

The Japanese Automobile Industry During the Coronavirus Pandemic: Highlights on the Problems and Strategies Adopted for Business Success

KHONDAKER Mizanur Rahman / CHOWDHURY Mahbulul Alam

Abstract

This paper discusses the consequences of the Coronavirus (COVID-19) crisis on the automobiles industry in Japan. Japan boasted being the second largest developed country until 2011 and thereafter the third-largest economy of the world. Its economic strength is at least partly due to the strong market of the automobile industry domestically as well as internationally. Japan achieved this status largely on the backdrop of its highly efficient manufacturing and exporting capabilities, which it built through heavy capital investment and a high emphasis on technology and process innovation. It is the world's third largest vehicle manufacturing country. Led by Toyota, Japanese companies imported US and European mass-production approaches, procedures, and equipment, and then added their own adaptations (such as the concept of *Kaizen*, *Kanban*, JIT, and a greater integration of suppliers into production processes) to reap even greater benefits from them. Within the automobile sector, COVID-19 has been a massive and hopefully a once-in-a-lifetime disruption, and the situation is changing rapidly. Levels and trends of production and sales in domestic and external markets have already fallen short of those prior to the COVID-19 crisis. Like many other industries, the automobile market is being seriously affected by the Coronavirus pandemic. Domestic and international resource mobilization has suffered as production activities reduced. All auto-makers have had to close production plants domestically and all around the world as a safety measure for the time being. The current global context, however, witnessed significant reduction of production and export, which affected the economy of the country. Current evidence suggests a greater and more immediate impact of the COVID-19 crisis with job losses in 2020 more than the number of jobs that had been created since the 2008 Global Financial Crisis. This study, through primary and secondary sources, looks at the present COVID-19 situation, its impact on the demand and supply of vehicles, and examines how the Japanese automobile industry is adopting strategic innovations for future development.

Key Words: Automobile industry, COVID-19 pandemic, supply-chain management, product innovation, strategies adopted.

1. INTRODUCTION

Japan is the third-largest economy (behind the United States and China) and third largest manufacturer of vehicles in the world, behind China and the United States. Japan achieved this status largely on the back of its highly efficient manufacturing and exporting capabilities, which it built through heavy capital investment and an emphasis on technology and process innovation. The Japanese automobile industry is well known across the world for its innovative ideas, attractive designs, high quality, and use of latest technologies. The industry is one of the Japanese economy's core industries and is the most prominent and largest industry of the current manufacturing sectors. The industry has 78 factories in 22 prefectures in which 5.5 million people, or 8.7 percent of Japan's workforce are employed in automotive manufacturing and related industries (JAMA, 2020, 6). Japan has been in the top three countries surpassing Germany with the most cars manufactured since the 1960s. The automobile industry in this country rapidly grew from the 1970s, and in 1980 it became the top producing country in the world. According to the Japan Automobile Manufacturers Association (JAMA), in the 1980s and 1990s, it overtook the United States as the production leader with about 13 million cars manufactured and significant exports per year. In 2007, Japan produced 11.48 million vehicles, compared to 11.36 million in the United States and thus became the world's largest vehicle producer. However, the 2008 Financial Crisis caused by the Lehman Brothers collapse and the Great East Japan Earthquake in 2011 had a negative impact on Japanese production. With China moving into full gear car production and sales in its domestic market, from the beginning of the 21st century China has surpassed both Japan and the United States. In addition, the world has experienced a number of economic crises, and the COVID-19 crisis seems quite different from previous crises. The COVID-19 has resulted in a significant decrease in inbound tourists; disruption of supply chains (all manufacturing sectors especially automobile industry); a decline in exports and willingness towards capital investment as the global economy deteriorates; and world-wide economic downturn due to the deterioration of economic activity. Of these, the disruption of the supply chain was more closely associated with logistics (Nippon Express, May 7, 2020). Under these circumstances, the production and sales have further declined to 9.68 million units in 2019 compared with production of 9.91 million units in 2012 (JAMA, 2020, 6).

This paper draws upon research carried out in the context of the Japanese automobile industry, with the biggest challenges being to the business operations of all its associated companies. The discussion is organized as follows. Section 2 gives a brief history of the Japanese automobile industry; Section 3 examines performance of the automobile industry prior to the Coronavirus pandemic. Section 4 reviews performance of the automobile industry during the Coronavirus pandemic. Section 5 examines strategies adopted by the automobile industry during the Coronavirus pandemic. Finally, Section 6 gives concluding remarks deliberating on and summarizing the successful strategies (being) implemented to overcome the problems brought about by the pandemic with particular reference to previous crisis management techniques/ strate-

gies and highlights on the future of Japanese automobile industry success.

2. A BRIEF HISTORY OF THE JAPANESE AUTOMOBILE INDUSTRY

The automobile industry was started more than a century ago. Initial manufacturing started in Europe (Germany, the UK, and France), and came of age in the United States in the era of mass production. Vehicle volumes, efficiency, safety, features, and choice have grown steadily throughout the industry's history. It is so synonymous with 20th century industrial development and so intertwined with its twin marvels, mass production and mass consumption. In Japan the first car was manufactured by Komanosuke Uchiyama in 1907. The Model-A vehicle was introduced in 1914 by Mitsubishi Zosen which was a *zai-batsu* (Table 1). During this time, the government tried to protect the domestic automobile industry mainly through the Military Subsidies Act of 1918. At the first stage, the production of trucks did not exceed 100 units per year until 1925 (Cusumano, 1985, 15-16). In 1933, *Nihon Sangyo* established Nissan, and in the same year, a weaving machine company, Toyota *Jido Shokki*, which later became Toyota automobile industry, founded its automobile factory.

However, the Japanese automobile industry was insignificant throughout World War II, and automobile corporations produced almost only military and industrial trucks and buses. In 1953, 10,000 units were manufactured, and the number reached 20,000 units in 1955. Car ownership increased dramatically as a result of the rise in living standards due to the rise in personal income. The most popular consumer items in the mid-to-late 1950s – televisions, washing machines and refrigerators – gave way to the “3C” phenomenon - cars, (air) conditioners, and color TVs – in the 1960s and 1970s. At the same time, the boom in personal car ownership was greatly enhanced by increased opportunities for leisure travel, the development of Japan's road network, and a sharp increase of the number of new driver's licenses issued. Japanese automobile industry has surpassed Germany since the 1960s, and Japan has been among top three automakers in the world since then. Industry production has increased rapidly over the past decades, aiming for both domestic use and exports. The industry focused on changing market trends and developments in consumer needs. Vehicles were designed, manufactured, and marketed accordingly.

