

Sakichi Toyoda, Inventor

Toyota Motor Corporation celebrated its 50th anniversary in 1987. For a proper perspective on the company's history, however, we must go back more than a century and begin with a Japanese inventor whose life was marked with great trial; we must begin with the story of Sakichi Toyoda, the father of founder Kiichiro Toyoda.

Sakichi developed many useful devices, but he is especially well-known as the inventor of Japan's first automatic loom. Indeed, his inventions represented so great a contribution to Japan's modernization that the Japanese Patent Office recognized Sakichi in April 1985 as one of the country's 10 most influential inventors over the past 100 years.

Sakichi Toyoda was born in the small village of Yamaguchi, now part of the city of Kosai, Shizuoka Prefecture, on February 14, 1867, the year before the Meiji government came to power. The leaders of the new Meiji government dedicated themselves to the enormous task of transforming Japan into a modern state by catching up with the leading nations of the West. The rapid influx of industrial goods from Europe and the United States following the opening of Japan to the West made both the Japanese government and individual entrepreneurs realize that modernization of the nation's industries was critically important.

The sudden inflow of inexpensive goods from abroad overwhelmed many traditional industries. Among these, the domestic cotton industry was dealt a tremendous blow by the inexpensive, high-quality cotton goods from England and elsewhere. The government responded to the effects of these imports 23 by promoting the dissemination of new technologies through National Industrial Exhibitions and other industrial fairs. Specifically, it worked to foster a modern spinning industry capable of competing with imported cotton yarn by taking such protective measures as opening state-run spinning mills and selling spinning machinery to private businesses at nominal prices. But modernization of the textile industry did not progress smoothly, and most businesses failed because of the small scale of their operations.

The area around Sakichi's home village had long been active in producing cotton. Although Sakichi was born into a family that had been farmers for generations, his father was a carpenter by trade, and his mother wove cloth to supplement the family income. After graduating from elementary school, Sakichi learned carpentry from his father. And, like his father, Sakichi poured everything into his work. Seeing the impoverished farmers in his own village and those of the surrounding area, however, and hearing of the efforts being made throughout the nation to modernize Japan's industries, he became filled with a desire to contribute to society by accomplishing something of consequence.

Japan's Patent Law was promulgated in 1885. Around this time, Sakichi participated in an evening study group attended by young men who, like himself, were eager to satisfy their thirst for knowledge. The group discussed the current state of affairs in Japan, and it was during those discussions that Sakichi resolved to do something that would benefit the nation and contribute to its development. Upon hearing about the main points of the Patent Law, he determined that he would achieve his goal through invention.

In the spring of his 20th year, Sakichi began studying ways of improving looms. He later described his motivation in these words:

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In those days, spinning and weaving was not a thriving business as it is today. The work was done by old women sitting at home and weaving the cloth by hand. Although everybody in my village was a farmer, every house also had its own handloom. I began thinking about ways to power the looms so that weaving could be done faster, and more cloth could be made more cheaply. People could then buy cotton goods for less, and that would benefit society substantially.

Since he was expected to follow in his father's footsteps, Sakichi was trained as a carpenter. He thus found it easy to apply his woodworking skills to the wooden looms as he sketched them and built test models. He began to tinker with looms whenever his father was not watching, looking for ways to improve the design. Eventually, he became so busy with the looms that he was no longer able to concentrate on the carpentry work. Despite opposition from his father and many of the villagers, who largely regarded him as an eccentric, Sakichi's enthusiasm for inventing only grew.

Improving the looms was not an easy task for Sakichi, who had the skills of a carpenter but lacked the necessary basic technical knowledge. He made repeated efforts on a trial-and-error basis, but progress was slow. "I was like a man possessed," he said later, reflecting on his life at the time with some amusement. "People around me probably thought I was some kind of madman."

In 1890, when Sakichi heard about the Third National Industrial Exhibition being held that year in Tokyo, nothing could deter him from going to see it for himself. About 1,700 foreign products, many of which had been shown at the Paris Exhibition held the previous year, were on display. Sakichi visited the exhibition's machinery pavilion every day for two

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weeks to see how these machines worked. He then visited a number of factories in the Tokyo-Yokohama area before returning home. Although the trip did not produce any immediate tangible results, it seemed to be effective in dispelling any remaining selfdoubt in Sakichi.

That autumn, after several months of experimentation with different prototypes, Sakichi perfected his first invention. It was a wooden, manually operated loom, which he patented in May 1891. When Sakichi persuaded a weaver in a neighboring village to put the loom to practical use, the quality of the weaver's woven cloth improved drastically and his productivity rose by 40%-50%.

Sakichi built four or five of his patented looms and took them to Tokyo, where he opened up his own weaving business. His cloth acquired a good reputation, but his handlooms attracted little interest. Small-scale textile businesses short on capital were not likely to buy a manually operated loom whose operation took up all of a weaver's time, even if productivity did improve by

half. Sakichi renewed his research with a new goal - the development of a power-driven loom. But his business was not profitable enough to provide the funds he needed to invent such a machine.

Around this time, Sakichi married Tami Sahara, the younger sister of his good friend Gorosaku Sahara. Although Sakichi remained entirely preoccupied with his work on the power loom, in 1893 he was forced to close his weaving business and return to his home village.

In Sakichi's words, "Apart from food and clothes, I also needed money for my research and my projects. It seems like serious inventors always end up being poor and being cut off from others; sometimes they even get persecuted. It's as if an inventor has to have his fill of hardship before he can fulfill his ambitions." Even though his first son Kiichiro had been born in 26

June 1894, Sakichi left his home to visit an uncle in Toyohashi, Aichi Prefecture, and remained there; it was this move that eventually led to the breakup of his marriage.

Settling in Toyohashi, Sakichi decided to make an improved yarn-reeling machine. He invented a reeling machine that produced constant lengths of yarn twice as efficiently as conventional devices.

In 1895, Sakichi opened a company, Toyoda Shoten, in Nagoya. It seemed that finally he had a means of funding his inventions. While making a business out of building and selling his reeling machine, Sakichi focused his efforts on the invention of a power loom.

Sakichi married again in 1897, this time to Asako Hayashi, a young woman from his home village. Asako not only raised Kiichiro but also managed Toyoda Shoten at the same time, proving to be an invaluable support for Sakichi and his inventing. Sakichi's brother Heikichi, meanwhile, eight years Sakichi's junior, took over sales of the reeling machine and quickly became Sakichi's right-hand man. It was not long after this that Sakichi perfected Japan's first power loom.

A customer who was using Sakichi's reeling machine recognized the immense potential of the new loom and suggested that they go into the weaving business together. Sakichi built 60 power looms and contributed them as his investment in the new partnership. In 1898, Sakichi and his new partner opened a textile mill fitted with steam-powered looms. Although a mill hand could operate only one conventional loom at a time, he could operate two or three power looms simultaneously. Productivity increased fourfold at the new mill, and costs decreased by over 50%. These factors, coupled with the high quality of the product, spurred the rapid growth of the new company.

Around this time, Mitsui & Co., already one of Japan's 27 largest trading companies, observed the demand in China for narrow-width cotton fabric and decided to throw its full weight behind the Toyoda power loom. Sakichi's invention was suddenly thrust into the limelight. A succession of dignitaries visited Toyoda Shoten, and the name of the 32-year-old inventor became known throughout Japan.

Mitsui wanted the exclusive selling rights for Sakichi's power looms, and in 1899 it signed a 10-year agreement with Sakichi and established Igeta Shokai in Nagoya to produce and sell the looms. As the company's chief engineer, Sakichi concentrated his efforts on further improving the power loom.

The Toyoda power loom cost 93 yen, compared with 872 yen for the German Hartmann loom and 389 yen for the French Diederichs loom. Besides being much less expensive, the small, wooden Toyoda loom was also much easier to handle. Business was so good that Igeta Shokai was unable to keep up

with the flood of orders for looms from small textile manufacturers competing in the rapidly growing export market for narrow-width cotton fabric.

In 1902, after almost two years of toil, Sakichi patented a let-off device that maintained the warp at a constant tension as it was being fed. This outstanding invention served as the prototype for the let-off devices used in looms today. Having taken this first step toward automation, Sakichi next concentrated on developing a device for automatically replenishing the weft. Conventional looms had to be stopped when the weft ran out so that the wooden bobbin on which the weft was wound could be replaced.

Japan faced a severe recession after the Sino-Japanese War of 1894-1895, and the spinning industry was hit particularly hard. There was no room for expansion in the domestic market, and competition from Indian and Chinese companies in the promising Chinese market was becoming increasingly intense.

Business at Igeta Shokai also markedly worsened, resulting in restrictions on Sakichi's research budget and leading him to resign from the company. In 1902, he returned to Toyoda Shoten, his old business; he renamed it Toyoda Shokai and installed 138 looms, vowing to support his research with his own earnings. Leaving the management of the mill to his wife Asako and his younger brother Sasuke, Sakichi devoted himself to inventing a device that would automatically replenish the weft. He succeeded the following year. This new automatic shuttle-changing device yielded excellent results when fitted to narrow-width power looms.

It was just around this time, stimulated by the outbreak in 1904 of the Russo-Japanese War, that a sudden demand for cotton cloth arose and smaller textile companies began to expand their facilities. Sakichi responded to the new market demand with his inexpensive, efficient power looms, and sales of Toyoda Shokai looms thrived. Even as business thus boomed, Sakichi continued improving his automatic shuttle-changing device and experimenting with its application to broad-width looms.

Kanegafuchi Spinning Co., Ltd. (now Kanebo, Ltd.), one of Japan's leading spinning companies, contacted Sakichi in 1905 to say it was interested in conducting performance tests to compare his automatic broad-width loom with other makes. Although Sakichi was still building and improving experimental models, Kanegafuchi convinced the reluctant inventor to let them conduct the tests by offering to manufacture the loom if it could use the patent. The performance tests continued for a year. They showed that looms made by the British firm Platt Brothers & Co., Ltd., operated best overall, and that the Toyoda looms were less efficient and produced inferior cloth.

