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Toyota Motor Corporation: Just in Time (JIT) Management Strategy or Beyond?

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Abstract

JIT as a strategy was adopted by major manufacturing companies with different names viz. Cycle Time Management, Quick Response Manufacturing etc. The basic underlying tenet or principles of JIT remained common as companies tried to cut costs by reducing inventory levels. This strategy met with tremendous success in companies like Toyota, where it originated. However, a surge in natural calamities and sudden changes in business environment have not helped the JIT systems and in most cases forced major Industrial players to rethink strategy. This case study highlights how the pioneer of JIT adapted a strategy different from the lean inventory to build in resiliency in its supply chain.

Keywords: *inventory management, Just-in-time management strategy, crises*

Introduction:

Early in May 2021, Toyota Motor Corporation, reported a profit of \$ 7 bn for the months January to March (CNBC, 2021). This was double the amount of profit over the same period in the last year. Toyota had recovered from the pandemic as sales picked up. This paradoxically was in the backdrop of the report by consulting firm, Alix partners, (Wayland, 2021), that the semi-conductor chip shortage would cost the automobile industry \$110 mn losses in revenue.

With advancing technology, semiconductor chips were not only confined to computers but present in all forms of electronic items, even inside automobiles. Not surprisingly its ubiquitousness in all electronic items has led to its demand outstripping supply. The automobile sector, which depends on semi-conductor chips for everything from the computer management of engines to driver assistance systems, was affected the most. Automobile manufacturers such as Ford, Volkswagen and Jaguar Land Rover have resorted to shutting down plants and laying off workers. Toyota Motor Corporation reporting profits did not come as a surprise but was an outcome of a lesson well learnt

by the company in the wake of the tsunami in 2011. Toyota Motor Corporations profits were because of a Business Continuity Plan that required stockpiling of chips by suppliers from two to six months. This may sound equally paradoxical for a company that had pioneered and advocated the Just-in-Time production system.

As the semiconductor-chip shortage induced crisis for electronics manufacturers all over the globe calls out for a resiliency in supply chain, a leaf out of Toyota Motor Corporations manufacturing system on how it managed the crisis can help other companies.

Toyota Motor Corporation: A Brief Background and Company History

Toyota Motor Corporation, belonging to the Japanese Toyota Group became the largest automobile manufacturer in the world for the first time in 2008, surpassing General Motors. Of its 1,000 subsidiary companies and affiliates, many are involved in the production of automobiles, automobile parts, and commercial and industrial vehicles. Toyota Motor Corporation has its headquarters at Toyota City, an industrial city east of Nagoya, Japan. As a company known globally for manufacturing high quality automobiles, it is also known for introducing many techniques such as the Just-in-Time System, Kanban System and Jidoka.

It has been in existence for over 75 years now. During the 1960s and '70s the company expanded at a rapid rate and began exporting large numbers of automobiles to foreign markets. Toyota grew through acquisitions. In 1966, it acquired Hino Motors, Ltd., a manufacturer of buses and large trucks. Later it also acquired Nippon Denso Company, Ltd., a maker of electrical auto components and Daihatsu Motor Company, Ltd. For several decades Toyota Motor Corporation continued to be Japan's largest automobile manufacturer. Post its entry into the American market, the company continued its trajectory of growth in the American market, gaining a reputation for its low-cost, fuel-efficient, and reliable vehicles such as the Corolla, which was released in the United States in 1968.

Always known for innovative ideas, the photograph depicted in **Exhibit 1** provides an illustration of innovations in Toyota. The photograph shows how plug-in hybrid cars can also be used as an external power source by using a different external plug and can be used to cook rice.

Just-in-time Management Strategy at Toyota

The founder, Kiichiro Toyota of Toyota Motor Company (TMC), was of the opinion that the best way to survive in assembly line automobile manufacturing is by having all the parts for assembly at the side of their line just-in-time for use (Ohno, 1987). Just-in-time operations are widely followed in the manufacturing business to control the timeliness of the production and delivery of products while maintaining or improving the quality of products.

Just-in-time (JIT) inventory management is the procuring of materials immediately as they are required for use in production and doing away with a large inventory. A more specific definition is provided by Calvasina et al. (1989, p.41) as “JIT is a system of production control that seeks to minimise raw materials and Work-in-progress inventories ; control (eliminate) defects ; stabilise production ; continuously simplify the production process ; and create a flexible, multi skilled work force.” Further JIT purchasing implies matching the receipts of materials closely with the usage so that the raw material inventory is reduced to near zero level. The purpose of JIT Purchasing is to reduce stock levels to the minimum by creating closer relationship with suppliers and arranging frequent deliveries of materials in small quantities. It results in enormous saving in storage costs, material handling costs, reduces spoilage and obsolescence. In order to save on ordering costs , long term arrangements with the suppliers are entered with. **Exhibit 2** is an illustration of the Toyota Production System.