1) Development of the Automobile Industry in the Post-War Period

As mentioned above, the automobile industry is one of the most prominent and largest industries in Japan with the country being one of the leading car-producing nations in the world. In terms of structure, the automobile is a very complex mechanical product being made up of as many 20,000 to 30,000 individual parts and components, all of which even the largest manufacturers cannot produce themselves and thus the industry has been called the “industry of industries.” Japan has 11 companies that produce motor vehicles, including eight that make cars or mini-cars and three that make only trucks. An additional 9,000 companies supply parts and do subcontract work (JAMA, 2019). The top five automobile companies in

Table 1: Experience of the Japanese Automobile Industry

1907 – Hatsudoki Seizo Co., Ltd. established
1911 – Kawaishinsha Motorcar Works established
1917 – Mitsubishi Motors produced the 1st car
1918 – Isuzu produced the 1st car
1920 – 1925 – Gorham/Lila – auto production established (merged into Datsun)
1924 – 1927 – Otomo built at the Hakuyosha Ironworks in Tokyo
1931 – Mazda Mazdago by Toyo Kogyo Corp, later Mazda
1933 – Automotive AG was established (AG is a German company which now produces cars under the Audi brand)
1934 – 1957 – Ohta began auto production
1936 – Toyota produced 1st car (Toyota AA)
1938 – Toyota began military truck production
1945 – 1955 – Production system was recovered after WWII
1952 – 1966 – Prince Motor Company was integrated into Nissan
1953 – 1967 – Hino Motors starts auto production (and later merged into Toyota)
1954 – Subaru produced 1st car (Subaru P-1)
1955 – Suzuki produced 1st car (Suzulight)
1956 – 1960 established policy of supporting the automotive industry
1957 – Daihatsu's 1st car (Daihatsu Midget)
1961 – 1965 established and achieved mass production system
1963 – Honda's 1st production car (Honda S500)
1966 – 1973 environmental changes lead to industry restructuring
1966 – One of the best-selling cars of all time, the Toyota Corolla, is introduced
1967 – Japan Automobile Manufacturers Association (JAMA) is founded
1967 – Mazda Cosmo 110S was one of first two mass-produced cars with Wankel rotary engine
1974 – 1978 as oil crisis, led to the beginning of rationalization business
1979 – 1986 formally enter the European market
1980 – Japan surpassed the United States and became first in auto manufacturing
1981 – Voluntary export restraints from May limit exports to United States to 1.68 million cars per year.
1990 – Production inside US replaces direct exports; similar policies adopted in several EU countries
1982 – Honda Accord becomes the first Japanese car built in the United States
1982 – Mitsuoka 1st car (BUBU shuttle 50) was built
1983 – Holden and Nissan form a joint venture in Australia
1984 – Toyota opens NUMMI, the first joint venture plant in the United States with General Motors
1986 – Acura is launched in the US by Honda
1987 – Formally enters the Asian market
1988 – Daihatsu enters the US making it the first time all nine Japanese manufacturers are present in this country
1989 – Lexus is launched in the US by Toyota
1989 – Infiniti is launched in the US by Nissan
1989 – United Australian Automobile Industries (UAAI) founded in Australia as a joint venture between Toyota and Holden
1991 – Mazda HR-X was one of the first hydrogen (combined with Wankel rotary) car
1994 – Japan conceded to the United States auto manufacturing
1996 – UAAI joint venture dissolved
1997 – Toyota Prius was the first mass-produced hybrid car
2003 – Scion is launched by Toyota
2006 – Japan surpassed the United States and became the first in auto manufacturing again
2008 – Toyota surpassed General Motors to become the largest car manufacturer
2009 – Japan was surpassed by China and became the second in auto manufacturer
2010 – 2009 – 2010 Toyota vehicle recalls
2011 – Tohoku earthquake affects production
Prior to Corona crisis – Development of next generation vehicles (next generation vehicles include hybrid vehicles, plug-in hybrid vehicles, fuel cell vehicles, electric vehicles, hydrogen vehicles, clean diesel vehicles, natural gas vehicles, and diesel-alternative LPG vehicles)
Post-Corona crisis – Japanese car market was hit in 2020 by the world-wide COVID-19 pandemic and impacted sales significantly

Source: Chowdhury, 2019a, 113.

Japan are Toyota, Honda, Nissan, Mitsubishi, and Mazda. There are effectively three automobile groups since Toyota now holds equity in Subaru, Suzuki, Mazda, Daihatsu, and Hino, as all work jointly in future

powertrain and safety technologies, while producing cars together makes business sense – Toyota with Suzuki in India, with Mazda in the USA, and with Subaru in Japan. Other companies that make cars are Subaru, Suzuki, and Daihatsu and that make trucks are Isuzu, Hino, and Fuso.

After 1955, in response to a growing domestic market, Japanese automobile production took off, but expanded dramatically beginning in 1965. In 1950, Japanese automobile production output was 31,597 cars and trucks — little more than one day's output for the United States automobile industry. During this period four domestic companies — Nissan, Toyota, Isuzu, and Hino — shared the market. Under the guidance of the Ministry of International Trade and Industry (MITI, now the Ministry of Economy, Trade and Industry (METI)), the Japanese automobile industry started to flourish. The MITI adopted two major policies. The most successful was to help domestic automobile producers cover their high costs by limiting imports to about 1 percent of the Japanese market following the postwar United States occupation. Prices for Japanese-made vehicles dropped between the early 1950s and the early 1970s.

However, since the domestic market grew faster than supply, each company made a significant profit. Another policy, which was largely a failure, was an attempt to “rationalize” the automobile industry by encouraging mergers and specialization. Right after World War II, MITI tried to convince firms to abandon passenger car production. Again during the 1960s, MITI wanted to reduce the number of producers competing in the industry to raise scale economies for any one manufacturer. But most company executives saw a great potential in the auto industry and repeatedly refused to bow to the wishes of the government planners.

By the 1970s, Japan had started to export millions of vehicles across many countries around the world (Table 2). In relation to the production of other automobile-manufacturing countries, Japan ranked sixth in 1962, surpassing Italy the following year to take fifth place; France in 1964 to take fourth place; the United Kingdom in 1966 to take third place; and West Germany in 1967 (the year that JAMA was founded) to rank second in the world after the United States, which Japan could also surpass in 1980 to become the world's largest producer of automobiles. The Japanese automakers now lead the world in sales, technological changes, and production. They also equally benefited from the economic boom in the 1980s by introducing luxury cars that were lower in price and had better technology than the United States vehicles. Toyota Crown was the first Japanese car to be imported to the United States in 1957. The Japanese automobile giants established themselves in the United States manufacturing units in the early 1980s. Honda's Accord was the first Japanese car to be built in the United States in 1982.

With Japanese manufacturers producing very affordable, reliable, and popular cars throughout the 1990s, Japan maintained this level of achievement according to Juran (1993), who stated that Japanese automakers adopted the concept of quality improvement, applied it at an unprecedented rate, and kept in practice year after year. The most powerful force driving this effort was an intense new global competition in quality. This competition had produced a major shift in world economic priorities. Juran (1993) prophesized that while the 20th century had been the Century of Productivity, the 21st century would be the

Century of Quality. However, Japan's sales have decreased slightly in recent years, particularly due to competition from some Asian countries like China, South Korea, India, and others. Nevertheless, Japan's car industry had continuously flourished, with its production risen continuously and sales and exports keeping a commendable record (Table 2). At present, Japan is the third largest automobile market after China overtook it in 2009. Still, automobile exports has remained one of the country's most profitable export, and is a cornerstone of the recovery plan for the latest economic crisis caused by COVID-19.

