 0.3 mm to 3mm in thickness, 10 mm to 200 mm in diameter, and counting the types of edge, shapes of central bore, needs for special machining for key grooves and others, the number of the product model amounted to over several hundreds.

Production activity of the company was carried out by No. 1, 2, and 3 Production Sections and they were located in each workshop building which were connected by covered ways. In the No. 1 Production Section, 90 machine tools such as presses, lathes, drilling machines and broaches were installed and 153 people were working there including the section head, 2 group-foremen and 11 foremen. In this shop, in addition to basic machining like cutting, stamping by press, rough grinding, outer diameter cutting, boring, special machining like key grooves cutting, special boring were done. Most of the workers in this shop were men and most processes were operated on two shifts.

The No. 2 Production Section was equipped with 79 machines mainly varieties of grinding machines and a total of 127 people, including the section head, 2 group-foremen, and 8 foremen were working there. The main work in this shop was several steps of machining on the varied basic machining done in the No. 1 Section. Grinding works for jigs and tools were also done in a part of this shop. Most of the workers in this shop were also men and most of the processes were operated on two shifts.

In the No. 3 Production Section, there were 19 machines and equipment or heat treatment, pickling (tank), corrosion-prevention (oil tank), printing, wrapping and packing, and 59 people were working there including the section head, 2 group-foremen and 5 foremen. The

processes of this shop were; heat treatment (quenching, tempering); pickling; anti-corrosive treatment; printing of product marks, sizes and other specification, and the company's mark on the finished products; wrapping, bagging and packing. The Inspection Section consisting of 24 persons was also located in the same building and the final inspections were done here. More than half of workers of the No. 3 Production Section and the Inspection Section were women and other than the heat treatment process which was on 3 shifts, all were on one shift operation. However, in this shop, overtime work was increasing recently. 2,500 man-hour overtime in the No. 3 Production Section alone and 1,500 man-hour in Inspection Section were actually recorded as March, 1973. About 10 persons were hired as part time workers in the No. 3 Production Section and several in the Inspection Section in addition to the numbers above-mentioned. Others were all regular employees of the company.

As to the lead time, it required 20 to 30 days in most cases from outgoing of materials from the Procurement Department to the completion of final inspection although it varied according to the types, sizes, required accuracy (tolerance) and lot sizes of products.

At that time, the Production Engineering Section of the Engineering Department, was revising the standard times. This section was in charge of technical guidance on production, work improvement, establishment of production control standards (routing, standard time, etc.). In February 1973, the Production Engineering Section, as part of this revision work, conducted a work sampling survey on the 3 Production Sections.*³ The survey covered both direct and indirect workers of each section and a flat 20% of the workers, from each process block and from each indirect workers group (such as inspection, jig and tool grinding and materials handling) were chosen by random sampling.*⁴ The outcome of the work sampling survey was summarized as follows:

	No. 1 Prod. Sec.	No. 2 Prod. Sec.	No. 3 Prod. Sec.
Primary work	68.1%	64.3%	74.3%
Set-up and clean-up work	17.4	18.6	10.2
Normal allowance (§1)	11.6	14.5	7.8
Abnormal allowance (§2)	2.9	2.6	7.7

§1 Operating allowance (adjustment of machines, tidying up of workshop), personal allowance, shop allowance (waiting, meeting) are included and used as references in determining the allowance to be included in standard time.

§2 Walking without obvious purposes, chatting, absence are included in this category. They were not counted in setting the time standards.

*3: The section in charge of maintenance, repair and management of machinery and equipments.

*4: The survey was done only on the first shift work.

Management's View

In March 1973, the management of the company told the case writer the followings.

[President]

You may not know, if you are not engaged in this business, that this business is a fairly difficult one. So far, my company seems to be growing steadily, yet, we see some dark clouds on the horizon, especially in the decline in our market share although it is still a slight decline. We've got to do our job better. I am really hoping to see the sales of non-JIS spec. products will grow. By increasing the portion in this fields, I think we can increase our profitability. I am confident in our product quality. Our Engineering Department is doing an excellent job.

I always stress some key management factors to control our business.

I tell the Sales Manager to "increase sales which is the most important thing, and to minimize account receivables and product stock levels". Of course, I know that it is inevitable for account receivables and product stocks to increase in accordance with the increase of sales. What I am always saying is to maintain or improve our account receivables/sales ratio and product stock/sales ratio.

Similarly, I tell the Production Manager to "increase production volume and value, to improve the rate of work-in-process to the production value and to minimize the ratio of production cost to sales".

To the Procurement Manager, I remind the importance of the material stock/production value ratio and the purchasing prices of materials, especially of high speed steel sheet which is used most heavily in our company. However, materials prices fluctuate according to the market situation and are sometimes beyond the Procurement Department's control so we have to consider it.