The Not-so-natural Production Disruption by Natural Disasters , in 2011

On March 11, 2011, industries across the globe watched in deep shock and disbelief at the extent of the natural disaster caused by earthquake and tsunami in Japan. Manufacturing at Toyota Motor Corporation was also affected directly and indirectly by this catastrophe and there was a complete disruption of work. Damage to Toyota production sites consisted of the destruction of a portion of facilities at the Miyagi Plant of Central Motor Co., Ltd., the Iwate Plant of Kanto Auto Works, and Toyota Motor Tohoku Corporation. However, this damage was relatively minor compared to what its large network of suppliers and dealers in Japan went through. Approximately 450 of its dealers suffered damage including the complete destruction of units of 12 dealers. 1,791 completed vehicles at port facilities were also destroyed by tsunami.

For instance, Renesas Electronics Corp, based in Japan, supplied microcontroller units (MCU) and had 40% of the global market. These MCU controlled the braking, acceleration, steering,

ignition, rain sensors and other functions in the automobile. The importance of MCU for the automobile manufacturing becomes apparent. Renesas Electronics Corp's factory in Naka that manufactured 200-mm and 300-mm microcontroller was located 300 kilometers from the epicenter of the earthquake was worst affected. This led to large scale disruptions for automakers around the world, not just in Japan. Just as with the MCU, supplies were also affected for airbags, body control modules, braking, steering, vehicle stability systems, engine controls and replacement was difficult to find.

As Toyota Motor Corporation scrambled to get its production up and running post the disaster, it realized that its existing procurement strategy had to change. Post the disaster, Toyota drew up a plan where it estimated that the procurement of its more than 1,200 parts and materials might be affected due to fragile supply lines. It then drew up a list of 500 priority items that would need secure supply in the future, including semiconductors made by key Japanese chip supplier Renesas Electronics. For these items it entered into a stockpiling arrangement with its suppliers.

Apart from drawing up a list of priority items that had to be paid attention to, early warning systems were also designed for other products being supplied by its wide network of suppliers that could alert the company to shortages early on. Immediately after the earthquake, Toyota convened a crisis-response meeting and quickly established a company-wide "countermeasures" headquarters. In the meeting it was decided that the priorities would be in this following order, 1) protecting human life and providing relief to victims, 2) aiding rapid recovery of disaster regions, and 3) resuming production. Simultaneously, "earthquake-response" headquarters were established for each function within each operations group including procurement and production. Countermeasures headquarters were also established outside the Head Office in Nagoya, Tokyo, and other regions, and a system for the central collection of information using videoconferencing was set up. TMC was able to bring about a 360 degrees turnaround in its operations despite the wrath of natural disaster that it faced.

For a company that pioneered and rode the wave of competition due to its Just-in time Management which made it effective and cost efficient, it was not afraid to change the rule book when the rules of the game had changed. The supply chain resiliency that it had built in into its many points seemed to pay off a decade later when it encountered the semi-conductor chip crisis in the Covid-19 pandemic.

Global Shortage of Semiconductors and Shortage of Chips

The Covid-19 Pandemic has reshaped consumer preferences. Overall demand for semiconductors from basic microcontrollers and memory chips to the most sophisticated high-performance processors—has grown over the past decade, as smartphone usage and computing power boomed. The steady rise in semiconductor sales was interrupted by a fall in 2019 but then peaked up to 5.4% boosted by 2020's shelter-in-place demand for home gadgets, (Bloomberg, 2021). On the other end of the supply chain, chipmaking capacity has kept pace with the growth in sales over past years, according to Bloomberg, 2021 suggesting that buyers were purchasing the chips as soon as they are manufactured. This indicated that semiconductor demand has in general been at par with available production. However, advanced manufacturing of semi-conductor chips has become concentrated in the hands of fewer and fewer players. These chips are also an important component in automobiles.

Envisaging the situation that would be created by the increasing demand and limited availability, Toyota put in a plan of action to ensure continuous supply of chips. Incidentally, for an uninterrupted supply of raw material and uninterrupted manufacturing of automobiles, the solution worked out was that the suppliers would always ensure raw material availability by supplying in bulk when a batch of units were produced, even though it meant the cost of inventory going up. Inventories of chips are held for Toyota by parts suppliers such as Denso, chip makers and chip traders. What is interesting in its model that it continues to have a lean inventory crucial to JIT at its own factories but ensures stockpiles to avoid supply disruption at the supplier location.

The Big question: Just-In-Time Management Strategy or Beyond ?

The revamp in inventory management strategy resulting out of the two events calls out for a relook at the JIT strategy and for a discussion around a strategy beyond JIT as a response to the changing business scenario.

In JIT production system, the “lead time” can be greatly reduced by making sure that all processes are producing only the necessary parts at the necessary time and have only the minimum stock to hold all the processes together. However, the ground realities can sometimes be different. Couple of earthquakes and natural disasters in April 2016 had disrupted Toyota's production. Few months later, it had to shut down more than 20 vehicle assembly line across the whole of Japan. Twice in three months' time, Toyota was forced to stop production due to supplier troubles. This led

the company to revisit the idea of just enough inventory and its own policy of JIT. Although JIT was one of the most valued system and Toyota's gift to the world of management, it had to be relooked at in times of crises. No matter how prepared company is, a natural disaster will tear it down. The major limitations for JIT system were due to disruptions in supply of small but crucial parts from its suppliers. The need of the hour was to have a Business Continuity Plan in place so that the suppliers take care of uninterrupted supply of parts. The lean Inventory Strategy applied by Toyota is explained in **Exhibit 3**. The strategy clearly reflects the company's mechanism not only to deal with inventory management at the time of natural calamities but also at unprecedented times of pandemic effected by COVID-19.