Table 2: Trends of the Automobile Industries in Japan

(unit: vehicles)

Year	Import		Production		Export		Domestic Sales	
	Cars	Total	Cars	Total	Cars	Total	Cars	Total
1960	3,540	4,329	165,094	481,551	7,013	38,809	145,446	407,963
1965	12,881	13,348	696,176	1,875,614	100,716	194,168	586,881	1,661,826
1970	19,080	19,552	3,178,708	5,289,157	725,586	1,086,776	2,373,054	4,097,361
1975	45,480	46,145	4,567,854	6,941,591	1,827,286	2,677,612	2,728,601	4,309,016
1980	46,285	47,918	7,038,108	11,042,884	3,947,160	5,966,961	2,854,214	5,015,628
1985	52,549	53,475	7,646,816	12,271,095	4,426,762	6,730,472	3,104,066	5,556,878
1990	251,169	252,841	9,947,972	13,486,796	4,482,130	5,831,212	5,102,236	7,776,838
1995	401,836	404,695	7,610,533	10,195,536	2,896,216	3,790,809	4,443,906	6,865,034
2000	283,582	285,428	8,363,485	10,140,796	3,795,854	4,454,887	4,259,872	5,963,042
2005	282,654	284,734	9,016,735	10,799,659	4,363,168	5,053,061	4,748,409	5,852,067
2010	230,791	243,493	8,310,362	9,628,920	4,272,256	4,838,350	4,212,267	4,956,136
2011	203,800	275,644	7,158,525	8,398,705	3,929,904	4,464,413	3,524,788	4,210,219
2012	239,546	315,993	8,554,503	9,943,077	4,198,494	4,803,591	4,572,332	5,369,720
2013	278,846	346,133	8,189,323	9,630,181	4,065,519	4,674,633	4,562,282	5,375,513
2014	336,764	354,704	8,227,070	9,774,665	3,852,178	4,490,724	4,699,591	5,562,888
2015	320,295	336,988	7,830,722	9,278,321	3,970,003	4,578,078	4,215,889	5,046,510
2016	331,207	349,313	7,873,886	9,204,696	4,118,496	4,634,097	4,146,458	4,970,258
2017	336,950	357,713	8,347,836	9,690,674	4,218,429	4,705,848	4,386,377	5,234,165
2018	358,221	385,693	8,359,286	9,729,594	4,357,782	4,817,470	4,391,160	5,272,067
2019	335,766	361,675	8,328,756	9,684,294	4,372,645	4,818,132	4,301,091	5,195,216

Source: *Nikkan Jidosha Shinbunsha*, several issues.

2) Japanese Automobile Industry Strategies

Conventional wisdom used to associate high quality with high price, however Japanese automakers have demonstrated to the world that high quality is not necessarily associated with high price (Abegglen and Stalk, 1987; Womack, *et al.*, 1991). Globally, the Japanese have a reputation for producing high quality, innovative products that are amazingly sold at the most competitive prices. For most components, automobile manufacturing costs tend to decrease with increased production volumes and with the accumulation of experience. Japanese automobile industry products, that is, Japanese cars, are of a superior grade and last for longer periods, in addition to being fuel efficient. Japanese cars are primarily priced at affordable rates which are comparatively much lower than cars produced by their foreign competitors especially those based in the United States and Western Europe. Japanese automakers combined have established a dominant global position in terms of the number of cars sold, autonomous driving

technology, and automotive engineering, and this is the most advanced industry in the world. However, there are some important strategies for cost-effectiveness which have been adopted in the following ways.

a) The *Kaizen* Strategy

The Japanese production system terms like *muda*¹⁾ which means ‘unnecessary’, *seiri*²⁾ which means ‘sort out’, and *setsuyaku* which means ‘to do more while having less’, or ‘to do more with a lack of resources’ are well known within the automotive industry. In business terms, just-in-time (JIT), low-cost automation, and lean production system (Ohno, 1978), and production systems by Nissan, Toyota, Honda, Mitsubishi, and others automobile companies are also used in connection with frugal production practices (Chowdhury, 2019b, 10). There is an important term used in production management, *kaizen*, which means continuous improvement, involving everyone in the organization from top management to managers, supervisors, and workers. The implementation of *kaizen* principles has been viewed as one of the key factors to Japanese competitive success (Imai, 2017); *kaizen* principles emphasize problem-awareness and provide clues to identifying problems. When identified, problems must be solved, so *kaizen* is also a problem-solving process (Chowdhury, 2019b, 10). Cost reduction aims at cutting off the unnecessary expenses which occur during the production, storing, selling, and distribution of the product.

b) Cost-effectiveness Strategy

To ‘do more with less’ is the main philosophy of the frugal cost strategy. The automobile industry also developed a synchronized production philosophy with a focus on “[t]he synchronization of quality, cost, elimination of waste, and the reduction in lead times...” and to achieve “...boundless synchronization with customers and boundless exposure to problems and innovation”. In addition, synchronization has its emphasis on “produce when consume”. That means to supply when in demand, in a never-ending quest to make just-in-time supply perfect. The idea was to improve the company’s productivity and effectiveness and have a global standard production system. In line with legislative provisions promoting the so-called 3R initiatives (reduce, reuse, and recycle), Japan’s automakers also strive to design vehicles using lightweight materials that are easy to dismantle and recycle and to reduce and recycle waste generated in the manufacturing process (JAMA, 2019). Scrap recycling expansion to material specifications also focuses on recycle and re-use policies on frugal practices. As mentioned above, frugality is a process, which aims at lowering costs and is a service rendered without affecting product quality by using new and improved methods and techniques. Frugal production is becoming popular due to lower costs and no-frills structure. It ensures savings in per unit cost and maximization of profits for an organization.

1) *Muda* of overproduction implies *muda* of waiting, *muda* of conveyance, *muda* of processing, *muda* of inventory, *muda* of motion, *muda* of producing defects (Imai, 2017, 134).

2) *Seiri* or “*sort*” advocates elimination of unnecessary tools, parts, and instructions by retaining only the essential items.

Through the *kaizen* philosophy companies aim to eliminate the seven types of waste caused by over-production, waiting, transportation, unnecessary stock, over processing, motion, and defective parts. It is very clear that *kaizen* principles and frugal principles both have the same goals. *Kaizen* supports the improvement of existing activities. It is important for a firm to maintain a balance between innovation and *kaizen* is a strategy that focuses on improvement (Cane, 1996). The Frugal Approach is an approach to innovation which is based on the principle of simplification, finding solutions to a problem which solves the problem but without adding unnecessary costs or adding unwanted functions. ‘Frugal’ for the replacement and improvement of automated labor is reducing production costs, decreasing production time, and increasing efficiency which seem to agree with *kaizen* practices.

c) New Technology Strategy

Over the last few years there have been major changes within the automobile industry, and technologies have continued to change with the rise of more fuel-efficient and eco-friendly vehicles taking over the marketplace. More recently, the Nissan Leaf has taken the technology a step further than the Prius of Toyota by removing emissions altogether and becoming the world’s best-selling pure-electric vehicle. According to the Ministry of Environment (MOE, 2016) in Japan, next-generation vehicles (NGVs) are environmentally friendly, emit less air pollutants such as nitrogen oxides (NO_x) and particulate matter (PM), or do not emit any pollutants at all, and offer excellent fuel economy. The whole automobile industry will introduce the mechanism of these NGVs (MOE, 2016, 4).

The rise of hybrid electric vehicles in Japan has hands down the highest penetration of hybrids worldwide. The term “next-generation vehicles” refers to alternative energy-powered vehicles and clean diesel vehicles. Several automakers have developed NGVs; they include Honda, Toyota, Nissan, and Mitsubishi to name a few. These automakers are all setting up strategic plans for mass production of NGVs in the near future and are broadly divided into hybrid vehicles and electric vehicles. An explanation of the main differences between hybrids and other types of electric vehicles will be given here.