Reflecting on the causes of the poor results, Sakichi later ²⁹ wrote: "You can't be creative and complete a piece of work unless, above all, you work on the construction yourself, attend carefully to every single detail and experiment over and over again. And you must never leave the production to anyone else. These are the lessons I learned from experience, and they should be minded." For the rest of his life, Sakichi conducted all his own tests, without relying on outsiders.

At the urging of Mitsui, Sakichi decided to start a fullfledged loom-manufacturing company. In December 1907, he dissolved Toyoda Shokai and in its stead established Toyoda's Loom Works, capitalized at 1 million yen. Sakichi became managing director, and the new situation let him concentrate on research.

Toyoda's Loom Works was a large-scale enterprise for its time: The paid-in capital of 1 million yen was the same as that of Mitsui. But when the economy went into recession after the Russo-Japanese War, business slumped badly. Although Sakichi's research progressed smoothly, culminating in the successful development of a broad-width automatic power loom in 1908, his large research budget was blamed for contributing to the company's poor performance. Notwithstanding, Sakichi pushed ahead with improvements in factory equipment, tool improvements and procurement, and construction of a pilot plant. He had no intention of revising his strong belief in research and testing. In the end, however, invention and research proved incompatible with profitability, and disagreements within the company prompted Sakichi's resignation in 1910.

In May 1910, still disappointed from his experience at Toyoda's Loom Works, Sakichi traveled to the United States. Visiting Seattle, Chicago and New York, Sakichi was deeply

impressed by the tremendous industrial strength everywhere he 30 went. He was particularly impressed with the automobile, which struck him as a veritable conglomeration of parts and mechanisms. The automobile had its beginnings in Europe, the first successful ones being Karl Benz's gas-powered three-wheeled motor car in 1885 and Gottlieb Daimler's gasoline-powered four-wheeled motor carriage the following year; it was the Americans, however, who were the first to mass-produce the automobile. When Sakichi went to the United States in 1910, less than two years had passed since the Model T Ford, a car built for the masses, was marketed. Nevertheless, American manufacturers were already turning out over 100,000 automobiles a year, and the car was becoming an everyday means of transportation.

Sakichi's main interest at that time, however, was looms, and he visited the quality textile-producing centers in the Boston area. At the time, most American mills were using Northrop automatic looms, and when Sakichi compared their speed, frequency of breakdown and product quality with his own looms, his faith in his inventions was restored.

Sakichi returned home on New Year's Day 1911, resolved to embark once more on the research and development of an automatic loom. Having learned from his two previous failures, he sought personal financial backing for an independent, selfsupporting plant so he would not have to rely again on outside capital. After obtaining financing, he built a new textile mill in Nagoya. Together with his family, he moved to the mill and immersed himself in the further development of automatic looms. Every morning before work commenced, he would enter the office where he conducted his research and pore over his drawings. During the day, he would study the automatic looms while they were running to look for points that could be improved, and he would get completely covered with oil in the process. At night, he would shut himself up in his office again and continue with his research. Sakichi's enthusiasm spread to his staff, and in

a short time the number of looms in operation was increased from 100 to 200 as the mill's business steadily grew.

The Japanese spinning industry was still technologically backward, and 80% of its production was of thick, coarse yarn. Using yarn of such inferior quality presented a problem: It was unsuitable for testing the looms, because when the yarn snapped it was impossible to determine whether the cause was a defect in the loom or in the yarn.

Sakichi, therefore, decided to start his own spinning business and make yarn himself that was of dependable quality. But the scale he had in mind was too small to be considered profitable by conventional standards; the average Japanese spinning mill had 50,000-60,000 spindles, and Sakichi planned to use only 6,000. He received offers of help, however, from Ichizo Kodama, manager of Witsui's Nagoya branch. The spinning mill began operating in February 1914.

One result of the business relationship with Kodama was a deepening of the friendship between the two men, and in 1915 Sakichi's daughter, Aiko, married Kodama's younger brother, Risaburo, with Risaburo adopting the Toyoda family name. At the time, 31-year-old Risaburo was general manager of the Manila branch of C. Itoh & Co., one of Japan's foremost trading companies in the raw cotton business. He left C. Itoh, however, and joined and became a key management figure of the Toyoda enterprises. Aiko supported her husband in his work, and she later encouraged and supported her elder brother Kiichiro in his automobile venture.

The First World War broke out soon after Sakichi's spinning business got under way, and the economy boomed. The spinning mill was deluged with orders, and a succession of expansions in its facilities rapidly transformed it into a huge operation. This led to the establishment in January 1918 of Toyoda Spinning & Weaving Co., Ltd. Capitalized at 5 million yen, the new company had 34,000 spindles, 1,000 looms and a staff of 1,000. Sakichi was president, Risaburo managing director, and in 1920 Sakichi's eldest son Kiichiro, who had just graduated from the Faculty of Engineering at Tokyo Imperial University, now the University of Tokyo, joined the company's technical staff.

Toyoda Spinning & Weaving continued to flourish in this favorable business climate, becoming the foundation for what was later to become the Toyota Group.

With the rapid expansion of the weaving sectors of the major spinning concerns and the availability of inexpensive, domestically produced power looms to smaller textile makers, the Japanese cotton weaving industry grew spectacularly. In terms of revenue, exports of cotton cloth overtook imports in 1909. Japan had consistently suffered an unfavorable balance of trade since trade with Western nations opened in the late nineteenth century; but now, besides the decrease in imports as a result of the First World War, the steady growth of cotton and other exports resulted in trade surpluses from 1915 to 1918.

Around 1920, impelled by the high import tariffs imposed by China on Japanese cotton goods, Japanese spinning companies began setting up subsidiaries in China. In November 1921, with Toyoda Spinning & Weaving now a going concern at home, Sakichi opened the Toyoda Spinning & Weaving Works in Shanghai. The mill had 60,000 spindles and 400 looms.

Acting on these convictions, Sakichi moved his family to Shanghai, where he made a success of his first overseas venture. At long last, he was able to immerse himself in his research without financial worries.

Kariya, Aichi Prefecture. The plant was equipped with 200 newly designed automatic looms, and practical testing began. The development of the automatic loom now proceeded rapidly, spawning numerous patent applications. The automatic weft replenishment device had a shuttle-change

mechanism that made it revolutionary: It allowed shuttles to be replaced smoothly, without damage to the shuttles and without reducing the speed of the running loom in the slightest. Ten shuttles could be positioned in front of the shuttle box; when the weft ran out, a new shuttle would automatically move into place, pushing the empty shuttle out at the back.

Finally, in 1924, an automatic loom was perfected whose performance both satisfied Sakichi's expectations and surpassed the highest of contemporary international standards. An iron works was leased in Nagoya and converted into a foundry, and preparations were begun to go into mass production.

An automatic loom designed for mass production was perfected in November 1925. One year later, after installing 320 such machines in the pilot plant and confirming that they worked satisfactorily, Sakichi founded Toyoda Automatic Loom Works, Ltd., in Kariya, capitalized at 1 million yen. A foundry, an iron works and a woodwork shop were built, and in 1927 production and sales of the Toyoda G-type Automatic Loom began.

Although the G-type loom cost 630 yen, compared with 200 yen for conventional looms, one worker could operate 25 of them at once, and it was estimated that the capital investment for a mill with 1,000 of these looms could be recovered within a year. One after another, the nation's major textile mills shifted to the automatic loom, and exports to mills in countries like China and India grew as well.

Platt Brothers, then the world's largest maker of spinning and weaving machinery, commissioned Mitsui, their sole agent in Japan, to evaluate the performance of the Toyoda G-type loom. Then in 1929, Platt Brothers approached Toyoda with an offer to purchase the patent rights. Kiichiro went to England in December to negotiate with them, and agreement was reached on a price of 100,000 pounds. The purchased patent rights covered the entire world with the exception of Japan, China and the United States.

In 1930, Toyoda Automatic Loom Works began work on the development and manufacture of a high-draft spinning frame, as well as a carding machine and other machines for fore-spinning processes, where raw textile was prepared for spinning. Now head of the engineering staff, Kiichiro was instrumental in the development of these machines. The success of Toyoda Automatic Loom Works marked the beginning of the transition for Toyoda enterprises from the textile to the machinery industry, and in fact it signified their first step toward the manufacture of automobiles.

The Toyoda Precepts

1. Be contributive to the development and welfare of the country by working together, regardless of position, in faithfully

Although the most popular engineering course was shipbuilding when Kiichiro was at the university, students were already becoming interested in internal combustion engines. With the advent of the First World War, the attention of mechanical engineering students focused increasingly on automobile and airplane engines, and Kiichiro was no exception. After graduating in 1921, he accompanied Risaburo and his wife Aiko-Kiichiro's younger sister-on a tour of European and American textile mills. Inspired by the American auto industry when he visited the United States many years earlier, Sakichi had once come up with an idea for a motor similar to today's rotary engine. And now it was Kiichiro's turn, for when he saw how popular automobiles had become in the United States and Europe, the meaning of his father's words some years earlier

came home to him: "We are entering the era of the automobile." Kiichiro returned to Japan nurturing a dream of entering the auto industry himself. In the fall of 1929, Toyoda Automatic Loom Works was on the verge of signing an agreement with Platt Brothers to sell the use of the patent for the G-type Automatic Loom. Kiichiro traveled to England by way of the United States to conclude the negotiations, but on the way he wanted to see for himself how far the automobile industry had developed. Leaving negotiations about the patent to a Mitsui representative who was traveling with him, Kiichiro spent his time visiting auto assembly plants and parts makers in the United States and Great Britain.