To sum up, my principle is to evaluate them by their results rather than their efforts. As you know, for a growing company like ours, the biggest problem is how to finance the ever increasing working capital. We have to purchase more materials and employ more people to increase production and the return comes back much later. Yet the money recovered has to be poured in for further growth immediately. And, in the meantime, we've got to raise funds for investments to increase and expand the factory site, building and facilities. Indeed, we are always in shortage of money.

[Sales Department Manager]

The biggest problem for us is that the Production Department doesn't keep the agreed production schedule or production orders. Recently this is particularly so with the delays in Group A products. Also for Group B and C products, it is not unusual that we face troubles with customers because of stock-out due to delays in production schedule. After all it is we who get complaints. Very recently, one dealer in Osaka area stopped dealing with us and frequent delay in delivery was one of the reasons for the case. Consequently, that dealer started dealing with one of our competitors in the Kansai area. To avoid running out of stocks, we need to carry more stocks, but if we do have much higher stocks, our President shows displeasure. If this problem is solved and if we can accept more short-noticed orders and avoid delayed deliveries (for Group A products) and stockouts (for Group B and C products), we can easily increase our sales by 20 to 30%. We get very few complaints about our product quality.

[Production Department Manager]

Everyone in the shops is doing his best. The biggest problem for us is how we can keep our schedule for each production order. Just think of the numbers of production orders we have to follow. Well, over 500 orders are constantly in progress. Besides, the production orders for Group A products do not give us enough production lead times. On top of this, they often demand us earlier delivery dates than agreed, then increases or decreases of order volumes. This sort of changes are requested every day, and we often get more than 10 cases of such changes a day. In principle, we do not accept changes in volume for Group B and C products whose production orders are already issued and in operation. To increase an order volume after the start of operation requires placing an additional new order of small volume and this has to be treated as an "express order" in order to catch up the original order. In the case of a reduction in order, there may be a larger number of splitted smaller lots. Anyway the number of orders will increase and it reduces our production efficiency. Demand forecast on Group B and C products is not reliable. If more reliable projections are done and if we can keep our production runs longer, we can further increase the production output and avoid the delays in schedule. We are now preparing for the installation of several new machines in the No. 1 and the No. 2 Sections. We will have to think of enlarging the building after this.

[Procurement Department Manager]

Our President always criticises me on my stocks of materials. But they are not something you can order today and get tommorrow. If our department can not supply the necessary materials, the Production Department will get big troubles. I wish we could definitely know the production plan of 2 to 3 months ahead, but the plan is not so reliable. Anyway we maintain close contact with the Production Department and the Production Manager always appreciate our efforts.

Table 1. Business Performance over the Past 3 Years

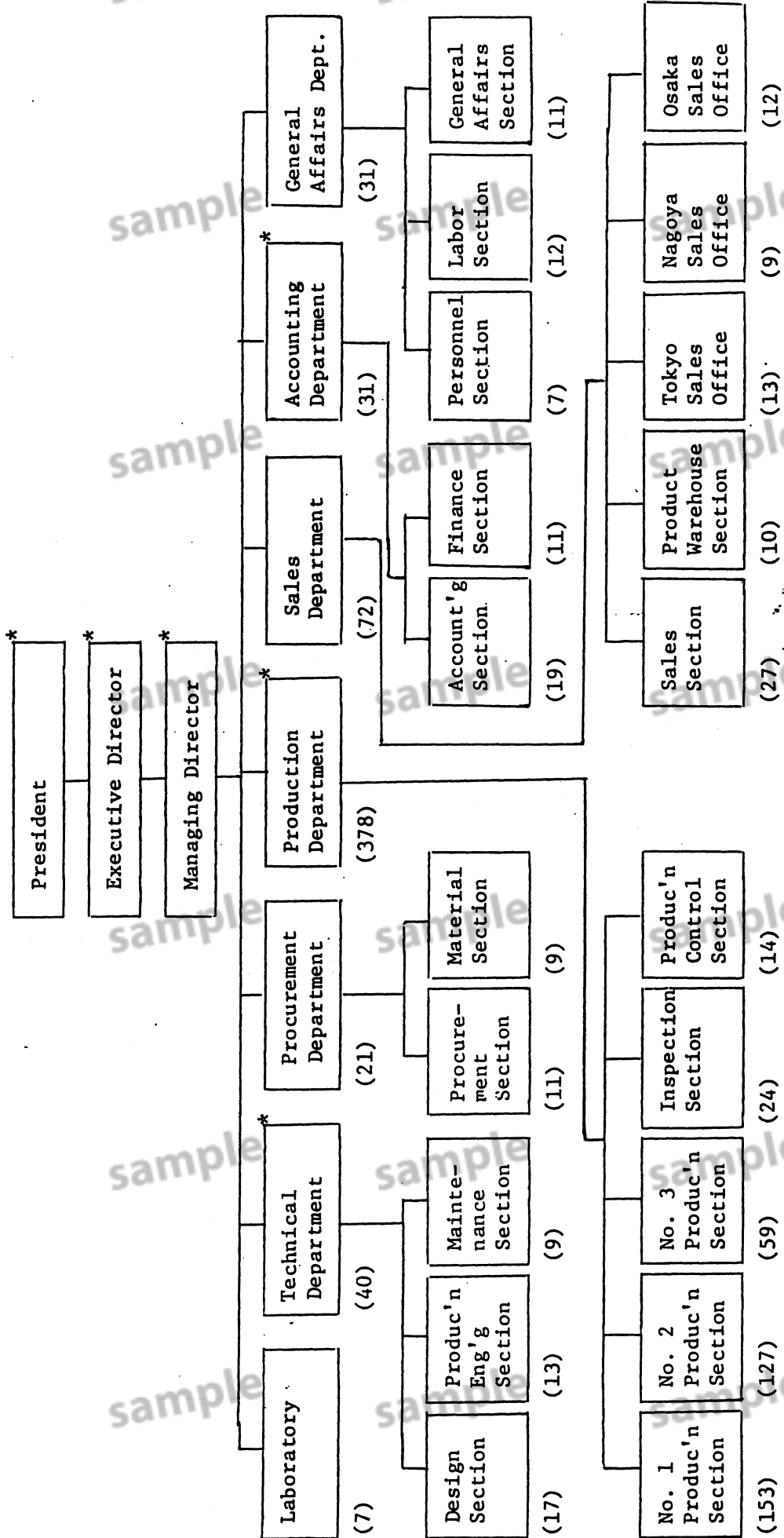
(unit: million yen)

