

The National Bicycle Industrial Company:

Implementing a Strategy of Mass Customization

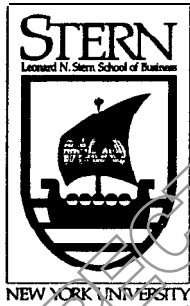
*This case was written by **Suresh Kotha**, Stern School of Business, New York University and **Andrew Fried**, International University of Japan. It is intended to be used as the basis for class discussion rather than to illustrate either effective or ineffective handling of a management situation.*

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THE NATIONAL BICYCLE INDUSTRIAL COMPANY: IMPLEMENTING A STRATEGY OF MASS-CUSTOMIZATION

A group of senior managers, including the Managing Director of National Bicycle Industrial Co. (NBIC), a subsidiary of Japanese industrial giant Matsushita, were reflecting upon the success of their firm over the last few years. NBIC is a leading manufacturer of bicycles. In 1987, the firm introduced the most innovative and revolutionary production system the Japanese bicycle industry had ever seen. The system, named the **Panasonic Order System** (POS), employed state-of-the-art techniques in bicycle production to manufacture “custom-made” bicycles. Using robots, computers, and skilled workers, the system blends human skills and advanced manufacturing automation to allow potential customers to custom-order bicycles. When ordering a custom-made bicycle, customers can choose from about 8 million possible variations based on model type, color, frame sizes, and other features. Using this system the firm delivers a high quality “crafted” bicycle within two weeks of the customer’s order.

With the introduction of POS the firm gained national and international attention and became the envy of the industry. In 1992, General Motors Corporation, the world’s largest manufacturing firm, sent a team of executives to study the firm’s “mass-customization” strategy and its implementation through the POS.¹

Despite the firm’s growing recognition, the senior management group was considering changes in the firm’s mass-customization strategy. To explore what changes were required by senior management, and the questions they might raise, this case looks at the Japanese bicycle industry, NBIC’s strategy and position within that industry, and the nature of issues facing the company during mid-1993.

¹ The term “mass-customization” was first coined by Stanley M. Davis in **Future Perfect** (Reading, Mass.: Addison-Wesley, 1987).

THE JAPANESE BICYCLE INDUSTRY

The Japanese bicycle industry's history dates from the Meiji restoration period, which began around 1868. It was during this period that European styled bicycles were first introduced into Japan. During the Meiji restoration, Japan's governing body and its government began modeling the Japanese political system after Western governments. The State, to end its isolation from the rest of world, encouraged foreigners to visit Japan.

As foreigners arrived in Japan, they brought with them their bicycles. When these bicycles needed repairs, they sought the assistance of hunting gun repair shops, established during the earlier Tokugawa period. These small shops, in and around cities like Tokyo and Osaka, began to fix bicycles. Skills acquired with pipes and screws to produce guns during the Tokugawa period enabled shop owners to apply their talents to service and repair bicycles. Over time these small repair shops began to produce bicycles modeled after European bicycles. The first domestic bicycle frame was manufactured in 1889, exactly 29 years after the invention of the bicycle by Pierre Michaux in France. Slowly, this gave rise to the Japanese bicycle industry.²

Bicycle demand in Japan grew rapidly in the early 1970s due to the robust growth in the economy and the resulting strong consumer demand. Several environmental changes including the growth of suburban residential areas and the building of large shopping areas in the periphery of cities contributed to an increase in bicycle demand. The bicycles were mainly for commuting to railway stations and shopping areas and back. Additionally, the introduction of the small or "miniwheel" that coincided with the popularity of "miniskirt trend" vastly improved women's appeal for bicycles³. Women became an important market segment and the industry introduced a greater variety of colors and models to appeal to this segment. The growing demand resulted in bicycle standardization and the adoption of mass production systems by Japanese manufacturers.

The 1973 "oil-shock" had a chilling effect on Japan, and bicycle production dropped over 18% to 7.6 million. The industry hoped that demand for bicycles would develop (in lieu of automobile purchases) under a 1973 energy savings plan, but this trend didn't develop and bicycle demand plateaued around 7 million units. Exhibit 1 shows the production, shipment, exports and imports of bicycles in Japan for a ten year period starting from 1982. The domestic production and shipment of bicycles has remained somewhat stable throughout the late 1980's and early 1990's. Exports of Japanese bicycles have gradually declined as the Japanese yen has increased in strength and imports

² Your Market in Japan- High Grade Bicycle and Wear, *Japan External Trade Organization* Report , 1990

³ In the past, Japanese bicycle manufacturers produced bicycles originally designed around European models. The lower average height of Japanese women made it difficult for them to use such bicycles. The miniwheel's small wheel diameter, lower saddle mount and U-type frames made it very appealing to women.

into Japan from neighboring Taiwan and China have grown steadily during this period. Exhibit 2 shows bicycle production for the different segments in Japan.

Manufacturers and Assemblers. Bicycle producers in Japan are subdivided by the industry into two groups: manufacturers and assemblers. The distinction between these two types lies mainly in (a) the degree of backward vertical integration achieved by the firms that belong to each group, and (b) the level of final product assembly carried out before shipment by firms in each group. For example, the manufacturers produce their own bicycle frames and forks, the two critical structural components of the bicycle, and purchase the remaining components from parts suppliers. Also, the bicycles produced by this group were appropriately 70% assembled at the time of shipment to wholesalers. The assemblers purchase all their components from outside parts suppliers and only assemble the bicycles as their name denotes. Historically, manufacturers accounted for most bicycles produced. Starting in the 1980's, the shipment of bicycles between the manufacturers and assemblers was evenly split with each accounting for approximately 50% of the industry.

In 1992, the Japanese bicycle industry consisted of over 80 bicycle manufacturers and hundreds of parts suppliers. The top five manufacturing firms were Bridgestone, National, Miyata, Maruishi, and Nichibeifuji. Bridgestone Cycle Co. was the industry leader with 18% of the domestic market. Bridgestone was followed by NBIC and Miyata, with 9% and 8% of the market respectively. The top five assemblers were Yokota, Deki, Hodaka, Saimoto and Wani. Yokota lead the group of assemblers with 9% of the market. Deki and Hodaka were next with 8% and 7% of the market respectively. Together the top five members of each group accounted for over 75% of bicycles produced in Japan (See Exhibit 3).