At the time, the American auto industry was using a conveyor system of mass production to turn out over 5 million vehicles a year. Ford Motor Company, founded in 1903, was enjoying spectacular growth with its mass-produced, massmarketed Model T. General Motors Corporation (GM), established in 1908 and led by Alfred I. Sloan, challenged the all-black, standardized Model T with a wide product line of colorful models, and with frequent model changes. Then, in 1927, GM surpassed Ford in number of units produced. After its founding in 1925, meanwhile, Chrysler Corporation had skillfully usurped the replacement demand from the Model T with its fresh intermediatesize cars, and it was growing rapidly.

In short, the American auto industry was making the transition from a period of competition among over 80 automakers to 39 the era of the Big Three, and the situation was changing from that of a seller's to a buyer's market. The time was also coming when automakers would open new markets even as they were competing with each other in the old ones. The Big Three were starting to expand overseas and were already on their way to dominating the world market.

Meanwhile, the Japanese auto industry was still in its infancy. The number of vehicles owned by Japanese exceeded 12,000 units in 1923 and grew rapidly thereafter, but the majority of these were European or American imports.

Kiichiro was one of many young Japanese entrepreneurs to visit the United States or Europe during this period and be struck by the civilization on wheels. Like them, he returned home determined to make automobiles. Shintaro Yoshida was another; he owned a small bicycle shop in Tokyo, and perfected Japan's first gasoline-powered automobile in 1907. Also, Masujiro Hashimoto, who had studied engine production in the United States, built an automobile in 1914 and started producing it commercially in 1918 when he founded the company Kaishinsha.

When the Military Automobile Subsidization Act was promulgated in March 1918, enterprises with sufficient capital seriously began to consider entering the automobile industry. Among these were Tokyo Gas & Electric Industry Co., Ltd., which initiated preparations for automobile production in 1917, and Tokyo Ishikawajima Shipyard Co., Ltd., which began preparing for manufacture of motor vehicles in 1920 and formed a separate company for that purpose, Ishikawajima Automobile Manufacturing Co., Ltd., in 1929.

Most pioneers, however, were hampered by the fact that in Japan the parts and machinery industries were not developed sufficiently and did not expand beyond the level of family enterprises.

Nor could enterprises that were new to the auto business 40

establish a commercial base for themselves.

In the aftermath of the Kanto Earthquake of September 1, 1923, eight hundred Ford truck chassis were imported to be used for building buses as an emergency measure in Tokyo, whose transit system had been destroyed. The transport efficiency of these vehicles awakened public awareness of the automobile practically overnight, and American automobiles were soon coming into the country in great numbers.

After studying the Japanese market, Ford entered it in 1925 by establishing Ford Motor Company of Japan (Ford-Japan) and building an assembly plant in Yokohama. In 1927, GM set up General Motors Corp. of Japan (GM-Japan) and built an assembly plant in Osaka. Both were huge knockdown assembly plants, far exceeding the output of which the Japanese auto industry was capable. The Ford plant turned out 8,000 units a year, and GM's plant 10,000 units. With the Americans setting the pace, the automobile quickly caught on in Japan. The number of vehicles on Japanese roads grew from 50,000 units in 1927 to 50,000 units in 1929. However, one by one the Japanese automakers were going into bankruptcy. In the end, only three domestic manufacturers remained—Tokyo Gas & Electric, Ishikawajima Automobile and Dat Motor Co., Ltd. - and their collective output in 1929 was only a little over 400 units.

In March 1930, fresh from a study of auto plants in the United States and Europe and now determined to build an automobile himself, Kiichiro set aside a corner of the Toyoda Automatic Loom Works plant for his research, gathered his engineers together and began working on a small gasoline engine. He wanted to start with the engine, as the heart of the automobile, but he soon found that even this initial step involved constant trial and error, as the research staff confronted problem after problem.

At the same time, Kiichiro believed that before moving 41

into auto production, the company must first acquire the technology to carry out precision machining and become familiar with mass production methods. He introduced a conveyor system to loom production and imported high-quality German and American machine tools, ostensibly to improve the precision of the looms and spinning machines. He also installed an electric furnace in the foundry to provide high-grade castings, and introduced Japan's first molding machine. Toyoda's automatic looms were also the first to have chrome plating to improve the precision and durability of their rotating parts, for which purpose the company hired its own chemical analyst. Meanwhile, Kiichiro pored over Henry Ford's N1Y Life and 1'Vork and urged everyone around him to read it too.

Kiichiro never rested. Even as he struggled to master the technologies required for auto manufacture, he visited the companies selling auto parts and also visited machine tool makers. By purchasing parts and analyzing them, he acquired an accurate view of the state of the parts industry, upon which the auto industry must have its foundation. Unlike Europe and the United States, Japan had never had a carriage industry and had not, therefore, developed any sizable parts industry. Now, however, the opening of the Ford-Japan and GM-Japan assembly plants had given rise to domestic manufacturers who supplied parts to both companies, and a trend toward improved quality was becoming apparent.

Trial Production of a Passenger Car

During this period, Ford-Japan and GM-Japan built up nationwide sales and service networks and cornered most of the Japanese market. When Ford carried out its initial survey of the Japanese auto market prior to entering Japan, it found that the 42

Military Automobile Subsidization Act provided for production by private companies of only the small quantity of automobiles required by the military. It also discovered that the various automakers shared no common standards and were unwilling to cooperate with one another. Further, the government's automobile import tariffs were light, consisting of a 50% duty ad valorem on imported auto chassis but only 30% ad valorem on parts and a specific duty of 20 yen per 60 kg on engines. There was obviously no interest in protecting domestic automakers.

In an environment thus ideally suited for knockdown assembly production, both Ford and GM made good profits. But as the assembly plants of the two companies went into full operation and the import volumes soared, Japan's balance of international payments worsened; the government's attitude toward Ford and GM changed, and it reversed its policy. In May 1931, the government took its first steps toward stimulation of domestic auto production when the Ministry of Commerce and Industry set up a committee to study promotion of the motor industry. The committee decided to put the auto industry on a firm footing by producing vehicles with standard specifications. The three firms of Tokyo Gas & Electric, Ishikawajima Automobile and Dat Motor, together with the Ministry of Railways, were given the task of design and trial production, and in March 1932 they completed a chassis for buses and trucks with a 1.5- to 2-ton capacity, a size larger than Ford's and Chevrolet's chassis.

The government urged the three domestic automakers to merge in order to mass-produce this standardized vehicle. The first phase took place in March 1933 with the merger of Ishikawajima Automobile and Dat Motor, but the conflicting interests of the two companies prevented much progress being made toward mass production.

Spurred by this new government attitude, large enterprises like the shipbuilders of the Mitsui and Mitsubishi zaibatsu 43 groups, which subsequently gave up making headway in the auto business, now began test-producing new vehicles. Yoshisuke Aikawa, the head of the new zaibatsu group Nihon Sangyo Co., Ltd., also made his move into the auto industry. Nihon Sangyo acquired the manufacturing and sales rights to the Datsun compact from Dat through a subsidiary, Tobata Imono Co. Ltd., and founded the Jidosha Seizo Co., [Ltd. in](#) December 1933 with a capital of 10 million yen. The following year, the name of the firm was changed to Nissan Motor Co. Ltd.

Kiichiro was making steady progress in his preparations for Toyoda's entry into the auto business. He visited friends from his university days who were now involved in the promotion of the auto industry and inquired about trends in both government and industry. Those friends included Kazuo Kumabe, an assistant professor at Tokyo Imperial University who served on the committee of the Ministry of Commerce and Industry mentioned above;

Kaoru Ban, who researched strategies for promoting the auto industry at the ministry; and Hideo Kobayashi, who headed the standardized vehicle design team at the Ministry of Railways. Never one for small talk, even in his student days, Kiichiro now surprised his old friends by abruptly broaching his plans for automobile production. In their discussions, Kiichiro gained much invaluable information.

Kiichiro made careful note of the movements afoot in business and government. He jotted down ideas as they came to him, constantly weighing them against one another while evaluating the technological capabilities of his plants. From the mountains of notes he left, one can gather how his plans gradually coalesced. Kiichiro realized that however good a vehicle might be, it would be of little value if it were too expensive to buy and uneconomical to run and also that it would not sell unless it were cheaper than foreign models; he decided it would be necessary to 44

consider the extent of the loss per unit that would be required to produce such a vehicle and the time it would take before the public bought the vehicle at a price that offset the cost. His main concern then became how long Toyoda Automatic Loom Works would be able to support such an effort.

Most of those who knew of Kiichiro's plan to go into automobile production believed he was acting rashly, and not a few told him to his face that the auto business was not worth the trouble. But Kiichiro was no longer interested in debating whether or not to build automobiles; to him, it had rather become a question of what kind to build and how many should be built to make such an enterprise work. His conclusion was to massproduce a passenger car for the general public.

To make a success of his venture, Kiichiro decided, it was absolutely necessary to mass-produce a car of the size most in demand, a 3,000-cc passenger car: "Instead of avoiding competition with Ford and Chevrolet, we will develop and mass-produce a car that incorporates the strong points of both and that can rival foreign cars in performance and price. Although we will base our method of production on the American mass production system, it will not be an exact imitation but will reflect the particular conditions in Japan."

Kiichiro's ideas had jelled. In the summer of 1933, his staff completed 10 prototype 60-cc engines for use in motorcycles. By this time, the Japanese economy was emerging from the chaos that followed the Great Depression of 1929, and the various Toyoda enterprises, spearheaded by Toyoda Spinning & Weaving and Toyoda Automatic Loom Works, were performing well.

In September 1933, feeling that it was the ideal time to embark on automobile production, Kiichiro revealed his plans to Risaburo and sought his approval. Since Sakichi had passed on to Risaburo the responsibility of managing all the Toyoda enterprises, Risaburo had to exercise extreme caution in entering a 45 business whose future was far from clear. But in the end, swayed by the firmness of Kiichiro's convictions, Risaburo agreed that if Toyoda were to enter the automobile business, now was the time.