There is still more development and innovation needed for EVs in order to reduce the overall number of parts used in the production of EVs. In making a single vehicle, auto makers use from 25,000 to 30,000 parts. It is believed that there are many unnecessary parts used in the production of vehicles, contributing to higher costs. The component parts of internal combustion engine vehicles (ICEVs) include total 30,000 units of 100 percent. Engine parts of (both EV and ICEV), 6,900 units of total 23 percent. Drive, transmission, operation parts of 5,700 units of total 19 percent in ICEVs to 2,100 units of total 7 percent in EV. Suspension braking parts of 4,500 units; body components 4,500 units (in ICEV) of total 30 percent; but EV has no need of these parts. Electrical component and parts 3,000 of total 10 percent (in ICEV), 2,100 parts in EV of total 10 percent; other parts of 5,400 units (uses in ICEV), which is not needed in EV (Chowdhury, 2019b, 13).

The Japanese automobile industry is putting more emphasis on new design and technological

challenges, and the important step at present is cost reduction of raw materials. Also, manufacturing of EV's has been increasing and more focus is being given on foreign markets. The industry has implemented advanced automation throughout the production process in a shift to medium-and small-lot production of different models such as the e-Power Note model to expand the market.

3) Foreign Direct Investment and Globalization.

Japanese automakers began sales and production in the United States in 1958, which until the second half of the 1960s were relatively insignificant. Japanese automakers have been able to invest in the U.S. auto market successfully, because they have been able to prove that the quality of their production was better than the average domestically built U.S. cars (Basu and Victoris, 2000, 155). These firms initially struggled to find a market for their vehicles, but by 1970, Honda, Nissan, and Toyota had all established sales operations and gained respect among Europe, America, and Asia consumers by offering high-quality, reasonably priced vehicles. During the 1970s and 1980s, Japanese auto-companies became increasingly international manufacturers and have gained a very important position in the world economy (Basu and Victoris, 2000, 91). By the 1980s, better production techniques, more effective management skills, and more efficient use of process automation made many Japanese assemblers superior to their American and European counterparts in productivity and quality (Lieberman *et al.*, 1990; Womack *et al.*, 1991). During the 1980s, Japanese automakers started to invest in foreign countries to reduce costs and to avoid foreign exchange losses and tariffs. Despite a tremendous rise in output, Japanese automobile production differed from that of other countries in terms of the type of automobiles produced (a high percentage of cars with small engine displacement), production infrastructure (multiple-model, small-lot production, and small factory size), and the fact that they continued to be mixed and non-stop producers of cars and trucks. With the experience of the oil crises in the 1970s, people moved towards electric cars as an alternative to other fuels. Nowadays, these vehicles are popular due to ever increasing oil prices and environment pollution. Toyota, Honda, and Nissan are already producing NGVs. In order to control the dependency on fuels and to design vehicles that are more efficient, Toyota has built and are building hybrid and fuel-cell vehicles. Japan's past successes and current challenges are most apparent in the country's automotive industry and in particular, its leading manufacturer and corporate icon, the Toyota. Table 2 shows that total automobile production in 2019 was about 9.6 million units. The domestic market peaked at 7.7 million units sold in 1990, which decreased to 4.2 million units in 2019. Sales were kept at about five million units for more than 20 years though there were recessions such as the financial crisis in 2008 and the natural disaster in 2011.

Japanese automakers are playing a critical role in the industry's historic transformation, and their commitment to technological progress has made them leaders in the creation of the "new mobility" paradigm. Like other major automakers, Japanese automakers are global firms that invest in the regions where they sell and produce vehicles. Having invested deeply in manufacturing, R&D, and design presence, as

well as the future workforces that such advancements require, Japanese makers are actively supporting innovation leadership. These superior capabilities helped them to achieve sizable import penetration in the North American market. North American car and light truck imports from Japan grew from 500,000 vehicles in 1970 to 2.6 million vehicles in 1981 and 3.7 million vehicles in 1986. Overseas expansion of this industry has continued, especially in low-cost Asian countries. Japanese vehicle assembly plants in North America and Europe increased from three in 1985 to seventeen in 1991. Assembly plants in the US are new, efficient, well sited, and serve a political as well as an economic purpose. Assembly plant production capacity increased from 640,000 vehicles to three million between 1985 and 1991 (Abo, 1994). The assembly plants are being used to meet local demand in those markets and to export vehicles and parts to Japan and other areas of the world. Finally, the location of plants in Europe as well as the United States serves as a hedge against foreign currency fluctuations.

Since the Japanese automobile industry first began producing cars in foreign countries, Japanese automotive technology has made remarkable progress and the country has come to be one of the international leaders. Japan became the world's largest vehicle producer in 2007, surpassing the United States by producing 11.48 million vehicles, compared to 11.36 million of this country. As of 2005, Japanese automakers had 95.8 percent of the market in Japan, 33.8 percent of the market in the United States, and 13.7 percent of the market in Europe. The total number in the world was 74 million units and Japan accounted for 6.7 percent of the world automobiles market (JAMA,2019). Foreign direct investment outflows surged in 2011-2012. With the yen strengthening in the wake of the Lehman crisis, Japanese companies embarked on an M&A spending spree in developed markets. Even though many large companies have problems with over-capacity and low profitability, the automotive industry retains very strong influence and importance. Under these circumstances, global automobile manufacturing introduced mergers such as the mega-merger between Daimler and Chrysler. Especially prominent are Japanese manufacturers such as Nissan and Mitsubishi. The importance of global strategies has been heightened regardless of participation in alliances or mergers, and survival among automakers in the 21st century will depend even more heavily on effective skills in designing global strategies.

The apparent impact was an understanding that the mega merger triggered a series of tie-ups beyond national borders. For example, the alliance type tie-up between Nissan and Renault, which was announced this year was directly triggered by the Daimler-Chrysler mega-merger. After this merger, Ford snapped up the passenger car department of Volvo. Another tie-up negotiation has taken place between Fiat and Mitsubishi. Even among manufacturers that already had joint relationships like Toyota-Nissan, Toyota-Daihatsu, and GM-Suzuki, they all have increased their stock holding ratios, which is part of their corporate groups' global strategies. The Daimler-Chrysler mega merger directly brings about this increasing tendency (Shimokawa, 2012, 202-227). But investment into emerging Asia also accelerated, as automobile industries continued to shift production abroad, especially as domestic energy crisis eroded manufacturing competitiveness.

The automobile industry is widely known for its cutting-edge technology and invigorating ideas to developed fancy vehicles. Japan has catered to the domestic and global markets through Japanese style of production management, response to globalized supply chains, and shift to green technology. However, just before COVID-19 crisis Japanese automobile industry has faced direct trade conflict with the US “America First” policy and the overhaul is narrowing the United States trade deficit. Americans spent \$67 billion more on Japanese goods than Japan bought from American suppliers in 2018 (Japan Times, July 6, 2018). Though President Donald Trump announced American withdrawal, Japan’s export industries, such as automakers, continued to ship their products to the United States just as before (Chowdhury and Khondaker 2020, 66). President Trump imposed tariffs on Japanese automobiles. After decades of multi-lateral trade liberalization and promises of diversification, the U.S.-Japan trade relationship has remained very lopsided and centered on just one industry — the automobile (Japan Times, July 6, 2018). Although, President Trump pressed Japanese Prime Minister Shinjo Abe to have Japanese automakers produce more vehicles in the United States and Toyota and Mazda decided to invest more in the US plants. The JAMA reported that Japanese auto makers operating in the U.S. purchased nearly \$70 billion in parts from the U.S.-based suppliers in 2019 and a record high and in Europe which was \$18 billion (JAMA,2020).