Parts Suppliers. In 1992, there were approximately 327 firms that produced individual parts and related items. Compared to bicycle producers, parts supplier firms were in the business of producing standardized parts in large volume and were more automated than complete bicycle producers.

In 1992, Shimano was the largest supplier of bicycle parts commanding a dominant market share. The other major parts suppliers were Araya, Sakae, and Cat Eye. Unlike the Japanese automobile industry, where exclusive suppliers are the norm, bicycle parts suppliers sold components to multiple firms. The growing supply of bicycle parts from Southeast Asian countries made it very difficult for Japanese suppliers to compete in labor intensive segments of the industry such as bicycle chains, pedals and wheels. To remain competitive some suppliers began moving their production facilities to South East Asian countries where labor costs were lower than in Japan. Others entered into joint ventures with parts suppliers from Taiwan and China.

Distribution. Bicycles in Japan were distributed through wholesalers, retailers, supermarkets, and department stores.⁴ There were approximately 1,600 wholesalers and about 38,000 retailers in 1990. While many wholesalers were subsidiaries of the large manufacturers such as Bridgestone, NBIC and others, retail outlets for the most part were small “mom and pop stores.” Approximately 60% of bicycles sold were transferred from wholesalers to retailers and the remaining were distributed through supermarkets and department stores located throughout Japan. In the past large company owned wholesalers dominated the distribution of bicycles. Recently, large supermarket chains and household superstores or “home centres” have started to sell bicycles. According to industry experts, the growing number of such outlets was one important reason for the steady rise in imported bicycles (see Exhibit 4).

COMPANY BACKGROUND

NBIC was Japan’s second largest manufacturer of bicycles in 1992 with sales reaching about ¥20 billion. The firm marketed bicycles under three different brand names, Panasonic, National and Hikari. NBIC targeted each brand at a unique market segment, and together the three brands covered the wide spectrum of bicycles sold in Japan. They ranged from high quality, high price sports and fashion bicycles (Panasonic) to bicycles that were used primarily for transportation from home to the nearest train station or supermarket and back (Hikari). National and Hikari brands together constituted the bulk of NBIC’s production and sales. Panasonic, the company’s more expensive line, accounted for a little less than 20% of total production in 1992.

NBIC began to manufacture and sell bicycles in 1952. At first growth in sales was slow, but picked up rapidly within a few years after the firm’s inception. Between 1952 and 1965, the firm produced almost a million bicycles. In 1965, due to ever increasing demand the firm completed the construction of a new factory in Kashihara city on the outskirts of Osaka, and moved its operations to this factory (see Appendix A for a brief outline of the company history). At Kashihara city the firm had two factories located next to each other. NBIC’s management called them the mass production factory and custom-factory. The custom-factory, initially conceptualized as a pilot plant, was built in 1987.

In 1992 according to published estimates, the firm produced a combined total of 700,000 bicycles in these two factories. Over 90% of these were produced in the mass production factory and shipped to Matsushita’s sales subsidiaries. High-end Panasonic bicycles were produced in the custom-factory and shipped to dealers to be delivered to individual customers. While most line workers worked at the mass production factory, a few of NBIC’s best skilled workers produced bicycles at the

⁴ According to industry reports, labeling firms as either wholesalers or retailers was problematic, because a majority of them operated jointly as wholesale and retail ventures.

custom-factory. Operating on a single-shift basis throughout the year, they produced a small fraction of the firm's production at this factory.

In early 1993, the firm employed 470 people with a little over 66% classified as direct or line workers, and the rest as indirect workers. A little over 50% of indirect workers were in the production engineering and design departments of the firm. The line workers belonged to the company union and actively participated in "quality circle" programs. Workers met once a month, as part of these programs, to discuss quality and safety issues. Additionally, management periodically tested line workers and ranked them according to their skill level. The highest skilled workers were given the opportunity to work at the custom-factory where wages were higher.

NBIC "sold" its bicycles to 10 sales companies. These sales companies distributed bicycles to approximately 9,000 retailers located throughout Japan that were part of the Matsushita group. Regular monthly meetings were held between management at NBIC and the sales companies to discuss sales trends and manufacturing concerns.

MASS-CUSTOMIZATION STRATEGY

The Genesis. The original idea for making custom-made bicycles came from the firm's President. The firm's Managing Director, who headed the team that implemented the idea, recollected:

It all started when our President visited a famous department store in Osaka. He noticed that women could custom order dresses that were then delivered by the store in two weeks. He wondered if it was possible for National to produce bicycles in this way. When we were on a trip to the U.S., he mentioned this idea. At that time we were used to making a few specially designed bicycles for some customers, like Olympic racers, but offering a custom-made bicycle to everyone was a different matter altogether.

Within a few days after their return, the Managing Director began giving serious thought to the idea mentioned by the firm's President. The bicycle industry was in the doldrums, demand was sluggish and the average unit price the customer was willing to pay for a "standard" bicycle was dropping (see Exhibit 5). According to a report in *Far East Economic Review*:

Although some Japanese component makers are riding high on the mountain bike boom, the rest of the Japanese bicycle industry is in the doldrums. The stronger yen has hurt exports of Japanese-made bicycles because of their higher cost overseas. Today, bicycle assembly for the U.S. and European markets is centered in Taiwan, dominated by such aggressive new makers as Giant, Merida, and Fairy.⁵

Though the average price of a sporting bicycle was increasing, this segment was not growing as anticipated by many large producers. It was under these conditions that the managing director with other senior managers at NBIC decided to change the firm's strategy by trying something bold. According to one senior manager:

⁵ Report published in the *Far East Economic Review*, December 7, 1989.

We were manufacturing bicycles in lot sizes greater than 50 in our factory. Now we were challenged by our President to produce bicycles in lot sizes of one. More importantly, the orders received were to be completed and delivered within two weeks. We not only had to convince ourselves that this was possible, but we had to convince our design people, our manufacturing people and line workers that this was a good and feasible idea.

Initially, not everyone at NBIC was unanimous in their support for this revolutionary idea. Some senior members at NBIC felt that it would require a large investment and also entailed a tremendous risk for the firm. They asked: What if NBIC failed in this attempt? Some also argued that the market for the sports bicycle in Japan was shrinking, though admittedly at a slower pace when compared to other segments (see Exhibit 2). Further, some industry analysts outside the firm said that such a strategy would be impossible to develop and implement. As one senior manager speaking for his colleagues recollected

We also had our own doubts during those early days, though we never mentioned this to our president or workers because we were committed to at least trying to see if this project would work. However, in our mind we gave it a fifty percent chance of success.