An Automobile Department was established. Kiichiro immediately closed off part of a warehouse at the plant and began work on the design and construction of a prototype. He filled the Automobile Department with the most talented people in the company and invited specialists from outside as well. Takatoshi Kan, who had experience with engine casting at another company, joined the group in November 1933. Years later, he recalled how Kiichiro

invited him to participate in the project: "Kiichiro told me that he was about to realize his long-held dream of producing automobiles but that he was having a hard time finding experienced engineers. He asked if I would work with him. I didn't really know that much about automobiles, but I was very excited by the idea of domestically producing a car for the public, so I agreed to join Toyoda and help out as best I could."

Kiichiro also recruited Benzo Fukada, who had been chief engineer for a steel manufacturer. "The auto industry is an integrated industry," he told Fukada, "and it requires a thorough knowledge of steel in particular. I'd like you to bring whoever you want with you and make whatever plans you like. I'll leave everything in your hands." Fukada accepted Kiichiro's offer enthusiastically and set about planning the construction of an in-house steel mill that could produce the special steel needed for motor vehicles. Kiichiro hired Fukada because the quality of the special steel then being produced in Japan was too poor for use in automobiles.

Kiichiro directed Kan to design an automobile pilot plant that would accommodate a future shift to mass production. He also contacted Risaburo Ohshima, who was in England wrapping up the agreement with Platt Brothers and directed him to go to

Gennany to purchase machine tools for the new plant:

In December 1933, Kiichiro asked Risaburo Toyoda to convene an emergency board of directors meeting. At the meeting, held on December 30, Kiichiro submitted his plan to move into auto production and asked the board to call a general stockholders meeting to obtain approval. According to his later recollections, Kiichiro believed, "When embarking on any new business venture, the most economical approach is to tackle it straight away." He was thinking of immediate construction of the automobile pilot plant and steel mill. Aware that even Mitsui and Mitsubishi had abandoned their efforts to enter the industry, some directors opposed the idea, but Kiichiro argued his case convincingly. Eventually, he persuaded the board to approve the establishment of the Automobile Department retroactive to September 1, 1933.

At the extraordinary stockholders meeting held on January 29, 1934, Toyoda Automatic Loom Works voted to increase its capital to 3 million yen and to add automobile manufacture and steelmaking to the businesses listed in its articles of incorporation. With its decision to join the auto industry now official, the company immediately began construction of a pilot plant and a steel mill within the Toyoda Automatic Loom Works compound.

The group of complete novices engaged in the prototype construction of their first automobile, however, found the going extremely rough. Although the men were confident with casting because of their experience using an electric furnace and molding machine to manufacture looms, components with complex shapes, such as engine cylinder blocks and heads, forced them to rethink every aspect of the process down to the type of sand used in the mold. The use of a core to create a hollow space in the casting presented a particular challenge, and the staff found themselves in an ongoing struggle to determine the right type and amount of oil to mix with the sand. It took a good half a year to cast the first cylinder block, and continuous trial and error by the most skilled staff members to determine the proper machining allowances. Kiichiro's staff finally completed their first prototype engine in September 1934. Christened the Type A, it was a 3,389-cc inline six-cylinder engine. But try as they might, they could not improve its horsepower. Kan sequestered himself in the plant for a week to work on the shape of the cylinder head combustion chamber before the target of 65 hp was finally achieved in March of the following year.

When it came to test production of the frame and body, materials were a problem. Domestically produced sheet steel, which cracked when it was stamped, proved utterly useless. The Toyota staff made repeated requests to the steelmakers to improve their product, but the country did not yet have the technology to produce steel sheet of uniform quality, and little improvement resulted. If they were going to use stamping presses for mass production, then at the very least they would have to import sheet steel for the body.

The first prototype automobile was finished in May 1935 - the Model A1 passenger car with a Type A engine. Its streamlined body was at the forefront of style for its day. In the United States, it had only been recently that streamlined bodies had begun to be used on the De Soto and other car models and there was no guarantee that the public would respond favorably to such a design. After listening to the opinions of many people and studying the structural dynamics, however, Kiichiro concluded that streamlining would become the norm for passenger cars of the future.

After producing three Model A1s, Kiichiro and the other members of the Automobile Department conducted almost daily road tests. Meanwhile, however, the environment of the auto industry was changing rapidly, and Kiichiro's dream of producing a passenger car was forced to undergo a major change in direction.

Inception of Japan's Motor Industry

Japan's economy grew spectacularly in the 1930s. The rate of increase of industrial production between 1931 and 1936 was 161% for steel and 139% for chemicals, greatly surpassing the 56% for textiles during the same period. Between 1936 and 1941, machinery production showed a high growth rate of 152%, and the economic structure shifted toward heavy industry and chemicals.

The automobile industry also moved into the spotlight. As a result of the worsening of the international balance of payments and changes in the international situation, the policy of promoting the growth of the domestic automobile industry developed rapidly from 1935. In May 1936, the Law Concerning the Manufacture of Motor Vehicles was promulgated to promote the establishment, in a single stroke, of Japan's automobile industry. The law instituted a system under which manufacturers of over 3,000 units annually had to be licensed by the government, and it also aimed for the total domestic production of vehicle parts.

This in effect put an end to the plans of Ford-Japan to build an integrated production plant, capable of everything from steel making to parts manufacture and final assembly, on land it had purchased in Yokohama. Moreover, with the increase of import tax on automobile parts and the plunge of Japan's currency, which began in 1937, Ford and GM lost their competitiveness and ultimately halted motor vehicle production activities in Japan.

The companies licensed under the provisions of the Law Concerning the Manufacture of Motor Vehicles were Toyota Automatic Loom Works and Nissan Motor Company. The reason for licensing only two companies was to avoid the chaos that

Line-off of the First Passenger Car

In May 1935, Toyota Automatic Loom Works completed its first Model A1 passenger car, which was powered by a Type A engine. Just before this, Kiichiro Toyota had learned that the Bill Concerning the Manufacture of Motor Vehicles would place great emphasis on the production of

trucks. Although Toyoda Automatic Loom Works had been carrying out trial manufacture aimed at passenger car production, Kiichiro realized that a shift in planning was needed. He thus instructed Risaburo Ohshima to set about developing trucks. In March 1935, Toyoda Automatic Loom Works initiated the trial manufacture of trucks. It was decided that the engine developed for the passenger car would be used and that the frame, like the Ford truck frame, would be principally designed for poor roads.

Meanwhile, the Bill Concerning the Manufacture of Motor Vehicles was moving quickly toward becoming law. Toyoda Automatic Loom Works had not yet begun full-scale production of passenger cars or trucks, so it had to speed up its efforts to prepare for manufacturing trucks. Consequently, a special general meeting of shareholders was held on July 9, where it was decided to start full-scale production of motor vehicles and to double the company's capital.

On August 20, after the Cabinet decided upon the outline of the vehicle manufacture bill, Toyoda Automatic Loom Works increased its capital to 6 million yen, and on August 25 a prototype

of the Model G1 truck was completed after less than six months' work. The body was handwrought, without using molds. Ohshima also introduced certain unique features into the body design, such as drawing upon the inspiration of a Noh mask in the design of the radiator grille.

Unfortunately, when the Model G1 truck was given a trial run on mountain roads, many defects became evident. The propeller shaft broke, for example, and the steering system and transmission both failed. In anticipation of possible problems, Toyoda Automatic Loom Works arranged for a service team to accompany the truck, but even so the results were extremely poor, and it was clear that much work had still to be carried out on the Model G1 truck.

Improvements were made and further trials quickly completed as Toyoda Automatic Loom Works moved to start production and sales as soon as possible. It knew that once the Law Concerning the Manufacture of Motor Vehicles came into effect, authorization would be given only to a few manufacturers; if Toyoda Automatic Loom Works were not selected, it would be unable to carry out the automobile manufacture in which it had already invested so much effort. It was necessary to make as many trucks as possible before the selections began.

Once the prospects for producing the vehicle had become certain, Toyoda Automatic Loom Works on November 21, 1935 held an exhibition in Tokyo to launch the Model G1 truck and, thereby, its full-scale entry into the automobile industry. At the launch, Kiichiro explained his enthusiasm for automobile manufacture and spoke about his aspirations: There were already large vehicle assembly plants in Japan operated by foreign makers, and it would be quite difficult for a wholly domestic automobile industry to develop in competition with them. Nevertheless, he was determined to overcome the many difficulties the company faced and to expand the automobile markets that had been pioneered by Ford-Japan and GM-Japan.

One of the things that Kiichiro learned when he visited the United States and saw the automobile industry there was that the key to success or failure of mass production lay in marketing. Ford-Japan and GM-Japan had already established sales networks in Japan; Toyoda Automatic Loom Works, therefore, had to establish a sales network to rival those of Ford and GM, even though it had no experience whatsoever in selling motor vehicles. It was around this time that Kiichiro was introduced to Shotaro Kamiya.

Kamiya began his business career with Mitsui and worked for some time at its Seattle Branch Office. He later left Mitsui and established his own steel wholesale business in London. Subsequently, he returned to Japan and joined GM-Japan. He brought with him experience in international business and automobile sales. Kiichiro, who was introduced to Kamiya by Tojiro Okamoto, manager of Toyoda Spinning & Weaving Co., Ltd., immediately invited Kamiya to join his company, saying that he would make Kamiya responsible for sales. Without hesitation, Kamiya decided to join Toyoda Automatic Loom Works, and he entered the company in October 1935. At GM-Japan, Kamiya was manager

When announced, the Model G1 truck was priced at 3,200 yen, 200 yen less than the models of Ford and GM. This price, though, was well below production cost, and profits could only be made after mass production was under way. The low price reflected Kamiya's belief that the first priority of Toyoda Auto

However, in 1935, only 20 Model G1 trucks were produced; their quality, moreover, was far from satisfactory. When trucks were taken to be exhibited at a show in Tokyo, they had to be

repaired on the way and were only just able to complete the journey. In December, too, when Hinode Motors in Nagoya held a launch, the truck broke down on the way from the factory. The situation was such that Risaburo Toyoda, the president of Toyoda Automatic Loom Works, is actually said to have asked, "Will our trucks ever run?"