3. PERFORMANCE OF AUTOMOBILE INDUSTRY PRIOR TO CORONAVIRUS CRISIS

The automobile industries support jobs and exports, which are vital to the national economy; but demand has fallen, and it faces a big challenge in the transition to greener technology. The eight major automakers produced about 7.98 million units domestically in 2011, down 13.4 percent from the previous year due to damage caused by the Great East Japan Earthquake (Table 2 above). Toyota produced about 40 percent of its vehicles domestically, the highest among Japan’s three largest carmakers, namely Toyota, Nissan, and Honda. Domestic automobile vehicles production has been steadily rising since 2012 considering a weaker yen and a stronger global market. According to JAMA, Japanese vehicle production, including passenger vehicles, trucks, and buses, totaled 9.2 million units in 2016 and increased to 9.6 million units in 2017. Before COVID-19, the production was 9.7 million units in 2018 and was decreased by 0.5 percent to a total of 9.6 million units in 2019 (JAMA, 2019). However, Toyota-brand vehicles continued to lead overall production with 2,847,367 units in 2016, which increased to 2,869,600 units in 2017, and declined to 2,825,147 units in 2018. Mazda held the second position producing 967,510 units in 2016, which declined to 961,039 units in 2017, and further increased to 984,291 units in 2018. Nissan, Honda, Suzuki, and others automobile producers’ positions are shown in the Table 3.

Table 3: Production and Sales in Domestic Market Prior to COVID-19 Period

(unit: vehicles)

Manufacturer	Production				Sales			
	2018	2017	2016	2015	2018	2017	2016	2015
Toyota	2,825,147	2,869,600	2,847,367	2,827,349	1,508,647	1,587,062	1,528,173	1,449,067
Honda	845,354	786,822	800,466	705,661	747,226	724,833	707,044	726,928
Suzuki	787,376	770,994	580,389	712,070	714,594	665,871	622,866	636,360
Daihatsu	758,596	749,828	562,323	955,961	646,781	630,856	586,974	610,396
Nissan	823,515	921,505	835,058	755,742	616,033	591,000	534,415	589,099
Mazda	984,291	961,039	967,510	955,961	220,743	209,689	201,404	245,437
Subaru	659,988	709,633	727,741	709,749	148,453	176,737	155,778	162,254
Mitsubishi	675,019	578,405	553,032	633,406	91,861	78,400	71,793	86,954

Source: Japan Automobile Dealers Association (JADA), <http://www.jada.or.jp>.

The sales of passenger cars in 2017 is about 4.3 million units which accounts for 80 percent of the total automobiles sales. The sales of commercial cars were about 0.8 million units, that was in 2.1 percent increase from the previous year. Sales of new automobiles in Japan declined because of Typhoon Hagibis and the consumption tax hike from 8 percent to 10 percent on October 1st in 2019. The sales of automobiles may decrease after the Tokyo Olympics in July - August 2021. In addition, personal car was affected by the aging society. The market was hit in 2020 and 2021 by the world-wide COVID-19 pandemic, which has impacted sales significantly (JAMA, 2021).

Due to growing uncertainty from COVID-19 in the world economy, major automakers in Japan had to decrease their sales. Toyota is now the top-selling vehicle brand in the country, selling more cars than its opponents Nissan and Honda combined. According to the JADA, in the year 2019, it sold 1.5 million units in Japan and 10.7 million units globally (JADA,2021). Nissan sold 616,033 units in 2018 (Table 3). Honda sold in domestic market 747,226 units in 2018 giving the company second place in the list of top eight Japanese car brands. Daihatsu is one of the best-selling mini vehicle car makers in Japan. It is also one of the oldest surviving Japanese internal combustion engine manufacturer, known for its range of smaller cars or '*keijidōsha*' (軽自動車), with an engine size smaller or equal to 660 cc models and off-road vehicles. However, before pandemic, the automotive sector was going through a bit of a metamorphosis on the technological front. AI (Artificial Intelligence), digital technologies, automation technology, ride-share and hybrid vehicles, fuel-cell vehicles, electrical vehicles were all focal points for original equipment manufacturers (OEMs) and the supply base as they looked to stay ahead or at least keep up with the base. Then, the pandemic hit early in 2020 with which the automobile industry had to shut down OEMs production plants globally and domestically to close or slow production in the first quarter of that fiscal year.

4. PERFORMANCE OF THE AUTO INDUSTRY DURING THE CORONAVIRUS CRISIS

COVID-19 has had many direct and indirect economic ramifications, including the prevention of business continuity, public contagion avoidance behavior, trade, and travel bans. In addition, the aftermath

has closed markets, long-term employment loss, and impacts on education. COVID-19 has created an economic situation that is fundamentally different from any previous crisis. It has been exerting a more radical and abrupt effect. It put the real economy out of action immediately and completely – evaporating supply and demand simultaneously. Gross domestic product (GDP) for countries all over the world has decreased, which was two times greater than during the 2008 recession, with a lagging impact and a high uncertainty. The situation in Japan was somewhat improved after lifting the state of emergency at the end of May 2020, gradually increasing socio-economic activities (Cabinet Office, 2020). At that time the Japanese Cabinet Office announced a 3.4 percent GDP decrease for the first quarter of 2020, a 6 percent decrease in exports, a 0.5 percent decrease of corporate investment, and a 0.7 percent decrease in personal consumer investments (Nagata, 2020). The number of employees laid off increased by 4.52 million in April to 6.52 million in June 2020 (Cabinet Office, 2020).

The automobile industry was affected immediately by COVID-19 crisis since June 2020. According to the *Financier Worldwide Magazine* (2021), the automotive sector faced significant challenges including issues such as changes in technology, the form of digital transformation, electrification, and the development of self-driving vehicles, customer habits, and international trade relations. Due to COVID-19 a collapse in demand for new vehicles was being experienced worldwide. The exact reduction varies by region, with for example China, apparently experiencing a decline of demand about 23 percent and Europe suffering a decline closer to 40 percent. However, the overall effect is probably the worst decline in car sales since the Second World War, and this will magnify the impact of pre-existing trends. In December 2019, a *Financier Worldwide Magazine* report predicted a 20 million units decline in the number of vehicles produced globally (*Financier Worldwide Magazine*, March 2021).

1) COVID-19 and Automobile Industry Production

The COVID-19 effect on the manufacturing sector has created a variety of challenges for production, including industry-wide factory shutdowns, an inability to procure certain key supplies such as semiconductors, employee absenteeism, and the need to ensure safety and social distancing in factories. Under these circumstances, the Japanese automobile sector was forced to close or slow production at scores of assembly lines in Japan and other countries. In late May 2020, Nissan announced plans to cut global production by 20 percent, plants in Indonesia and Spain were closed, with some operations transferred to Thailand. According to the *Wall Street Journal*, all Japanese automakers had to shut down production plants all around the world for safety reasons. Japan sales dropped sharply by 23 percent in June, with Toyota still being the top-performing company, followed by Honda and Nissan. In addition, as the *Wall Street Journal* (2020) reported, global production fell 14 percent at Toyota, Honda's production fell by more than a quarter, and at Nissan the drop was nearly 30 percent. While China was a big factor since most factories had to close there in February 2020 during the worst of the coronavirus spread, it was not the only cause. Nissan's production had been declining due to falling sales around the world. Its production fell 29

percent in Japan and 24 percent in the United States in February. Honda's production was down 14 percent in Japan and 5 percent in the United States in the same period (Wall Street Journal, March 30, 2020). As a result, Japan has experienced less global demand for its exports. Japan relies heavily on exporting and many of its biggest companies, such as Toyota and Honda, have seen global sales slumps. Toyota trimmed its production outlook on 10th September by about 3 percent to 9 million units from 9.3 million for the fiscal year ending March 2022 due to the spread of coronavirus in Southeast Asia which affected operations in several local parts suppliers. It cut September 2021 output by 70,000 units and October by 330,000 units and is trying to shift production to other regions. Over the past decades, Japanese automakers invested heavily in Southeast Asia as a source of cheap labor and a supplement to their China operations amid its trade conflict with the USA. Thailand has turned out as a major hub for Toyota, Mitsubishi, Honda, and Nissan (Japan News, September 11, 2021). As reported in Japan News (September 11, 2021), Toyota suspended operations at 14 domestic plants for up to 11 days in October (2021) due to delays in procuring parts. Operations were halted at 27 of the 28 production lines at those plants. During this time, production was also lowered by 330,000 units, of which 150,000 units were in the domestic plants and 180,000 were in foreign plants.