According to Managing Director, the firm had only a few broad objectives when it started on the road to customization. First, the firm wanted to double the amount of high value-added products the firm sold by accommodating the individual needs of the customer. Secondly, NBIC wanted to devise a "system" of production and delivery that clearly differentiated its high-end Panasonic brand from competitor products, and also meet the growing need for variety in the marketplace. During the late 1980's, as the demand for bicycles plateaued, there was increasing competition among the manufacturers. To gain market share, firms introduced many new model types. For example, NBIC offered over 250 different models types during 1987, and within each model type customers had a choice of color and other options. Management changed about 80% of models yearly. Similarly, not to be out done, the industry's largest producer offered over 300 models during the same period.

Within a few weeks of its inception, the Managing Director assembled a project team that consisted of senior members of his management team, a designer, a few process engineers and some highly skilled, experienced line workers. Discussing the implementation of the project he fondly recalls:

We worked long hours. We proposed and debated many new ideas for days. We started with a few people, but as the project began to progress, more people were added. Within a few weeks we established a pilot plant in a large empty warehouse next to the factory. Still, numerous issues had to be addressed and solved, but as time went on we were convinced that the project was doable. We knew we had the capability, because many of us had spent most of our professional lives making bicycles.

Motivated by the relentless effort of their leader, the team successfully tackled one concern after another to complete the project in a mere four months. By July 1987, the team converted the pilot plant to one that was fully operational and running. It was seven months since the firm's President visited the department store in Osaka.

The firm in June 1987 unveiled its strategy to Japan's bicycle industry to the dismay and surprise of its major competitors. The new system they had devised was aptly named the **Panasonic Ordering System**.

THE PANASONIC ORDERING SYSTEM (POS)

The Order Process. A customer ready to order a high-end bicycle walked into a Panasonic bicycle dealer equipped for POS and the dealer, using a unique measuring and gauging machine, noted the exact physical measurements of the customer including the size of the frame, the length of seat post, the position of the handle bar, and the extension of the handle bar stem. The customer was allowed to select the model type, the color scheme, and other features for their bicycle. Details on the number of models, colors and options that were available are provided in Exhibit 6. The actual form used by the dealer to capture this information is provided in Exhibit 7. When completed, the dealer immediately sent this information to the control room of the custom-made factory via facsimile transmission.

Once the facsimile order form was received in the master control room of the custom-factory, the receiving attendant immediately entered the information into the firm's host computer to register and control the customer's order specifications. The host computer then assigned each order a unique bar code label. This label, which traveled with the evolving bicycle, instructed and controlled each stage of manufacturing operation. At various stages in the process, line workers accessed the customer's unique requirement using the bar code label and a scanner. This information, displayed on a CRT terminal at each station, was fed directly to the computer controlled machines that were part of a local area computer network. Using such information, workers at each station performed the required sequence of operations assisted by machines. Exhibit 8 provides an overview of the entire manufacturing process used by NBIC, and Exhibit 9 provides an illustration of the POS factory layout.

The Manufacturing Process. At the heart of the POS lay the design and manufacturing capabilities of NBIC. Almost all the machines used in the manufacturing process were developed and built exclusively for use in the custom-factory. A significant portion of this development work was carried out by the firm's own design and process engineers with assistance from the parent company's engineering staff. While the computer hardware used in POS was purchased from outside vendors, much of the software employed to control and monitor the system was developed and written internally by NIBC's software engineers.

The production process began when the Computer-Aided Design (CAD) system, located in the control room scanned the bar code label to access information on the customer's order. A "blue print"

of the bicycle's frame and other structural details was produced in about 3 minutes.⁶ Information from the CAD system was automatically sent to the raw material supplies area located next to the control room. Here small lights, placed in front of the raw material bins, were automatically lit based on the customer's specifications. The materials from the bins that were lit were then picked up by a worker and sent to the factory.

Frame and Front Fork Production. The first step on the factory floor involved the cutting of tubes that formed the frame of the bicycle. Customer specifications were transferred to the computer assisted "tube cutting" machine. This machine then automatically sized and held the tubes in place while a worker cut them using a rotary saw. The surfaces where two tubes were to be welded together were then "arch" cut, using a special machine. According to the factory manager, this process improved the rigidity of the frame and precision of the joints during the brazing process. Small parts, such as brake guides, were then carefully brazed to the frame by a skilled worker.

The tubes were then carried to the "front triangle assembly" machine. This machine, using special jigs and other features, automatically aligned and held the tubes together, while they were **tack** welded to form the front triangle of the frame. The joints of the frame were then **brazed** by automatic brazing machines. Following this process, a worker using the "rear fork assembly machine" **tack** welded the chain stay hanger section, the seat stay and the seat lug section. These were then brazed to the frame. This processes brought together the front and rear triangle sections to complete the bicycle frame. According to NBIC's process engineers, the automated machines used in brazing process incorporated optical sensors capable of detecting temperature differences to +/- 1%. Such precision was required to ensure metal integrity, and to prevent the warping of the tubes during the process.

The final step involved the use of a "slitting and reaming" machine. In this process the seat lug, attached earlier, was slit and the inside of the seat tube reamed. This process ensured that the seat pillar could be adjusted smoothly and fixed firmly. The time taken to cut, braze and assemble the frame was about 25 minutes.

The tubes that formed the front fork of the bicycle were cut and assembled using processes similar to that of the frame.

Quality Check. The completed frame and fork were then placed on a 3-dimensional automatic measuring machine, designed by the firm's parent company engineers. This machine checked the actual measurements of the assembled frame and fork against the customer's original specification stored in the host computer's memory banks. Small variations, if any, were detected and displayed on

⁶ According to the factory manager, prior to the introduction of the CAD system this process took the company draftsmen about 180 minutes.

a CRT terminal or plotted using the attached plotter. This process was completed in less than 60 seconds.

Painting. Both completed frame and front fork were then moved by overhead conveyors to the surface cleaning area and immersed in special solutions. This process prevented the early rusting of the frame and improved the ability of the subsequent paint to adhere more uniformly to the surfaces. The cleaning process took about 10 to 15 minutes to complete. The bicycle frame and front fork were then transferred to a "preliminary" painting room to be automatically painted by a robot. Again, the robot received its instructions from the factory's host computer via the bar code label. According to the factory manager, NBIC was the first bicycle manufacturer to introduce a robot in the painting process for bicycles.