Initially, the trucks were sold only to customers who were sympathetic to the idea of fostering a domestic automobile industry and who lived in areas where the trucks could be repaired quickly in the event of any problems. And, indeed, breakdowns did occur.

The problems were mostly caused by parts made by Japanese subcontractors. Poor-quality materials and differences in manufacturing methods were resulting in fragile vehicles. Kiichiro personally inspected the trucks, crawling underneath in an effort to track down the cause of the difficulties. He gave various instructions for changes to be made in the materials and in the manufacturing methods. When a new part was perfected, he would smash the entire stock of the old part in front of all employees from the management down so as to express his resolve never again to build a product of inferior quality. The unceasing efforts of Toyoda's engineers gradually yielded improvements in quality. The improved trucks incorporated many new design features, such as hydraulic brakes, full-floating rear wheels and a rugged frame, so that once the initial problems were solved the truck's reputation improved steadily.

In January 1936, at a launch held together with the opening ceremony of Tokyo Toyoda Motor Sales, a bus chassis equipped with the same Type A engine was announced in addition to the Model G1 truck. Called the Model DA, it had high ground clearance despite a low floor and was sturdy enough to withstand driving on poor roads. The Model DA became widely popular,

and its Type A engine gained a good reputation for its low fuel consumption.

Truck production thus got under way, and so in February Kiichiro once again started work on the project he most wanted to bring to fruition, a prototype passenger car. Stamping dies for the car were finally completed, and the prototype Model AA passenger car emerged. It had somewhat softer body lines than those of the Model A1.

Automatic Loom Works was notified that it had been chosen as one of the companies authorized to produce automobiles under the Law Concerning the Manufacture of Motor Vehicles. That day indeed became one worthy of designation as a landmark day in Toyota's history.

Founding of Toyota Motor Company

Construction of the Kariya Assembly Plant moved ahead rapidly: 50,000 m² of land was acquired near the Toyoda Automatic Loom Works, and an assembly plant with a monthly production capacity of 150 trucks was completed in May 1936. This, together with the previously constructed steelworks and casting plant, constituted a complete automobile plant at Kariya. Parallel to these developments, aiming toward full-scale automobile production, in December 1935 Kiichiro purchased about 2 million m² of land in Koromo-cho, some 30 km east of Nagoya. At that time, the site was virgin property covered with red pine and various other trees. It was later developed and became the hub of the Toyota Group. Subsequently, Koromo-cho underwent great changes and was eventually renamed Toyota City.

Soon after entering the automobile-manufacturing business, Kiichiro was already thinking about spinning off the Automobile Department into a separate company and the construction of a new plant that would permit mass production. This became a financially viable proposition since Toyota was now authorized to produce motor vehicles under the Law Concerning the Manufacture of Motor Vehicles. In March 1937, a meeting of the Toyoda Automatic Loom Works' board of directors was held and it was decided to establish a new company and construct the Koromo Plant.

Toyota Motor Co., Ltd. (TMC) was established on August 28, 1937 with a capital of 12 million yen. Risaburo Toyoda became president, and Kiichiro Toyoda was appointed executive vice president; Risaburo Ohshima was named managing director, and Takatoshi Kan and Shotaro Kamiya were made directors. The capital came mostly from these new officers and members of the Toyoda family; the rest was borrowed from external sources.

Initially, TMC consisted of seven departments, i.e., the Administration Department, Sales Department, Manufacturing Department, Engineering Department, Technical Department, Total Vehicle Engineering Administration Department, and Research Department; and there were three offices, in Tokyo, Osaka and Nagoya. In creating this organization, Kiichiro decided to make it simple and conducive to coordinated control. In his words: "An automobile is made up of several thousand parts. If even one of these parts is missing, a complete automobile cannot be built. Unless there is complete control, it is impossible to make a single automobile, even though there may be parts in abundance. A large-scale business such as this can be controlled only by making it as simple as possible." As an example, Kiichiro advocated a policy of "building low-priced, high-quality vehicles" through the all-out efforts of the Manufacturing Department and Engineering Department working in close cooperation, and the respective managers of each department were given simultaneous managerial control of the other department. The Total Vehicle Engineering Administration Department was placed under the direct control of Kiichiro. Its function was to rectify unsatisfactory areas in the company, ranging from defects in the corporate structure to filling potholes in the on-site roads, improving the cafeteria menu and, of course, improving products in coordination with other departments.

The Research Department, which was headed by Kiichiro himself, was viewed with importance from the outset. Kiichiro felt that although establishing technical ties with overseas makers and adopting their technology and plant facilities would enable him to manufacture motor vehicles, it would not be conducive to fostering the Japanese automobile industry. Instead, he saw a need to promote the development of basic technology in order to produce an automobile which

was suitable for conditions in Japan. The importance placed on the Research Department clearly reflected Kiichiro's thinking.

Kiichiro frequently went to Tokyo to visit universities and research institutes in order to acquire new knowledge related to materials, parts and manufacturing technology. Upon acquiring some new piece of knowledge that could be utilized, he immediately wrote a memorandum to his staff, requesting them to change a material or manufacturing method.

In this way, engineering research progressed, employing as many authorities and research organizations as possible. However, a major problem was the ever-increasing manufacturing costs. Kiichiro said, "Nothing can alter the fact that a large number of machines are needed to make good automobiles. If we are going to hesitate about purchasing machines, it would have been better not to have entered the automobile industry in the first place." He proceeded to purchase the latest and most sophisticated machine tools one after another. Unfortunately, however, the overall efficiency was not as good as expected because of differences in the efficiency of different processes: Kiichiro wrote the words "Just in time" on a banner and hung it on the wall. "People talk about having missed a train just by a minute," he said, "but of course it's possible to miss a train just by a second. What I mean by 'just in time' is not simply that it is important to do something on time, but that it is absolutely essential to be precise in terms of quantity and not, for example, produce something on time but in excess, since excess amounts to waste." Storage locations for materials and parts were determined and nothing in excess of one day's supply of parts was allowed to sit idly beside a line. Kiichiro often walked around the plant and made the workers move away from the line anything that was surplus to the requirements of the day's work. In this way, the Just-in-Time System, one of the main pillars of the Toyota Production System, was started.

At the beginning of 1937, Kiichiro performed a detailed cost calculation and revenue and expenditure estimate. He concluded that if Toyota built a fully fledged plant at Koromo and produced about 1,500 automobiles a month, the company should be able to make a profit even after the interest due on loans had been subtracted.

Kiichiro instructed Kan to build a plant at Koromo. He did

so in the most informal manner, simply with the words, "Please construct a plant at Koromo capable of producing 500 passenger cars and 1,500 trucks a month" written on a scrap of paper.

On the other hand, Kiichiro's directives at the design stage of the plant were quite severe. Examples include: "Have the 30 or more factory buildings of various sizes laid out so that their proximities to one another will be conducive to the smooth production of complete automobiles"; "In the plant, place specialpurpose machines organically so their layout will be conducive to work flow from one machine to the other"; and "Build machines that will be flexible enough in function to meet any requirement, bearing in mind that they are to be used for 20 or 30 years."

The entire plant was laid out according to the manufacturing flow from the bringing in of raw materials to the dispatch of the completed automobiles. The budget did not permit the use of a conveyor system throughout, but the plant was laid out so that additional conveyors could be installed at any time. In the machine shop, machine tools were not set up with the machines grouped together by function or type, but in a manner conducive to production flow by arrangement according to the process sequence.

Construction of the Koromo Plant, the present Honsha Plant, began in September 1937, and the entire project was completed by the end of September 1938. By the end of October 1938, the move from the Kariya Plant had been made. On November 3, 1938, a ceremony was held to mark its completion and the switch was thrown to initiate the operation of the Koromo Plant. This day was also designated as the date marking the founding of Toyota Motor Corporation.

Toward All-out Production

With the completion of the Koromo Plant, TMC moved into full-scale production of passenger cars and trucks. The main truck model produced was switched to the Model GB, which was equipped with the newly developed Type B engine. The engine used a five-bearing system and was capable of 75 hp, more than the Chevrolet engine with which it was in competition. In January 1939, the Model GB truck was put on the market, and the resulting brisk sales were aided by the existing economic boom.

Kiichiro constantly toured the plant, promoting the shift to a modern plant operation that would meet the needs of mass production. The Kariya Plant was run under a contract system in which wages for employees were determined on the basis of turnover for each process; it was thus not possible to bring about completely the Just-in-Time System as conceived by Kiichiro. But the system was modified when production was moved to the new plant, and the task of reforming the production method was tackled. Under the new production system, a series number was allocated to every 10 vehicles produced, and these numbers were

In October 1938, the government put forward a four-year plan for promoting the increased production of 15 major items, including automobiles, ships and steel. Together with Nissan, TMC was obliged to produce 20,000 trucks in fiscal 1939. In April 1939, the company increased its capital to 30 million yen and began the execution of an extension plan at the Koromo Plant. TMC enjoyed good business results from the outset, attaining a profit of 800,000 yen in 1938 and 2 million yen in 1939. As a result, Toyobo Co., Ltd., Nippon Life Insurance Co. and C. Itoh & Co. applied to participate in a recapitalization. In this way, the company, which had initially obtained its capital from a very limited number of inside stockholders, finally started to draw on external capital. Using this additional capital, TMC began expanding its annealing plant, special iron foundry and malleable iron foundry.

Because of the shortage of machine tools and the lack of raw materials and coal, production in 1939 was only 11,981 vehicles. Moreover, almost the entire production was trucks; only 107 passenger cars were built.