Automobile industry sectors have not only been struggling to rebuild inventories but have faced a variety of challenges, including worsening of parts shortages essential to every new vehicle. As it is known, the auto industry depends heavily upon suppliers, which supply raw materials, parts, accessories, and other products. During COVID-19, production and sales have declined (Table 4). The downturn in productivity and the disruption to the automotive supply chain was heavily impacting both new car demand, part supply, and other matters within the industry, but despite the difficult trading climate, there was the possibility that these emerging markets could capitalize on moves from multinational companies to shift some of their manufacturing operations.

Table 4: Production, Sales, and Export during COVID-19

(Unit: Vehicles)

Year	Month	Production				Sales	Export
		Cars	Trucks	Buses	Total		
2020	Jan-Mar	2,044,964	288,741	26,475	2,360,180	1,371,726	1,108,366
	Apr-Jun	1,049,773	197,632	13,052	1,260,457	836,050	513,602
	Jul-Sep	1,806,311	255,166	13,758	2,075,235	1,192,491	939,461
	Oct-Dec	2,059,363	296,192	16,516	2,372,071	1,198,348	1,179,403
2019	Jan-Mar	2,202,596	325,080	27,494	2,555,170	1,528,215	1,212,471
	Apr-Jun	2,072,479	315,475	29,594	2,417,458	1,225,205	1,193,019
	Jul-Sep	2,073,908	297,113	32,236	2,403,257	1,396,265	1,195,515
	Oct-Dec	1,979,773	295,249	33,387	2,305,409	1,045,531	1,217,127
2018	Jan-Mar	2,192,402	303,689	25,126	2,521,217	1,303,911	1,192,388
	Apr-Jun	1,987,712	306,658	29,780	2,324,158	980,112	1,189,168
	Jul-Sep	1,973,592	303,801	28,246	2,305,639	1,075,084	1,443,939
	Oct-Dec	2,203,514	330,299	29,175	2,562,988	1,023,851	1,291,975

Source: JAMA, 2021, <https://www.jama.org>

2) COVID-19 and Automobile Industry Sales

COVID-19 has had a multifaceted impact on the automobile industry sector and has resulted in decreased production, lower inventories, and a decline in sales. In 2020, auto sales declined from 2019 levels, although there was an uptick in sales from January to March in 2020 (Table 5). During 2021, the industry expects sales to continue to recover from 2020 levels. Automakers continued to register steady growth in automobile sales as the effects of the pandemic gradually subside in the markets.

Table 5: Sale Performance of Japanese Automobile Industry Prior to Corona Crisis

(Units)

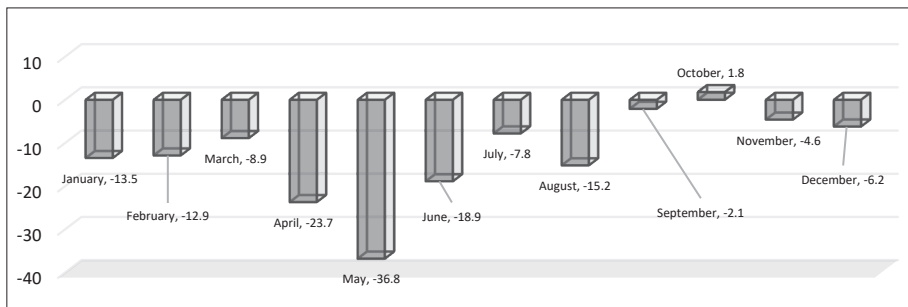
Year	Month	Toyota	Nissan	Mazda	Mitsubishi	Isuzu	Daihatsu	Honda	Subaru	UD Truck	Hino	Suzuki	Fuso	Lexus	Others	Total
2020	Jan-Mar	407,171	153,131	63,543	26,961	20,223	173,482	187,113	37,208	2,176	17,633	187,371	11,398	14,766	69,550	1,371,726
	Apr-Jun	277,919	83,834	25,805	10,806	13,231	98,650	126,100	15,960	2,128	12,515	106,056	7,506	10,460	45,080	836,050
	Jul-Sep	372,618	119,995	47,979	16,254	18,649	156,670	155,476	24,317	2,158	15,791	175,838	9,129	9,274	68,343	1,192,491
2019	Oct-Dec	396,816	111,584	39,760	16,260	14,645	163,544	150,443	28,055	3,251	14,112	161,577	10,070	14,559	73,672	1,198,348
	Jan-Mar	425,694	186,298	64,757	35,504	23,501	192,670	220,495	38,482	2,366	20,620	211,105	10,723	19,130	76,870	1,528,215
	Apr-Jun	373,858	126,444	39,053	22,749	18,042	152,506	182,869	30,848	2,623	14,726	166,935	9,795	12,410	72,347	1,225,205
2018	Jul-Sep	416,447	154,521	59,260	29,332	26,236	176,334	196,507	38,285	2,850	21,129	165,884	11,885	17,464	80,131	1,396,265
	Oct-Dec	331,174	100,380	40,510	15,901	13,663	137,339	122,204	23,646	2,549	13,316	152,090	8,869	13,390	70,500	1,045,531
	Jan-Mar	419,203	206,183	70,940	35,601	21,383	188,058	218,992	46,867	2,250	19,921	200,593	11,644	20,388	78,670	1,540,693
2018	Apr-Jun	346,580	129,814	48,961	20,826	14,790	147,056	166,750	29,733	2,433	15,380	173,485	9,997	12,524	73,456	1,191,785
	Jul-Sep	371,203	154,836	53,794	26,822	22,366	151,826	179,668	37,686	2,355	18,134	175,458	10,258	10,250	76,472	1,291,128
	Oct-Dec	371,661	125,200	47,048	21,342	18,208	159,841	181,816	34,167	2,936	17,376	165,058	10,449	11,934	81,425	1,248,461

Note: As of January 2003, vehicle categories for new registrations-sales are number plate-based rather than chassis-based.
 Source: JAMA, 2021, <https://www.jama.org/>.

According to the JAMA, auto sales were up 10.9 percent (year over year) in December 2020 to 315,200 units from 284,278 units in 2019. Toyota’s sales rose in January to March period 2020 to 407,171 units from 331,174 units in October-December 2019 (Table 5). Honda sold 40,834 vehicles during the month, up from 35,617 vehicles it sold in the same period of the previous year. Nissan also registered an increase in sales to 29,978 units from 26,047 units in the previous year (JAMA, 2019 website).