Following this, two skilled workers completed the "final" by painting the "hard-to-reach" areas using electrostatic spray guns. Finishing touches and customer's "special" painting instructions were completed by the workers.

Labeling and Engraving process. This process involved printing or engraving the customer's name on the bicycle frame or handle bar stem. A skilled worker, using a silk screen process, printed the customer's name and transferred it on to the frame. Or alternatively, a name engraving machine engraved the name of the customer on the handle stem. With the completion of this process, the frame was ready for the final assembly process.

Final Assembly and Shipping. The final assembly involved the mating of the completed frame and fork with the appropriate wheels, chain, gears, brakes, tires and other components that constitute a complete bicycle. During this process the "derailleur" adjustment and the "rotation" adjustment of the bearing section were completed. Also, the seat pillar and seat lug section were checked and adjusted according to customer specifications. Each bicycle was fully assembled and tested by a single skilled craftsman. The assembly process was performed in any one of the three main assembly stations and took about 30 minutes. The completed bicycle was then boxed and sent to a holding area, outside the factory, to be picked up for delivery. They were generally shipped the same day.

The entire manufacturing and assembly time required to complete a single customer order was approximately 150 minutes. In 1989, the factory employing 18 workers (15 workers were employed in 1987) had the capability to make about 60 custom-order bicycles daily. It received orders for approximately 12,000 bicycles, an increase of 20% over the previous two years. A significant portion of these orders were from customers in Japan.

A year after the introduction of the PCS, the company unveiled a new system named Panasonic Individual Customer System (PICS). The purpose of PICS was to offer custom-made bicycles to

customers in overseas markets, especially in countries like Australia, the U.S. and Germany. PICS used the same customized manufacturing technology as the POS, but offered customers the choice of much larger frame sizes more suitable to western customers. The time taken from order to delivery was increased from 2 weeks to 3 weeks under PICS.

Marketing and Distribution. According to General Manager of Sales at NBIC, customer service, “appropriate” pricing, and extensive communication were all an integral part in NBIC’s mass-customization strategy. Domestic customers were guaranteed a delivery time of two weeks, not a day more but also not a day less. He pointed out that: “We could have made the time shorter, but we want people to feel excited about waiting for something special.” According to a manager at the factory, custom-made Panasonic bicycles were priced only about 20 to 30% higher (depending on the particular model and features selected) when compared to a “comparable” bicycle produced at the mass production factory.

Under the POS, it was the factory that was given the responsibility to communicate directly with customers. Shortly after the factory received the customer’s order, a personalized computer generated drawing of the bicycle was mailed with a note thanking the customer for choosing the POS. This was followed up with a second personal note, three months later, inquiring about the customer’s satisfaction with his or her bicycle. Finally, a “bicycle birthday card” was sent commemorating the first anniversary of the bicycle.

According to the General Manager in-charge of sales, dealership selection played an important role in pursuing their strategy. In early 1993, only about 15% of 9,000 domestic dealerships were part of the POS (see Exhibit 10). They explained the reasons for this:

We cannot afford to make mistakes. Mistakes can be very costly. It is important that customers don’t lose confidence in our system. We have to be very careful in selecting knowledgeable and committed dealers so that they send us the correct information. We can’t tolerate mistakes at any stage.

RESPONSE TO POS

Competitors Imitate NBIC. NBIC’s strategy of offering a truly custom-made bicycle surprised all its major competitors. Within months, the two other leading manufacturers of bicycles scrambled to develop and implement their version of mass-customisation. In a year, both offered their own “unique” versions of mass-customization. But, they were unable to duplicate all aspects of NBIC’s strategy as noted by a senior manager at Bridgestone in early 1993:

The trouble with this segment is that it is too small, perhaps 10,000 or more. It costs a lot of money to advertise for such a small segment. Since NBIC was the first firm to introduce this idea they have established a strong image in the customer’s mind. When you mention customization, the consumer only thinks of Panasonic. Also, National’s parent company Matsushita is famous for its marketing savvy and it is difficult for us to match them. We as a company have not paid much attention to this segment. I expect we will in the future, because we too want to be known for our innovativeness.

According to a knowledgeable source in the industry, NBIC was the only company to have successfully mastered the art of mass-customisation, and that competitors were unable to offer the same degree of variety NBIC offered. Unlike NBIC, leading competitors simply increased the inventory of frames types and model sizes they carried to accommodate the variety demand by its customers. According to the Managing Director.

One of our competitive advantages is that we are located in Osaka close to all the major parts suppliers. Frequency and reliability of parts delivery from our suppliers has helped us “truly” custom build bicycles. There is little need to hold large inventories of finished frames and other parts unlike others outside the Kansai region.

Extensive Media Coverage. Soon after the announcement of the POS, journalists following this industry began expounding on its revolutionary nature. These Japanese stories were soon picked up by foreign journalists who write about Japanese manufacturing practices. Within a span of two years, NBIC was featured in *Fortune*, the *New York Times*, and *Washington Post*. One leading American television network, ABC, featured the firm in its regular prime-time *World News Tonight* program hosted by its chief anchor person Peter Jennings. The German Public Television network produced a documentary for European audiences. Additionally, NBIC receives many requests from other manufacturing firms for information about its new system. Within a few years of the introduction of POS, *Fortune* magazine noted that:

The concept has so intrigued executives and engineers that they have been flocking from as far away as Italy to this factory in Kokubu, in western Japan, to study it. Big Japanese manufacturers of consumer goods are also taking note, hoping to improve their own production system. . . . [NBIC] built these one-of-a kind models by replacing mass production with flexible manufacturing. The method is being employed all over Japan to shrink small-lot production jobs to lots of one.⁷

While NBIC's customized bicycles manufactured under the POS system only accounted for two percent of total production, the effect of worldwide attention had a dramatic effect on the company's high-end segment.

Company's Sales Increase. Before the introduction of POS, NBIC's market share was languishing behind its two major competitors in the high end segment. Within, a few years of the introduction POS and PICS, the firm's total high-end (Panasonic) market share position improved dramatically. For the first time in its history, NBIC become the industry's second largest manufacturer of high-end bicycles (see Exhibit 11 and Exhibit 12).