Truck production could not keep up with the demand, but the real aim of TMC, and above all Kiichiro, was to produce passenger cars. Research into the Model AA passenger car was followed by that into a minicar of about 600-cc displacement, and prototypes were made of small cars, such as the front-wheel-drive Model EA and rear-wheel-drive Model EB. A prototype of the Model AC, an improved version of the Model AA, was also started. However, in 1938, the Ministry of Commerce and Industry banned the production of small vehicles, and TMC was forced to reduce its passenger car production drastically.

One of his instructions to the Technical Department was "Hold on to the people who make the passenger car bodies." A frequent saying of his was: "If we don't build passenger cars,

we won't be able to develop any meaningful technology," and he continued to make prototypes of passenger cars and carry out research into them.

At the beginning of 1940, a launch was held for a 2,200-cc Model AE passenger car, and dealer representatives were invited to test-drive it. The vehicle, named the Shin Nippon Goh, had been developed at the request of the Ministry of Commerce and Industry. As the wartime situation became increasingly severe, however, it was no longer possible to use the limited supplies of raw materials for building passenger cars. Full-scale production of the Shin Nippon Goh was never realized.

The military ordered TMC and Nissan to supply automobiles to mainland China and also to repair them there. Nihon Sangyo Co., Ltd., the parent company of Nissan, moved its headquarters to the northeastern part of China and was renamed Manchurian Heavy Industries Development Corporation. In April 1938, TMC constructed its Tientsin Plant, and in February 1940 the Pei-chin Automobile Company was established with 10 million yen capital. Then, in May 1939, an assembly plant was constructed in Shanghai and production of the Model GB truck commenced. The Shanghai Plant then took steps to begin full-scale production and in February 1942 became independent as the Hua-chung Toyota Automobile Company with 5 million yen capital.

Following the outbreak of war in Europe in September 1939, procurement of raw materials became increasingly difficult. At TMC, rationalization of the production processes and in-house production of machine tools were carried out under Kiichiro's instructions. However, the allotted material quantities were greatly insufficient, and the dearth already far exceeded what could be compensated for by the frugal use of materials and in-house

manufacture. The shortage of raw materials resulted in delays in the supply of parts made by subcontractors and also forced suppliers to rationalize production. In contrast to Europe and the

Under wartime economic controls, the consumption of steel was regulated and rationing imposed. As a result, from around 1938, it became increasingly difficult to obtain steel for automobile production, and even when steel was available it was no longer possible to specify a particular quality or standard. To overcome this, the steelworks of Toyoda Automatic Loom Works was expanded, and in May 1939 construction began on a new steel mill. In March 1940, Toyoda Automatic Loom Works transferred all its equipment and facilities as its investment share in the establishment of Toyoda Steel Works, Ltd., which was set up with a capital of 17 million yen.

TMC, meanwhile, was having difficulty in procuring machine tools and, despite increasing their in-house manufacture, was unable to support production expansion. Although a few good machine toolmakers had begun to develop in Japan, Kiichiro wanted to make special-purpose machines that would have the

high productivity needed to meet the scale and process requirements of TMC's plants. To bring this about, TMC in November 1939 decided to spin off its Machine Tool Department as an independent company and construct a plant in Kariya. The new company, Toyoda Machine Works, Ltd., was set up in May 1941 with a capital of 8 million yen.

In August 1944, the Ministry of Munitions ordered further simplification of vehicles built for the wartime conditions in order to achieve greater savings in materials and also to increase vehicle production. As a result, the amount of steel used in the driver's cab and the bed of the Model KC trucks was reduced to a bare minimum, and only a single headlamp was installed at the center; it thus became

known as the "one-eyed truck." In addition, the radiator grille was replaced by a single horizontal bar on which the headlamp was mounted. The bumper was made narrower than the width of the vehicle and, incredibly, brakes were fitted to the rear wheels only. It was possible though for such a dangerous truck as this to run on the roads since by this time there were very few vehicles about.

Kiichiro believed that one of the mainstays of the automobile industry was body manufacture. For this reason, he had plans to spin off the body plant as early as 1940, and in May 1945 it was decided to establish Toyota Shatai Kogyo, Ltd., now Toyota Auto Body, Co., Ltd. The first capital payment was made on August 1. Kiichiro became president and the new company was capitalized at 9 million yen.

By this time, the war situation had gone from bad to worse, and it was inevitable that Japan would soon have to fight the decisive battle on its own soil. Then, in August 1945, the atomic bombs were dropped, first on Hiroshima and then on Nagasaki. In a memo written around that time, Kiichiro pointed out that automobile production in the United States was a hundred times greater than that in Japan. He also asked how Japan, with only one hundredth the weapons possessed by the United States, could possibly win such a war. Kiichiro was becoming interested in what the situation in Japan would be like after losing the war, and he read a great deal about conditions in Germany and its recovery following defeat in the First World War.

Finally, at noon on August 15, 1945, Emperor Hirohito went on radio to announce the end of the war. The message was relayed from speakers in the company's plants. There was a great deal of static interference in the broadcast, and those listening were not quite sure what it was all about. One person said, "He's saying that the decisive battle is about to be fought on Japanese soil, so we must all get ready for the final struggle." Without quite knowing what was going on, some employees went back to work and continued repairing the bombed plant.

At the end of the war, TMC was capitalized at 91.5 million yen and had six plants: the Koromo Plant, Kariya Plant, Shibaura Plant and the three aircraft plants it had gained from Chuo Spinning Company. TMC's affiliated companies included Toyoda Automatic Loom Works, Toyoda Steel Works, Toyoda Machine Works, Toyota Sangyo Kaisha, Ltd., Tokai Hikoki and the Toyoda Physical and Chemical Research Institute.

In 1945, a total of 3,275 trucks and buses was produced by TMC, but no passenger cars left its production lines.

Starting from Zero

The initial postwar years were extremely difficult ones for Japan. The nation's entire industrial heartland lay in ruins, and industrial output had dropped to one-tenth of prewar levels. In 1946, the first complete postwar year, the economy showed no signs of recovery and inflation worsened. In the initial six months after the war, retail prices approximately tripled.

With defeat, Japan came under the control of the Allies, principally the United States. In September 1945, General Headquarters (GHQ), the military headquarters for the Supreme Commander for the Allied Powers, was established. Initially, the policy of the Occupation was to

promote the demilitarization and democratization of Japan's political, economic and social environment.

Besides revising the constitution, redistributing farmland and expelling militarists from public office, as part of its democratic reforms the government under the Occupation dissolved the zaibatsu that had constituted the nucleus of the prewar economy. Almost all important business leaders were purged. The postwar Japanese economy had to start from zero.

The auto industry also had to start anew. At that time, the transportation system centered on the railroads, and the road network was in a bad state of disrepair. Only 112,000 trucks, poorly maintained and running on a variety of alternative fuels, were in service at the end of 1946.

Although the production facilities of automakers had suffered comparatively little damage in the air raids, since 1936 they had been put through extremely hard service, had undergone virtually no improvement and were quickly becoming obsolete.

The auto industry thus had to make its start with run-down, outdated plants and equipment.

In September 1945, auto companies received permission to make vehicles, though only for trucks that were to be used for reconstruction work. Corporate activities, however, were severely restricted in many ways as Occupation authorities included their production facilities in the reparations plan; the automakers were included among the companies designated as restricted to further the dismemberment of the zaibatsu. In addition to restrictive Occupation policies, sources of materials had dried up, making it extremely difficult for them to expand production.

In 1947, however, at the start of the Cold War between the United States and the Soviet Union, an abrupt reversal took place in Occupation policy in the direction of reviving the Japanese economy. In concert with the Marshall Plan for Western Europe, Occupation authorities rapidly implemented a series of economic recovery policies for Japan, including two aid programs - Government Aid and Relief in Occupied Areas (GARIOA) and Economic Rehabilitation in Occupied Areas (EROA) - and the reduction of reparations.

This turnabout in Occupation policy was also good news for the auto industry. Directives targeting auto production facilities for reparations and designating automakers as restricted companies were relaxed and the import of basic raw materials such as oil, coal and iron ore was promoted. As part of the economic recovery plan, a priority production system was established, aimed at increasing production in, and channeling funds and materials to, the basic materials sectors of coal and steel. This system soon began to show results, finally brightening the prospects of recovery for the auto industry. In August 1948, a five-year plan to revive the auto industry was formulated, which called for a total annual production of 120,000 vehicles a year by 1953.

As a result of increased government spending, however, inflation steadily accelerated. In December 1948, GHQ laid down its Nine Principles for Economic Stabilization to resurrect the Japanese economy. In February 1949, Joseph Dodge came to Japan as financial adviser and began to advocate budget reduction, and financing to industry halted. The so-called Dodge Line managed to stop inflation, but unemployment and corporate bankruptcies soared. The auto industry also suffered from sluggish sales and a rapid growth in inventory.

In June 1950, the Korean War broke out. Because the Allies' army procured supplies from Japan, Korea's neighbor, the Japanese economy experienced a sudden surge of prosperity.

Manufacturing industries, centering on textiles and metals, rebuilt their operations as domestic consumption and investment boomed.

The auto industry was able not only to boost production and strengthen its operational base but also rapidly modernize its facilities and carry out corporate rationalization. Passenger car production, however, still faced an uncertain future. Just as before the war, in the Japanese auto industry, the bulk of the production resources was devoted to trucks. The passenger cars manufactured could not compete in the international market.

Designated as a military supply company during the war, TMC was in danger of having its facilities seized for reparations by the Occupation authorities. Also, many employees left the company as the food supply worsened. Of the 9,600 employees at the Koromo Plant only 3,700 remained by the end of October. Those who were left began the task of rebuilding the company.

Since food was in extremely short supply, the company began cultivating crops on the grounds of the Koromo Plant, and also built a flour mill, bakery and charcoal plant to supply its employees with food and fuel. Facilities at other plants were used to manufacture auto parts and recondition vehicles, to make electric stoves and irons, and even to fashion pots and pans from materials originally intended for airplanes. While there was no prospect of being able to produce motor vehicles, the company had to eke out an existence by making whatever it could.