Figure 1 shows that sales of vehicles declined to minus 13.5 percent in January 2020. The situation was improving slowly up until the virus struck, leading to a very sharp drop in sales in April, minus 23.7 percent, followed by the worst performing month of the year in May, which was minus 36.8 percent. In

Figure 1: Monthly Sales Variation of Vehicles in 2020



Source: JAMA, 2021, <https://www.jama.org/>.

the second half of the year, the auto industry recovered reporting only one month with a double-digit sales drop (August, down 15.2 percent), but also only one month of growth in the entire year (October, +1.8 percent). However, the domestic sales in Japan returned to 2019 levels from January to March in 2021.

3) The Coronavirus Effect on the Automobile Supply Chain

In Japan COVID-19 caused immediate concern for all automobile sectors and their supply chains. Automobile manufacturing is an integrated industry, and it relies on many supporting industries to produce the great diversity of materials and components it uses. A motor vehicle has 25,000 to 30,000 parts, all of which even the largest vehicle manufacturers cannot produce themselves. Many car parts makers, often called tier-1 suppliers, are very specialized in their product offerings. It is highly integrated and global with most vehicles getting parts from many countries. Supply chains for automotive manufacturers are some of the most complex processes in the world.

Japan, at present as the third-largest auto-producing country, is a major force in that global supply chain. As for final goods, the import ratio of capital goods from China is 50.3 percent, which is higher than that of other Asian countries, and the ratio of consumption goods is also high at 31.6 percent. As for intermediate goods, processed goods account for 16.6 percent, which is not that high compared to other Asian countries, whilst parts and components account for 30.3 percent. In other words, Japan is a country that depends largely on China and thus it is easily affected when something happens in that country (Nippon Express, May 7, 2020). Although the “China Plus One” strategy is advancing in China, Japan’s supply chain dependence on China still remains high. Every time something happens there, the need for “diversification of manufacturing bases for risk dispersion” is commented on, but Japanese companies seem slow to take action on diversification of procurement (Nippon Express, May 7, 2020). With the spread of the coronavirus in Japan, retail, leisure, and dining businesses are being hit, and economists predict a fall of over 2 trillion yen (\$18 billion) in household consumption (Koydo News, Feb. 28, 2020). Much steeper declines were expected in March 2020, when the COVID-19 spread around the globe, and was declared a pandemic. Automobile industrial sectors have closed factories in Asia, Europe, and the United States that workers can stay home for safety. These shutdowns were expected to last until at least early April to May in 2020 according to the World Street Journal article dated 30 March 2020. As a result, the global consumer demand was severely impacted by supply chain.

5. STRATEGIES ADOPTED BY THE AUTO INDUSTRY DURING CORONAVIRUS CRISIS

The automobile industry in Japan has resumed production after a hiatus because of the surging cases of Covid-19 and the rampaging fourth wave of the pandemic. It has adapted social distancing to keep assembly lines running and makers are seeking to accelerate the move to more regional parts suppliers to increase reliability. In addition, several other crises have impacted the industry, including supply chain

issues, international logistics issues, and a microchip crisis, all these problems have impacted the industry as a whole. Under these circumstances, there are concerns that the automakers will not be able to reach the optimum production level in the near few years, as the demands for the vehicles are much lower.

The COVID-19 crisis makes uncertainty about future costs inescapable because of the uncertain rate and direction of future technological progress, as well as uncertainties about the future prices of raw materials, energy, labor, and capital. It has resulted in decreases in different sectors especially in sales and production, innovation, and new technological challenges, as well as potential opportunities for these sectors. Innovation in technology has been having a huge impact on this sector in recent years, including design and vehicle functionality level as well as in digitalization of logistics processes involved in the production and supply chains. The current situation means there is an urgent need for adopting AI, digital technologies across their processes from product design, procurement, production, supply chain, and all the way to sales and marketing.

Several automotive companies have been adopting AI, increasing digital capabilities through re-organization, creating digitalization with business, and acquiring and forming joint ventures to become more resilient. Companies such as Toyota, which focus on autonomous driving and mobility, have been focusing on digital initiatives with Aishin Seiki and Denso which are Toyota suppliers. However, with the implementation of Japan's AI strategy, the priority areas of productivity and mobility can be expected to be affected the most. The current uncertain situation is combined with a near standstill in international trade (in physical goods). Border restrictions and ambiguous supply chains have huge and lasting negative effects on the global economy, impacting production and consumption.

1) Strategies concerning Production

At the production level, COVID-19 has accelerated development in the automotive industry. For high efficiency and productivity, the industry has operated according to rigid and optimized production schedules. Due to the emergency in Japan and lockdown in various countries (parts suppliers), automobile companies have had to close their factories and postpone the launch of upcoming models. Currently, the industry has been adopting a flexible production system that can respond to any changes. OEMs and parts suppliers have yet to return to full production capacity. Automotive manufacturers are moving to just-in-time (JIT) operations that may contain costs and improve supply chain operations. Consequent delays in delivery might impact the market at multiple levels from postponed new car model launches, shattered supply chains, financially drained SMEs, and dampened vehicle sales. The effects will spill over with unfulfilled order deliveries due to the slowdown of production.

This situation is set to exacerbate the numerous challenges already facing the auto industry. Thus, there will be need for higher investment in new technologies. Adoption of full-scale digitalization of the supply chain will not only improve operational efficiency but also increase traceability and transparency in operations. Japanese car makers such as Toyota, Nissan, Honda, and some others, who are driving these

changes, come from digital technology backgrounds, and are not only driving the mobility specific change but are also very easily leading in adoption and innovative usage of digital technologies in other aspects of the business beyond production.

2) Strategies of Supply-Chain Management

Japanese automobile companies are stepping up to the challenge created by national emergency lockdowns in various countries, where they have had to postpone production of new models. Under such situations Japanese car manufacturers induce themselves to implement applicable strategies to deal with the pandemic. China is Japan's largest parts supplier and trading partner, with the automobile sector mainly dependent on Chinese parts suppliers. The pandemic experience has made the automobile sector needing more parts suppliers from many other countries and regions. Although Japan's METI has been trying for several years to reduce the country's dependence on China, the need has much accentuated during this corona time. The automobile companies and their suppliers need to adapt to the markets and to consumer demand. There is a need to further pursue their strategies of developing better power engines which is causing them to lag behind in the field of self-driving and other digital driving technologies. With time, the industry has undergone various changes and developments, but these need to be continued and expanded.

3) Strategies in Sales and Marketing

The pandemic has massively influenced the automobile and its allied industries. Vehicle sales have fallen year on year units (Table 6). According to Fourin (2021), light passenger vehicle (LPV) sales in 2020 decreased 10 percent from the previous year to 1.33 million units. Although several new models were launched in 2020, light passenger vehicle sales decreased for the second consecutive year due to the

Table 6: Sales of Light Passenger Vehicle in Japan

Brand	Year	2015	2016	2017	2018	2019	2020	Year-on year
Suzuki	Total	427,496	379,278	410,785	441,098	433,499	403,480	-6.9
	LPV share	28.3	28.2	28.5	29.5	29.3	30.3	1.0
Daihatsu	Total	466,517	439,886	459,783	460,667	464,148	394,893	-14.9
	LPV share	30.9	32.7	31.9	30.8	31.4	29.7	-1.7
Honda	Total	317,166	303,353	314,830	325,370	304,191	274,439	-9.8
	LPV share	21.0	22.6	21.8	21.8	20.6	20.6	0.1
Nissan	Total	175,623	114,955	141,333	145,853	161,894	163,918	1.3
	LPV share	11.6	8.5	9.8	9.8	10.9	12.3	1.4
Mitsubishi	Total	47,815	37,436	43,424	45,929	45,595	33,746	-26.0
	LPV share	3.2	2.8	3.0	3.1	3.1	2.5	-0.5
Mazda	Total	34,570	29,581	29,929	32,873	29,238	28,581	-2.2
	LPV share	2.3	2.2	2.1	2.2	2.0	2.1	0.2
Toyota	Total	18,554	21,061	22,284	25,627	24,669	19,687	-20.2
	LPV share	1.2	1.6	1.5	1.7	1.7	1.5	0.2
Subaru	Total	23,567	19,360	20,935	18,218	15,892	12,330	-22.5
	LPV share	1.6	1.4	1.5	1.2	1.1	0.9	-0.1

Source: JAMA, Several Issues, <https://www.jama.org/>.

decreased number of dealership visitors, the slowdown in the pace of orders, and the suspension of factory operations triggered by the pandemic. Furthermore, monthly sales in May were down 52.7 percent (year-on-year) but recovered sharply in October up 25.6 percent, with a further rise of 7.8 percent in November, and 42.3 percent in December, respectively (Fourin, 2021).