Reflecting on the events of the last few years, members of the senior management at NBIC glowed with pride about the achievements of their firm. Despite the repeated attempts by competitors to offer customized bicycles, the “Panasonic” name was increasingly viewed as the only “truly” mass customized bicycle in Japan. The firm was now viewed as the leader and innovator in the industry.

⁷ Susan Moffat, “Japan's Personalized production.” *Fortune*, October 22, 1990, p. 132.

Still, this was not the time to rest on past laurels, there were some major concerns facing NBIC and the industry in 1993.

OUTLOOK FOR THE FUTURE

Total company sales in 1992 grew marginally by 1.2%, but exports of NBIC's Panasonic bicycles were down by over 50%. This significant decrease in exports was the result of many factors including: the aggressive export strategies of firms in Taiwan, China and other neighboring countries; the continued strengthening of the Japanese yen against the U.S. dollar; the softening of the demand for bicycles in Europe and the United States; and the increased competition in overseas markets. The news on the domestic front was not very encouraging either. The sales of domestic bicycles had been stagnant for some time. Forecasts for 1993 indicated only modest overall growth. According to an industry source, the Japanese industry was steadily undergoing structural change. The assemblers were beginning to exploit the growing supply of less expensive bicycle parts from overseas, to the dismay of major manufacturers. According to early industry predictions for 1993, Yokota's share of the market was expected to grow even larger in 1993. And Deki, the second largest assembler, was expected to match NBIC in the production of bicycles (see Exhibit 3).

Role of Customization at NBIC. In early 1993, given the domestic and international situation, senior managers were pondering the future role of mass-customisation at NBIC. The lessons and the manufacturing skills the firm had acquired in the custom-factory were readily transferable to the mass production factory. Skilled workers from the custom-factory were regularly used for training line workers in the larger mass production factory. Over the last few years, the mass production factory was undergoing slow, but significant changes. Lot sizes employed in production were steadily decreasing. Over the last few years lot sizes were reduced from 50 to a mere 20 in 1993.

Senior management were now examining the feasibility of turning the mass production factory into a custom-shop. The goal was to increase the revenues contributed by high-end segment to 50% of total sales within the next five years. More importantly, its likely impact on the firm's overall strategy was unclear. Some managers were under the view that the size of this custom segment should not be nurtured to grow beyond the current size. The firm should maintain it as a small high-value niche market to maintain customer interest and high prices. Others argued for a strategy to increase the size of this segment.

Exhibit 1
Bicycle Demand in Japan 1982-1992 (units, 000s)

Year	Production	Shipment (1)	Export (2)	Import (3)	Total Demand (1-2+3)
1982	6,532	6,624	674	13	5,963
1983	7,039	6,996	864	6	6,138
1984	6,810	6,839	856	28	6,011
1985	6,785	6,808	888	40	5,960
1986	6,583	6,638	682	158	6,114
1987	7,379	7,742	416	580	7,636
1988	7,509	7,624	325	900	8,119
1989	7,792	7,881	200	857	8,538
1990	7,969	8,033	226	667	8,474
1991	7,448	7,416	203	940	8,153

Source: Japan Bicycle Manufacturer's Association

Exhibit 2
Bicycle Production By Type (000s Units)

	1984	1985	1986	1987	1988	1989	1990	1991
Roadsters	57	42	37	38	35	38	35	27
Lightcycles	916	1017	1339	2296	2893	3486	3694	3511
Sports cycles	1465	1304	999	883	761	562	501	405
Juvenilecycles	756	795	726	770	772	770	788	747
Children*	566	565	542	546	555	520	527	477
Mini cycles	2871	2753	2687	2570	2192	2065	1822	1426
Others**	181	308	254	275	301	350	602	855
Total	6810	6785	6583	7379	7509	7792	7969	7448

Source: Japan Bicycle Promotion Institute.

* Geared towards preschool children with 12"-16" wheels. The standard size bicycle had wheels which were 26 or 27 inches.

** Includes adults tricycles, motorcross bikes, mountain bikes, high-risers, heavy weight load-carrying bicycles, track racing bikes, bicycles for acrobatics, etc.

Exhibit 3
Market Shares of Major Bicycle Producers

Companies	1992 Production (units, 000)	Market share	1993 Production (Est.)
Top five Manufacturers			
Bridgestone	1400	18%	1450
National	700	9%	700
Miyata	640	8%	610
Maruishi	310	4%	310
Nichibei Fuji	200	3%	200
	3250	43%	3270
Top five Assemblers			
Yokota	710	9%	750
Deki	630	8%	700
Hodaka	530	7%	570
Saimoto	400	5%	400
	290	4%	290
	2560	34%	2710