Around this time, Kiichiro wrote a memo entitled "Corporate Reform Policy," in which he outlined the following thoughts concerning the future of the economy, the auto industry and the company:

We have finally come to the point where Japan will have to convert to a free market economy like that of the United States and compete with the rest of the world on an equal basis. We must, therefore, reform our protected and monopolistic companies.

The Japanese auto industry has been fostered and protected in a controlled economy and has never braved the rough

waves of a free market situation. It is like a hothouse plant. Moreover, viewed impartially from a global standpoint, Toyota is far from being a first-class company. Because of Japan's defeat in the war, we should see ourselves as something like a third-class auto company.

We will find it difficult to hold a clear course without foundering in the stormy seas of a free market economy. The ability of this company, which has sustained heavy blows, to make the transition from a controlled to a free market economy will determine its ultimate success or failure. However, if we can succeed in a free market economy, we will have a bright future ahead of us. Everything depends on our own determination.

In April 1946, Kiichiro formed a project team called the Reconstruction Department outside the existing managerial structure and placed himself at the head of plant reconstruction efforts. Although it was still too early to determine what the future would hold for the auto industry, TMC moved quickly to transfer all engineers both within and outside the company into the Reconstruction Department, repair war damage, return evacuated production facilities and completely refurbish facilities that had suffered during the war.

With high expectations for future growth, the company also hired 200 new employees. Many of these people had been aircraft engineers. Kiichiro stated, "Japan is being allowed to develop an auto industry. Future competition will be fierce. Now that aircraft production has

been discontinued, it is important to put the technical skills our engineers developed in making aircraft to good use in making cars. I don't want to waste Japanese technology."

In May 1946, Kiichiro invited representatives of automobile distributors from each prefecture to the Koromo Plant, an initial step toward quickly rebuilding the Toyota dealer network. In his address to these representatives, Kiichiro called for industry solidarity in developing the Japanese auto industry, "I believe that from this day forward, we will face a desperate struggle for many years to come. I shall keep on struggling till I drop."

Kamiya noted that the wartime distribution system still in effect prevented customer opinion from being heard and hindered the development of the auto industry. Expounding his philosophy of "customer first, dealer second, manufacturer third," he called for the revival of the prewar dealership system.

Thus, a clear policy was established for sales and production. The speeches of Kiichiro and Kamiya had a large impact: One month later, the Ministry of Transportation dissolved the distribution companies in each prefecture and re-established the individual maker-dealership system that had existed before the war. In addition, the personal ties that Kamiya had cultivated during the war and the inviting of dealers to the Koromo Plant, where vigorous rebuilding was already under way, strengthened dealer confidence in Toyota.

The restoration of the dealer network proceeded smoothly. Besides the prewar Toyota dealers who returned to the company fold, many leading dealers who had once been affiliated with the old Nissan network switched to Toyota, enabling the company to establish a strong dealer network. In November, the Toyota Motor

production remained at around 200 units. To procure steel, TMC had to dispatch purchasing staff to the coal mines in the southwest of Japan. The purchasing staff would buy coal, then arrange to transport it in trucks to the nearest port and ship it to steel companies, where it was then used to manufacture the much-needed steel. To procure parts, staff traveled with large knapsacks to parts makers in Tokyo and Osaka, loaded up the required parts and carried them back to the plant.

Inflation continued to rage. Under the Price Control Ordinance, which restricted the prices of automobiles, losses piled up. TMC was able to survive the crisis with loans from the Reconstruction Finance Bank, established in January 1947, but its debts grew to an enormous sum, which proved to be a heavy burden to the company's operation.

In July, TMC established the Management Study Committee to determine ways of overcoming the difficulties. Based on its recommendations, the company implemented various measures to rationalize operating and management work: the planned purchase of materials, the making of cost tables for materials purchased, and the establishment of a cost accounting system. In the plant, the company adopted various systematic measures, including concerted efforts to eliminate waste, improve efficiency and encourage creative suggestions by employees.

Launching of a Small Passenger Car

Immediately after the war, Kiichiro commented, "This will be the era of the small passenger car. I want research on a massproduced passenger car begun as soon as possible." The mass

production of passenger cars had been Kiichiro's dream ever since he joined the auto industry, and he resolved to embark upon the task at once. He laid out a basic plan calling for an engine with a displacement of between 1,000 and 1,500 cc and a

In November 1945, engineers began designing a fourcylinder 1,000-cc Type S engine, taking hints from such engines as the German Adler.

In January 1947, TMC engineers completed a prototype Model SA passenger car with a Type S engine, a displacement of 995 cc and maximum power of 27 hp. This streamlined two-door car was built to meet the demands of individual users.

In March, a prototype of the Model SB small truck was built using the same engine, and in April preparations for mass production began. Although the production of passenger cars was

still not allowed, the company showed the Model SA to the Ministry of Commerce and Industry and continued to petition the ministry for permission to begin production. In June, GHQ requested the production of 50 large passenger cars and gave permission to all Japanese automakers to make an annual total of 300 passenger cars of 1,500 cc or less. GHQ specially commissioned TMC to make the large passenger cars, which it intended to use to transport members of foreign trade missions in Japan. Using parts still in stock from during the war, TMC assembled 50 Model AC passenger cars by the end of July 1947.

In September, the company decided to adopt the nickname "Toyopet" for its small-sized vehicles. In October, Toyota launched the small passenger car Model SA, which marked the beginning of the long-awaited production of passenger cars.

Demand, though, for the Model SA was not as great as anticipated. Furthermore, production did not go as smoothly as was expected, and the car was unable to turn a profit. The car included systems that were advanced for the time, such as a double wishbone front suspension system; however, because production technology for making ball joints with the required degree of precision and research into spring friction were not sufficiently advanced, the car encountered various problems after its launch.

At that time, there was a great need for taxis. To meet this demand, Nissan launched the Datsun, which met with great acclaim. In May 1948, TMC produced a prototype of the Model SC, a four-door sedan that used a truck frame. However, this Model SC prototype, too, used independent front suspension and other new mechanisms that made it mechanically unstable.

The Model SB small truck, on the other hand, was designed for stability and durability and offered a comfortable ride. It was popular and sold well, even at premium prices. The Model SB underwent customization by both dealers and customers to make station wagons and four-door sedans. To satisfy this demand, Toyota commissioned Kanto Denki Jidosha Seizo K.K. to build a passenger car body for the Model SB truck chassis, because the company, which also had experience building electric vehicles, had many aircraft engineers and outstanding body production technology.

In 1950, Kanto Denki Jidosha Seizo changed its name to Kanto Auto Works, Ltd. As a member of the Toyota Group, it has developed and manufactured many passenger cars and commercial vehicles. Meanwhile, TMC used the experience it had gained with the Model SA as a base for research and accumulating technical expertise in the development of passenger car suspension systems and bodies.

to boost efficiency and cut material costs and other expenses. Despite TMC showing an increase in vehicle sales during this period, pretax profits, which were 6.46 million yen for the reporting period ending August 1946, only amounted to 10.98 million yen for the entire period from then until the end of November 1949.

Labor Dispute and the Founding of Toyota Motor Sales Company In 1949, the government's deflationary policy was strengthened under the guidance of GHQ financial adviser Dodge. The auto industry, which was finally facing prospects of recovery, was hit hard by the twin blows of a cutoff in Reconstruction Finance Bank loans and the sudden drop in demand caused by the Dodge recession.

Whereas production in 1947 had totaled 3,900 vehicles, TMC issued production plans calling for 15,840 units in fiscal 1949 and 21,400 in fiscal 1950. To meet these goals, which were higher than any previous level, the company began remodeling its plant at the end of 1948. However, the tight money policy made it harder to raise funds, and TMC had to reduce drastically investments in plant and equipment. Even though monthly production had almost reached the 1,000-unit mark by the summer of 1949, the plan to increase production had to be abandoned midway through its first year.

Other automakers in the same predicament were forced to rationalize by laying off workers. In October 1949, Isuzu Motors issued notice of dismissal to 1,271 employees and Nissan gave the same announcement to 2,000 employees. The unions at both companies immediately called strikes.

TMC held to its policy of no dismissals and continued labor-management discussions regarding pay cuts, but the company began to delay the payment of wages. In addition, TMC had more trouble collecting payments on vehicles sold and fell behind in repaying its loans and paying for materials. In November, TMC recorded a deficit of 35 million yen in its operating balance and faced the possibility of this figure rising to 200 million in December. The company was confronted with a financial crisis.

TMC employees realized the seriousness of the situation and, after negotiations with the management in the Management Conference, agreed to accept a 10% cut in wages. In return, the company promised not to dismiss employees and sent the union a memorandum to this effect. This promise was even included in the labor agreement.

However, even wage cuts were not sufficient to eliminate the huge deficit. Because the danger to TMC was a serious problem for the entire business community in the Nagoya area, in December 1949 a group of 24 banks, led by the Nagoya Branch of the Bank of Japan, were asked to form a consortium to provide financial aid to TMC.

As a condition for providing the financing, the consortium called for an "examination of the radical reconstruction plan of TMC." A new reconstruction plan drawn up by the banks was presented in January 1950. Financing was offered under strict conditions, including the creation of an independent sales company, the assignment of a key role to the sales company in determining production targets, and the dismissal of surplus labor: the bank group judged that the TMC management was not giving sufficient attention to sales planning and was failing to make necessary personnel cuts.

As Kiichiro put it, "It is my conviction that we should sell what we produce." Nevertheless he accepted the consortium's conditions and decided to establish a sales

company. In explaining his reasons to the Management Conference, he said, "Those who have worked hard for us for many years should be put in charge of managing the sales company. If by doing this we can save ourselves from financial disaster, it will be a step forward for the auto industry."