	<u>1970</u>	<u>1971</u>	<u>1972</u>
Sales	1,748	2,157	2,619
Cost of Goods Sold:			
Raw materials	420	514	609
Labor	409	521	654
Production	227	267	322
Subtotal	1,056	1,298	1,585
Gross Profit	692	859	1,034
Administration and Sales Cost	380	454	566
Operating Profit	312	405	468
Non-operating Expenses	148	183	215
Net Profit (before tax)	164	222	253

Table 2. Trend in Number of Employees over the Past 3 Years
(As of the end of each year)

Year	1970	1971	1972
Number of Employees	518	546	571

Table 3. Organization Chart (as of March 31, 1973)



(Note) 1) The mark (*) shows a board member (director).
 2) Figures in brackets shows the number of persons belonging to each department and section.

Table 4. Sales Planning of Sales Office
(Case of the plan for April, 1973 in Osaka Sales Office)

Products	Inventory at the end of the last month	APRIL			MAY			JUNE			JULY		
		Supply order	Sales	Inventory at the end of the month	Supply order	Sales	Inventory at the end of the month	Supply order	Sales	Inventory at the end of the month	Supply order	Sales	Inventory at the end of the month
Group A	Large size	171	171	0	250	250	0	200	200	0	300	300	0
	Medium size	619	619	0	700	700	0	500	500	0	700	700	0
	Small size	824	824	0	800	800	0	900	900	0	900	900	0
	Total	1614	1614	0	1750	1750	0	1600	1600	0	1900	1900	0
Group B				(Omit the rest)									
	CT-007	0	25	0	50	50	0	40	40	0	60	60	0
Group C	CT-012	0	45	0	30	30	0	30	30	0	40	40	0
				(Omit the rest)									
Group C	CT-001	65	145	70	155	150	75	165	160	80	190	180	90
	CT-002	20	95	40	80	80	40	100	90	50	100	100	50
				(Omit the rest)									

(Note) Inventory here is an inventory in hand in Osaka Sales Office

Table 5. Production/Sales/Inventory Plan (Draft)
(Case of the term from April, 1973)

Products	Inventory at the end of the last month	APRIL			MAY			JUNE			JULY		
		Production	Sales**	Inventory at the end of this month*	Production	Sales	Inventory at the end of this month	Production	Sales	Inventory at the end of this month	Production	Sales	Inventory at the end of this month
Group A	Large Size	2120	2120	0	2450	2450	0	2500	2500	0	2700	2700	0
	Medium Size	6418	6418	0	6600	6600	0	6200	6200	0	7500	7500	0
	Small Size	7961	7961	0	7550	7550	0	8000	8000	0	9200	9200	0
	Total	16499	16499	0	16600	16600	0	16700	16700	0	19400	19400	0
Group B	CT-007	450	525	905	450	550	805	510	510	805	690	590	905
	CT-012	400	305	210	470	280	400	320	290	430	340	310	460
	CT-014	120	95	160	140	280	120	105	90	135	90	90	135
Group C	CT-001	1300	1015	1115	1700	1200	1615	1610	1310	1915	1480	1380	2015
	CT-002	900	820	895	1080	830	1145	890	840	1195	970	870	1295
	CT-003	690	760	1300	790	840	1250	930	880	1300	890	890	1300
							(Omit the rest)						

(Note) * Inventory here is an inventory in the main office, and in case of Group C products inventories in each sales office are not included.

** Sales here is based of the shipment record in the main office, and there may be some difference from the actual number of products sold due to the fructuation in inventory of Group C products in each sales office.

*** Production/Sales/Inventory Plan (Final) is in the same format.