Source: Cycle Press, No. 76, February, 1993

Exhibit 4
The Japanese Bicycle Distribution System - 1992

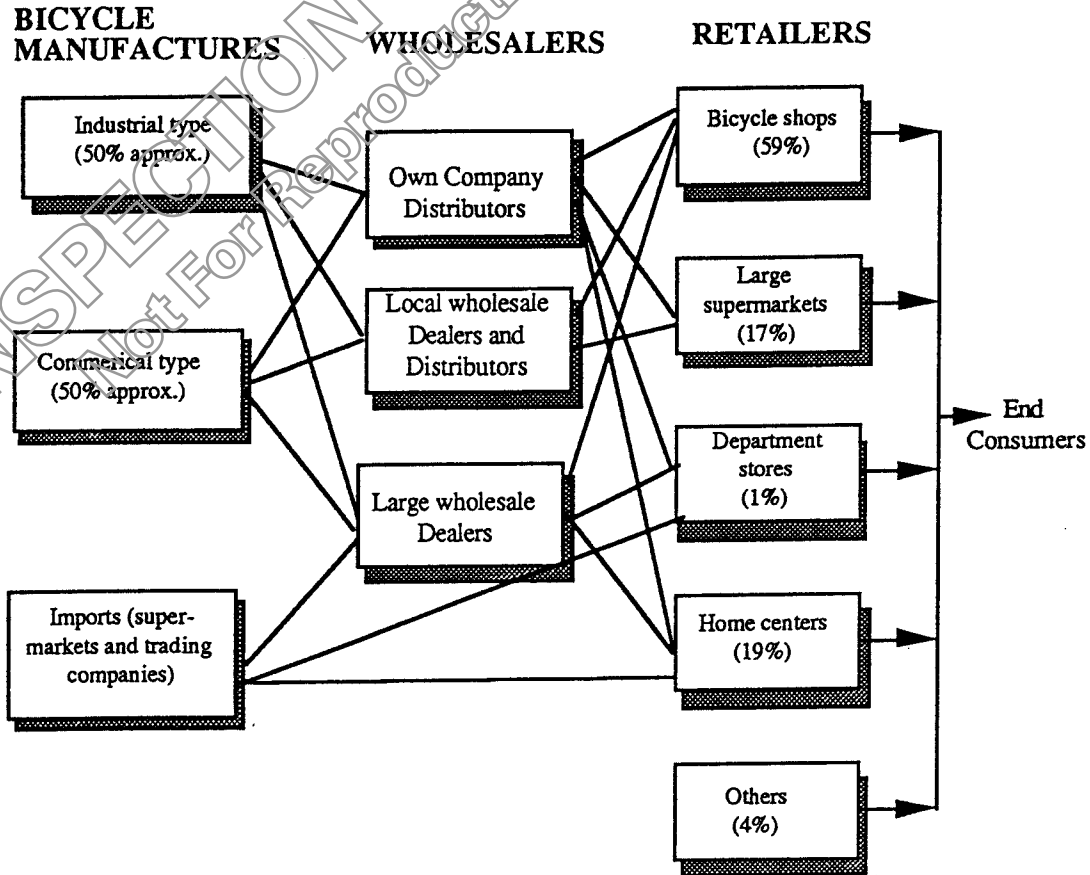


Exhibit 5
Change in Average Production Value per Complete Bicycle Unit (yen).

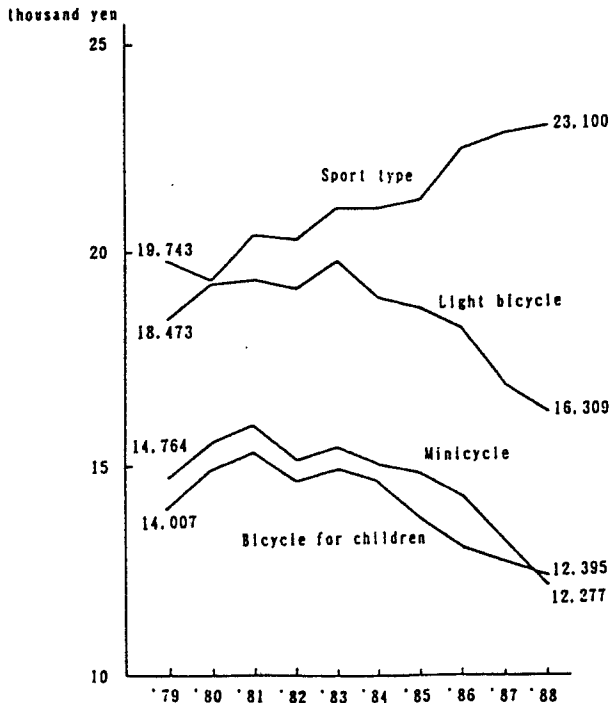
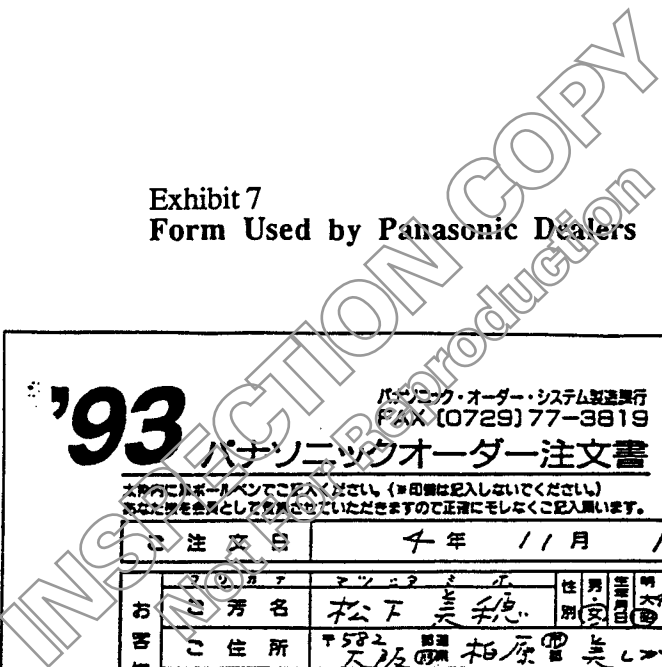


Exhibit 6
POS system
Selection of models available (Japan)

	Type	No. of Models
Bicycles	Road	10
	Triathlon	5
	Time Trial	3
	ATB	2
	Track	1
Frame	Road & Triathlon	4
	Time Trial	-
	ATB	-
	Track	1
	Frame Color	Pattern
	1 Color	15
	2 Colors	40
	3 Colors	15

Source: NBIC Company Records.

Exhibit 7
Form Used by Panasonic Dealers



'93

パナソニック・オーダー・システム製造販売
FAX (0729) 77-3819

Panasonic
ORDER SYSTEM

※管理用印

パナソニックオーダー注文書

本券内にはボールペンで記入してください。(※印欄は記入しないでください)
※なお本券を会員として発行させていただきますので正確に是非なく記入願います。

ご注文日	4年 11月 / 日 (FAX済・未)			
お客様	お名前	松下 美穂	性別	女
	ご住所	〒582 大阪府 柏原市 美し丘 1-1		
	電話	0729-12-3456	会員種	

品番	フレームサイズ	フレームカラー
B-OCR9	4 8 0	2 3 J 2

(T) フレームの場合
 ・ 図面、A-Eまでの3タイプより選択してください。
 ・ 文字等の指定は、その文字の○にしてください。
 ・ 数字は半角、すべて大文字で記入します。
 (H) ハンドルの場合
 ・ 図面の指定でください。
 ・ 文字等は半角以内で指定。
 ・ アルファベットの大きさのみ、中文字を入力してください。

ネーム位置	(T) フレーム (H) ハンドル(ロードのみ選択可) ☆ネームなし			
書体	(A)	B	C	D
(H) ハンドルの場合は、ここまで(2文字以内)				
M (A) (H) (A) M (A) (T) (S) (U) (S) (H) (I) (T) (A)				