TMC thus decided to create an independent sales company and in April 1950 founded Toyota Motor Sales Co., Ltd. (TMS), capitalized at 80 million yen. Its executive officers were President Shotaro Kamiya, Managing Director Shiro Ohnishi and Director Shikanosuke Hanasaki.

In July 1950, TMS took 353 employees and began operations in the sales sphere. The new firm assumed all of the domestic marketing functions for Toyota, including the provision of financing for installment sales, and soon began handling overseas marketing as well. The market-oriented perspective of TMS served over the years as a constructive counterpoint to TMC's concentration on technology and production, and their ongoing exchange of opinions and ideas yielded sound overall operating policies that constitute Toyota's unique management base.

Unfortunately, reductions in the work force at TMC nevertheless became unavoidable. Wages were still being delayed into 1950. In March 1950, soon after becoming independent, Nippondenso announced personnel cuts, which immediately precipitated a strike. In April, the TMC labor union formed a struggle committee and began collective bargaining. During the negotiations, the company asked for 1,600 voluntary retirements. Kiichiro apologized to the union representatives for his

As the dispute dragged on, monthly output fell from more than 1,000 units at the beginning of 1950 to 619 in April and 304 in May. The company was accumulating huge losses daily. The bank consortium signaled that it would cut the financial flow. Toyota dealers, facing a management crisis caused by the suspension of vehicle deliveries, called for an immediate solution to the dispute.

The crisis finally came to a head. Kiichiro announced his resignation and made it known that his decision was final. In June, President Kiichiro Toyoda, Executive Vice President Kumabe and Managing Director Kohachiro Nishimura, who was in charge of financial affairs, resigned.

At around this time, employees began leaving the company voluntarily. Soon, 1,760 employees, a greater number than that requested by the company, applied for retirement. The focus of collective bargaining between labor and management now shifted

to finding new jobs for the voluntary retirees and other problems related to the aftermath of the dispute. After four days of continuous negotiations, labor and management signed a memorandum accepting the company's reconstruction plan and the two-month dispute was brought to a close. The final number of voluntary retirees was 2,146, and the number of employees remaining 5,994. Both labor and management felt strongly that one such experience of seeing the people they had worked with having to leave the company was quite sufficient.

In July 1950, Taizo Ishida replaced Kiichiro Toyoda as president of TMC. Fukio Nakagawa was appointed senior managing director, and Shuji Ohno, Eiji Toyoda and Shoichi Saito were made managing directors. Ishida had been president of Toyota Automatic Loom Works; he had displayed his skill in rebuilding the company after the war and in settling labor disputes. His managerial ability was highly regarded. Ishida accepted this highly responsible post with the intention that Kiichiro be reappointed president when business improved.

Five-Year Plan for Modernizing Production Facilities

In April 1950, regulations fixing prices and limiting the distribution of automobiles were abolished, and in June restrictions on raw and sheet steel were lifted. The production and sale of automobiles thus entered an era of all-out free competition. In July, the United States military requested Japanese automakers to submit bids for an order of 1,320 trucks for use in Korea. Although this was the first job for the Export Department of TMS, which had just started operations, it succeeded in winning an order for 1,000 trucks. After this, a series of orders came from the armed forces of the United States. To meet the demand, TMC adopted a policy of expanding its facilities while hiring as few new em

ployees as possible and having one person operate several machines. It had only been two months since the large-scale personnel cuts and any increase in the work force would have been a heavy burden on both labor and management.

The recovery of the Japanese economy and the revival of domestic auto sales brought production back up to 1,000 units in August. Inventory was rapidly used up and output was unable to meet demand, even with employees on overtime and the plant producing at full capacity.

After recording losses of 76.5 million yen for the period ending in March 1950, TMC broke even for the period ending in September and registered a pretax profit of 249.3 million yen for the period ending March 1951, making possible the payment of the first postwar dividend.

Although the special procurement ended in March 1951 with an order for 1,350 units, TMC had reaped a rich harvest and learned much during this period. TMC had been able to take advantage of this opportunity because it had reorganized its plant and rationalized production. President Ishida, who had previously said, "We must never forget that these special procurements are the result of unfortunate events in a neighboring

Manufacturing special procurement vehicles enabled TMC to learn effective quality control methods. Given the production technology of the time, tremendous efforts were needed to guarantee the quality and meet the delivery dates demanded by the United States military. The strict inspections carried out by the military gave TMC a chance to develop its highly advanced and standardized inspection technology. Production and inspection processes at the Koromo Plant were not the only beneficiaries: Suppliers also learned parts inspection methods. Making good use of this experience, the company was able to raise its quality control to today's high level.

This experience also benefited the development of the Model BJ, which was designed with a longer wheelbase and body and more horsepower than the American Jeep. This vehicle later evolved into the Toyota Land Cruiser.

Yet another fruit of this experience was the keen awareness that it was imperative for the company to make truly international, competitively priced vehicles. For example, the Model BX large truck, launched in August 1951, had a design that compared favorably with that of trucks produced in the United States. Also, a method was devised for smoothly bringing the new model on line without leaving surplus parts from the old. This method later became the basis for starting the production of new models and conducting model changes.

Beginning, immediately after the war, when Kiichiro realized that an age of free competition would arrive, the technological gap that existed between the auto industry in Japan and the United States was a constant source of concern to him. In June 1950, President Kamiya of TMS went to the United States to

Based on reports by Eiji Toyoda and Saito, TMC formulated a five-year plan for modernizing its production equipment in February 1951. This plan was designed to increase production capacity in a single stroke to 3,000 units a month by modernizing production facilities and production control. At the same time, it called for the full-scale introduction of a flow assembly system.

The plan not only concerned itself with replacing obsolete facilities, it also tackled a wide range of areas, from the improvement of the work environment to the modernization of office work management.

Shortly after it had begun the development of its passenger cars, the company was rocked by the sudden, close deaths of two of its founders. On March 27, 1952, Kiichiro Toyoda died at the age of 57. On June 3 of the same year, Risaburo Toyoda passed away at the age of 68. The lives of both men had been dedicated to the establishment of the domestic automobile industry. They had clearly seen the potential of modern technology, promoted the growth of many affiliated companies and trained numerous talented and devoted employees. Neither of them ever allowed his own self-interest to interfere with business.

Kiichiro's death was a particularly severe blow. After resigning from the presidency during the labor dispute, he underwent treatment for high blood pressure and also spent time engaging in his beloved research. President Ishida had asked him to resume his old job, and there were hopes that he might soon rejoin the management team, but these were dashed by his untimely death.

The story of Kiichiro's life is inseparable from that of the development of the Japanese auto industry. Beginning with the test production of the small 4-hp engine, he had completed an automobile engine, produced the car prototype Model A1, built the Model AA passenger car, founded TMC, been active as a leader of industry and, after leaving the company, conducted research on small passenger cars and automatic transmissions.

His interests were not limited to the automotive field,

though it is because of this that he is best known. In the period of confusion just after the war, faced with the need to safeguard the livelihoods of his many employees, he had studied the commercialization of many ideas related to basic necessities. Besides directing the development of a new sewing machine, he studied the cultivation of loaches, the mass production of *chikuuln* (fish cake) and even the making of pottery. Seeing Japan's burnt-out cities, he had the idea of building large numbers of fireproof homes. In March 1946, he established a research and development section at the Koromo Plant for studying the mass production of housing. In June 1950, he founded a company to produce prefabricated houses.

His eldest son, Shoichiro, current president of Toyota Motor Corporation who joined the company as a director in July 1952, had the following recollection of his father: "My father was always dreaming. His last dream was to make a helicopter. He had the idea of building large numbers of fireproof homes out of precast concrete, with people getting from place to place in their own private helicopters and utilizing the flat roofs of these buildings as landing pads. He dreamed of making this kind of world a reality in the near future."

Despite losing its founder and first president in such quick succession, TMC and TMS began achieving good business results. From the period ending March 1951, TMC registered a

rapid rise in profits and maintained an 11%-15% proportion of profit to total capital until the period ending November 1954. TMC also doubled its capital in May 1951, June 1952 and April 1953, an increase from 201 million yen to 1,672 million yen in only two years. With the establishment of TMS and its handling of financing for installment sales, TMC was now financially as well as technologically able to upgrade dynamically its plant and equipment to improve productivity. After beginning to make such

investments, TMC began actively to apply excessive depreciation, which exceeded the accelerated depreciation set forth in the Enterprise Rationalization Promotion Law, and its net worth rose from 25.2% for the period ended September 1950 to 60.1% for the period ended November 1954.

Investment in plant and facilities accelerated in 1953, principally because development of a new passenger car model had begun. Masaya Hanai, general manager of the Accounting Department and later chairman of the board, likened engineers to "children in a toy shop, pestering their parents to buy them this and that." But President Ishida told Hanai that if money was available it should be invested in facilities. "Let's use machines to raise our productivity," he said. Hanai and his staff took Ishida's words to heart and made untiring efforts to raise funds.

Meanwhile, Gentaro Tsuji (later vice chairman of the board), realizing that steps ought to be taken toward systematic reduction of costs, introduced and established a managerial accounting program. Through such procedures as analysis and control of budgeting on the basis of regular profit planning, the company began to conduct thorough, detailed cost management. The results were significant improvement during the ensuing years both in profitability and in corporate assets.

In 1956, a loan of 2.35 million dollars was obtained from the International Bank for Reconstruction and Development, i.e., the World Bank. TMC was able to obtain the loan because its assets were so sound. Following the financial crisis of 1950, the company's financial structure had changed completely within only a few years.

On the other hand, TMS had started with a capital of 50 million yen, but, buoyed by the steady growth in sales, it increased its capital to 200 million yen in October 1952 and 500 million yen in July 1953.

Toyota's annual motor vehicle production reached 11,000 units in 1952, putting it at the forefront of the Japanese auto industry. Subsequently, production of passenger cars and small trucks showed continued growth, reaching 23,000 units in 1954, which represented a major step forward for Toyota in its efforts to attain a monthly production level of 3,000 units.