In fact many automobile-retail stores remained closed for a month or more in 2020. The fall in sales has been primarily driven by the economic impact of the coronavirus. A sharp rise in unemployment has led to a considerable drop in consumer spending. Yet people have embraced digitization more during their time at home, working from home, using online services, and purchasing goods online. Crucially, the fall in vehicle demand also coincided with a reduction in public transport and ride-share usage, as people sought to adhere to social distancing guidelines. Many dealers were quick to adapt to online methods in reaching out to customers, enabling online walkthroughs and product delivery to customers' homes (Forrester and Toriello, 2020). But customers prefer to use showrooms when making relatively large capital commitments in vehicles. Automobile companies need to assist the dealers and help them with the adoption of the latest digital technologies. Automobile industry sales work on a dealership model in countries. While the easing of emergency measures has allowed some resumption in production, showrooms are still not as active as they were before COVID-19 in Japan. Most car owners of Japan reside in rural areas, its urban population deeply relies mostly on public transport. Due to COVID-19, the use of public transportation has declined for the fear of infection transmission.

Domestic brands such as Toyota, Nissan, Honda, Suzuki, and Mitsubishi dominate the Japanese automotive market, with foreign-manufactured cars seen more as status symbols due to their incredibly high maintenance costs. Consumers prefer to purchase smaller-sized vehicles to avoid crowded public transportation. Smaller-sized vehicles or *keijidōsha* and motorcycles are cheap alternatives to regular-sized cars and satisfy the people's demand. *keijidōsha* are convenient in small spaces, more affordable, taxes and insurance are low, and parking regulations are less. As a result, demand for *keijidōsha* is stronger now than ever before. Sales of *keijidōsha* currently account for nearly 40 percent of total car sales. Regular-sized car sales continue to improve, though with a relatively year on year decline.

4) Strategies of New Product Development

Global uncertainties, especially in sales and production, together with the COVID-19 crisis, are resulting in innovation and technological challenges as well as potential opportunities for the automobile sector. Innovation in technology has been having a huge impact on this sector in recent years. COVID-19 has brought out many problems and many opportunities. It has pushed the world, in a sense, to reset, to start over, as lockdowns have made it necessary to change our usual way of doing things (Yunus, 2021). COVID-19 causes decreases in both supply and demand; however both are expected to recover as the automobile industry is investing in new technology and thus have a better chance of increasing production rapidly as demand picks up.

Autonomous driving technologies are being further developed to make car easier to drive and handle in complex traffic situations. The concept of autonomous driving is re-defining the individual mobility platform and giving rise to the emergence of new application scenarios. To succeed in the innovation era, automotive companies will likely need to harness a variety of advanced technologies. In areas of AI, machine learning and the deep neural network have brought this concept from an idea into reality. In the current scenario, vehicle manufacturing companies need to redesign the conventional systems to accommodate any unpredictable demand environment. There is increased pressure from regulators across the globe to make transportation safe and sustainable, particularly to combat pollution, congestion, climate change, and to improve passenger and pedestrian safety. Before COVID-19, the automobile industry was emphasizing to adapt to major changes, such as the development of fully electric vehicles (EVs), driverless cars, digital factories, and Internet of Things (IoT). Due to COVID-19, these have become a necessity and urgent 'problems' to be solved. Japan has an AI strategy from 2020 to 2030, which has developed with relative stable long-term developments and will be implemented in Japan and changed for future driving. In addition, CASE (Connectivity, Autonomy, Sharing, Electrification) has been introduced over recent years (Choi, 2020; Genzlinger, Zejinilovic and Bustinza, 2020; Ivanov, 2020).

The Japanese automobile industry is known to be among the most innovative and technologically advanced in the world, with its adaptation in AI and other technologies. Toyota has fundamental policy to develop and produce new technologies and products alone. It has collaborated with Denso, the world's second-ranking auto parts manufacturer and Aishin Seiki, which ranks seventh. In March 2018, Toyota Research Institute - Advanced Development Inc. (TRI-AD), has initiated a joint venture between Toyota, Denso, and Aisin to unify and strengthen Toyota's software capabilities, particularly for automated driving and advanced safety. According to TRI-AD, the venture has established new R&D for autonomous driving. These R&D activities will be limited to within companies of the Toyota group (Toyota, 2020).

According to the Japan Times (2021), the Japanese government used a stimulus package (\$2.18 trillion) including significant direct spending to cushion the fallout to roughly 40 percent of the nation's Gross Domestic Product (GDP) (Japan Times, 18 Feb. 2021). According to JAMA, an estimated 850,000 people are employed in the automobile manufacturing sector which, accounts for around 10 percent of the nation's industrial output. Toyota's Chief Executive Officer and JAMA chairman Akio Toyoda appealed that the automotive industry increased employment even in the COVID-19 crisis whereas the total number of employments in Japan decreased. He stated that each person in the industry has put in a lot of effort in to preserving employment and to contributing to the recovery of the Japanese economy while taking extra care to prevent infection. The automotive industry and the Japanese economy are slowly but surely paving the way to recovery despite the ongoing COVID-19 crisis and all employees are working hard and pressing ahead in their various roles (JAMA,2021).

6. CONCLUSION AND REMARKS

Once the pandemic is over, automobile companies will be applying the lessons learnt from COVID-19 to future challenges to the automotive industry in Japan. Maybe the industry will not return to “business as usual”, but there will be a possibility to build back better. The impacts of the COVID-19 pandemic could have long-lasting effects on this industry. COVID-19 shows that, as soon as there is a strong and enough stimulus, things can change. The opportunity that the COVID-19 crisis offers is remarkable innovations that can be maintained after the crisis. Innovation have stalled, but the lessons learnt from the pandemic will pave the way for new ideas and research that could set new standards in this industry for the future.

COVID-19 has also proven to a wake-up call for automakers to keep better track of procurement. With the COVID-19 crisis, global auto suppliers have changed the way they produce and source the 30,000 parts required to assemble a single vehicle, including raising stocks, diversifying production, and creating alternative manufacturing capabilities. The Japanese automobile sector is cautiously looking forward to the future with hopes of being better post-COVID-19. A lot will hinge on how the economy grows. Integrated digitization, a rising interest in EVs, and working from home will bring systemic changes to the existing supply chain model. Companies are adopting custom digital initiatives to be able to successfully leverage their software investments, access new markets, and adopt best practices. Implementing digitization in areas such as maintenance and monitoring will arguably reduce production time and service as well.

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