ロード	*ハンドリングタイプ (対象車種: OCP9・OCR9) ORR9	(A) スタンダード — 標準的なハンドリング					
		B. ミドル — ややクイックなハンドリング					
		C. マスター — クイックなハンドリング					
	ポスト突出し量	A 70mm (OP.標準)	B 80mm	C 90mm	D 100mm	E 110mm	F 120mm
	ハンドル幅	A 360mm (OP.標準)	B 388mm (OTL.標準)	C 400mm (OP.標準)	D 420mm (OS.標準)		

ATB	ポスト突出し量	OXL2・OXM2	G 100mm	H 120mm	I 140mm
		OXG2・OXS2 OXC2・OME4	G 105mm	H 120mm	I 135mm

ご販売店名	保証	販売価格	円
住所		予約金	円
電話番号		残金	円
FAX地		*オプションパーツ・アクセサリ	
ショップ地			
取引販売会社 代理店名			

Panasonic 松下電器産業株式会社 自転車事業部

ご注文お問い合わせは ナショナルお客様センター POS専用 FAX 072(07)3819 TEL 072(07)1800 受付 9:00~18:00 大阪府豊中市山崎1-1-1

33 POS注文書用紙

FAX用、ご販売店様控

※送後変更はできませんので、ご了承ください。

受付印

ロード・ATB共通オーダーシート

Please print your name and address clearly. They will be included in Panasonic list of customers.

Code for bicycle size.

Frame size.

Code for design and pattern.

Location of customer name (frame or handle).

Font for customer name.

Customer name.

Choose bike type.

Circle the length of bicycle stem.

Circle the handle bar width.

(ATBモデルのみ)
決定したステム突き出しサイズに○をお付けください。

●オーダーシート(注文書)は FAX用、ご販売店控 販売会社・代理店控 お客様控 の3枚複写になっています。

Exhibit 8
The Production Process at the Custom-Factory

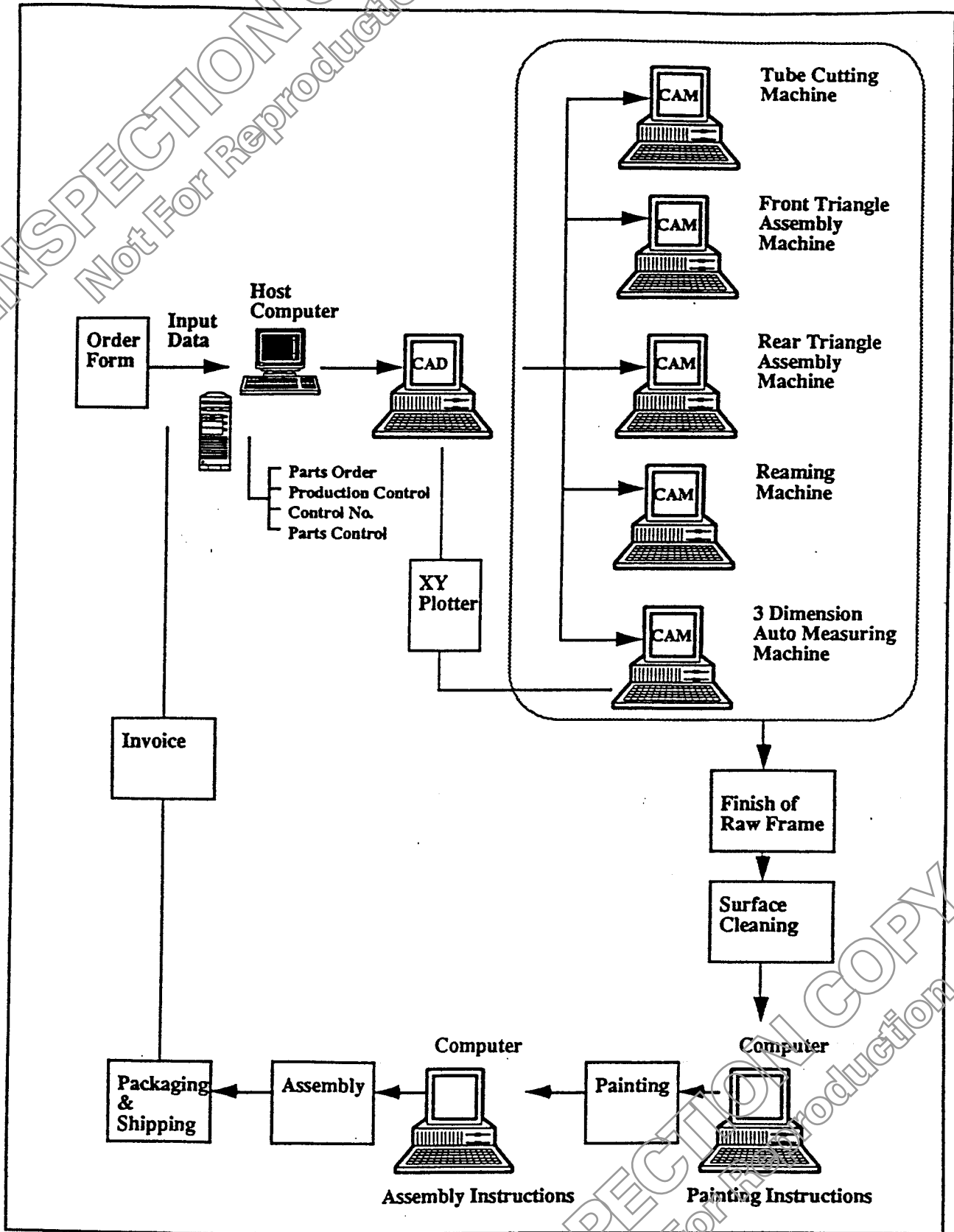


Exhibit 9
Layout of the POS/PICS Factory

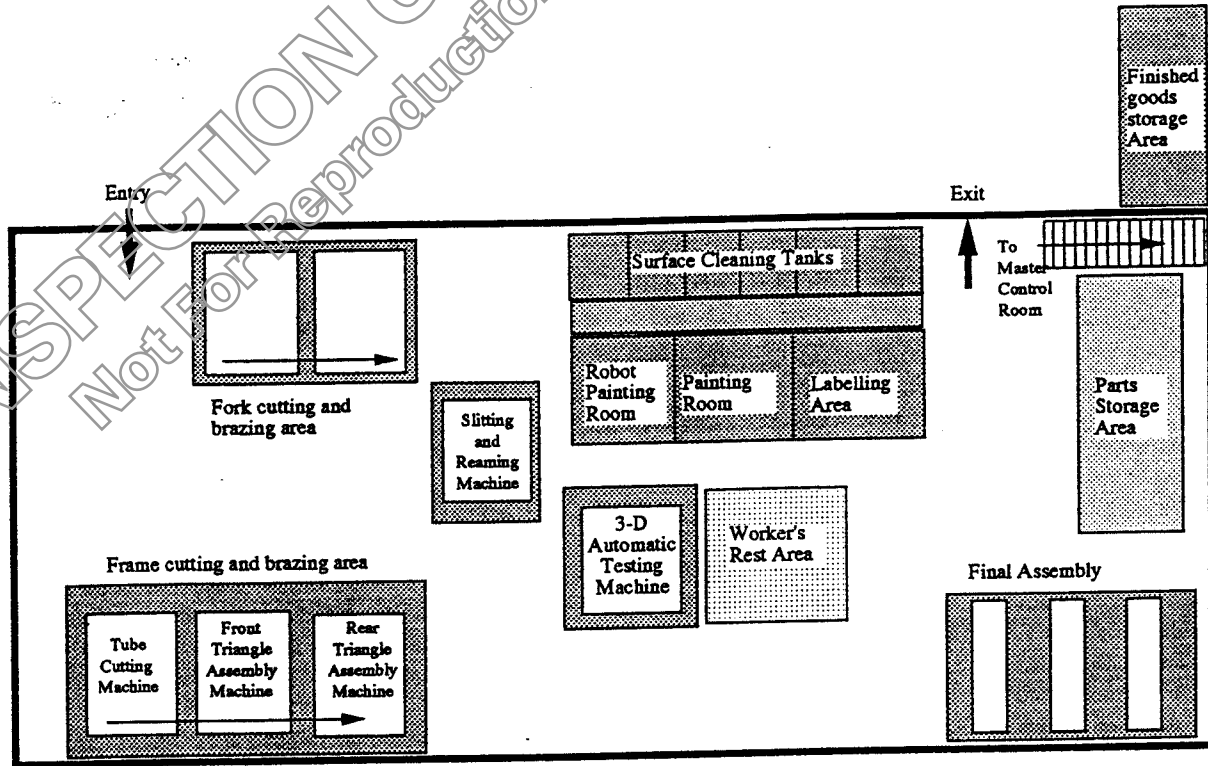


Exhibit 10
NBIC's Distribution System

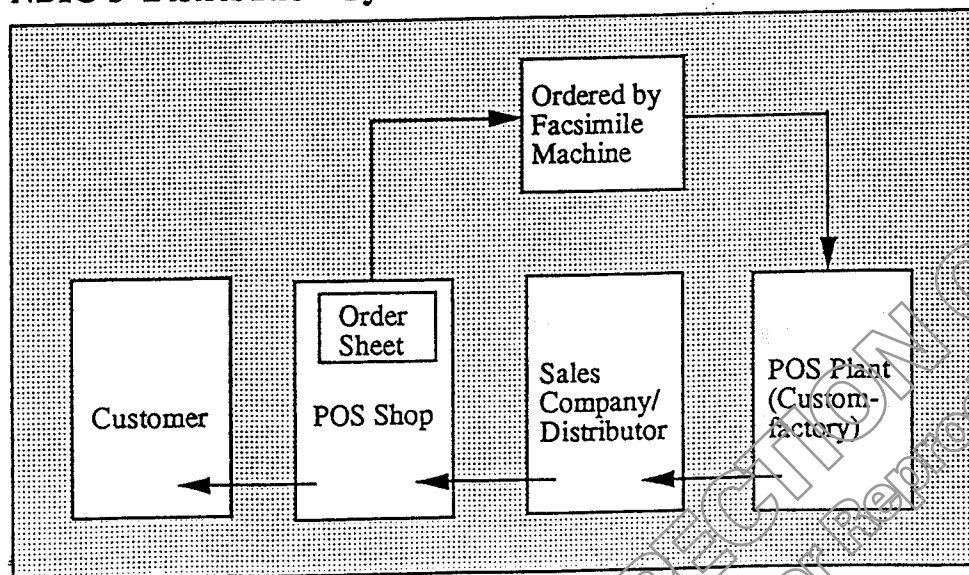


Exhibit 11
Production by Top Four Manufacturers (units, 000s)

Companies	1987	1992	1993 (Estimate)
Bridgestone	1,330	1,400	1,450
National	754	700	700
Miyata	620	640	610
Marubishi	379	310	310

Estimates published by Cycle Press, 1993.

Exhibit 12
NBIC "Panasonic" Brand Growth 1986-1992

	1986	1987	1992	Future Target
units (% of total production)	4%	7%	18%	-
Revenues (% of total Sales)	10%	13%	27%	50%

Appendix A
The History of National Bicycle

1918	•	Matsushita Electric (Parent Company) was founded.
1952	•	Commencement of bicycle manufacturing and sales.
1956	•	Began manufacturing and selling racing bicycles.
1960	•	National Bicycle Factory established in Sakai-city.
1965	•	Production of National bicycle reached one million units.
	•	National Bicycle completed new factory in Kashihara city.
1967	•	Japanese National Bicycle racing team adopts bicycles for World championships
1971	•	Commencement of export of Panasonic bicycles to the United States.
1972	•	Japanese Olympic bicycle team adopts Panasonic bicycles for the Munich Olympic.
	•	Production total reaches 3 million
1973	•	National Bicycle installed new automated assembly line.
1974	•	Gojyo National Bicycle Parts Co., was established (Wheel assembly factory).
1979	•	Commencement of export to Europe, Canada, and Australia.
	•	Formation of the Panasonic Racing Team in the United States.
1980	•	Seven millionth bicycle produced.
1983	•	Eight millionth bicycle produced.
1985	•	Nine millionth bicycle produced.
1986	•	Adoption of “Panasonic” brand name for top-class racing bicycles in Japan.
1987	•	Unique “Panasonic Order System” initiated starting on June 1st - receives acclaim from both inside and outside the industry.
	•	Ten millionth bicycle produced.
1988	•	First orders received February 1st for “PICS” 3-week delivery order system for United States customers.

Source: NBIC Company Records