An enterprise is exposed to risks—such as acts of terrorism, natural disasters and utility failure—which may disrupt operations, disaffect customers and compromise business credibility and revenue streams. Risk can also be introduced to an enterprise through changes—such as automation, down-sizing, process re-engineering or outsourcing of processes and services—each of which may also bring changes in the type of risk. In this regard, the conventional old ways of working may not help and a new strategy would have to be reinvented.

Today, Toyota maintains databases of around 6800 important inventory items and their suppliers and together with Japan Automobile Manufacturers Association has taken the lead in establishing a Disaster Resilient Supply Chain. Toyota's willingness to deviate from the JIT, a system that they themselves developed, shows the willingness of Toyota to change with the ever-changing business environment. This has been the corner stone of Toyota's success story for the last eight decades. Please see **Exhibit 3** for Lean Manufacturing Strategy applied by Toyota for MCU Chips.

Impact on Profitability : 2017 to 2021

The measure of a company's performance and its application of management strategy is strongly seen in its profitability movements. A quick analysis of the Toyota Motor Corporation's profit margin for the years from 2017 till 2021 shows the sharp down turns in Toyota's performance in recent times, and at the same time how Toyota has always been able to bounce back very strongly and in limited time frame. This indicates that the Company has time and again adapted to the

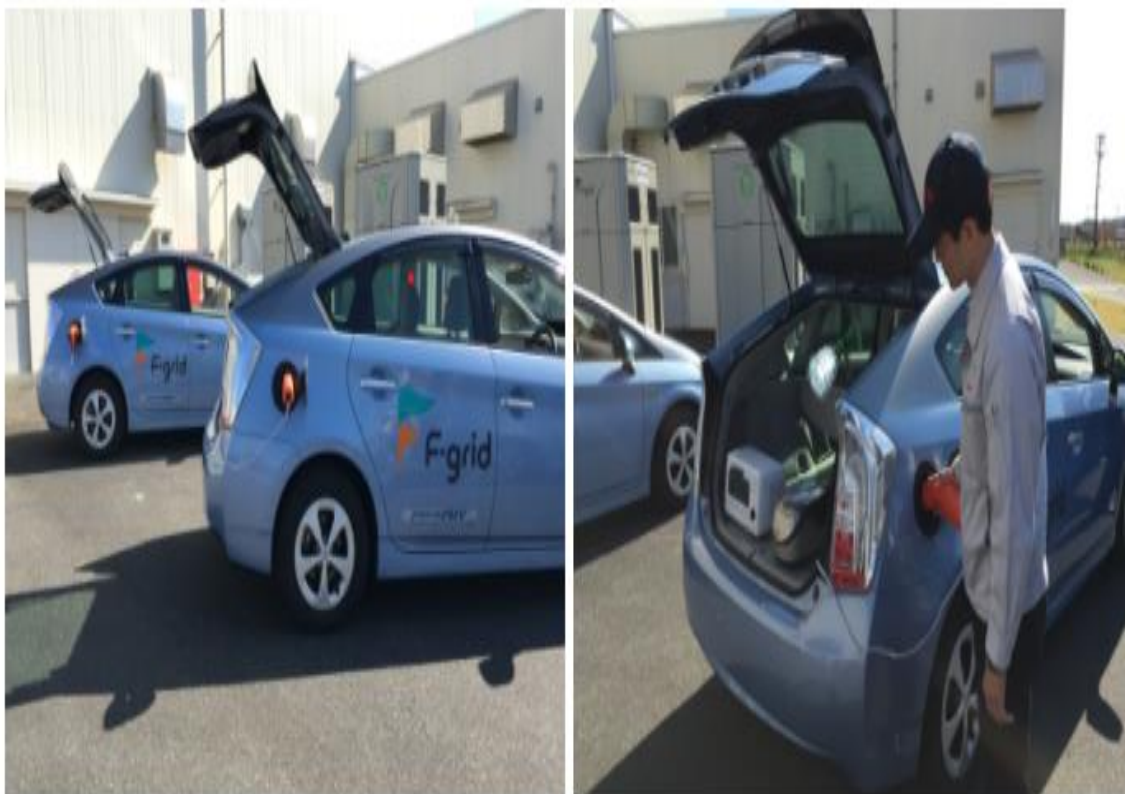
changing business scenarios and not just stuck to one rule book (Please see **Exhibit : 4** on Toyota Business Profitability Chart)

Moot Question for other Businesses:

The question that this case raises is can other organizations/ industries adopt a similar practice? Would it work for all kinds of organizations? Doing away with a well-established and accepted organizational routine is not easy, what factors present in an organization can help adapt to these changes?

Exhibits

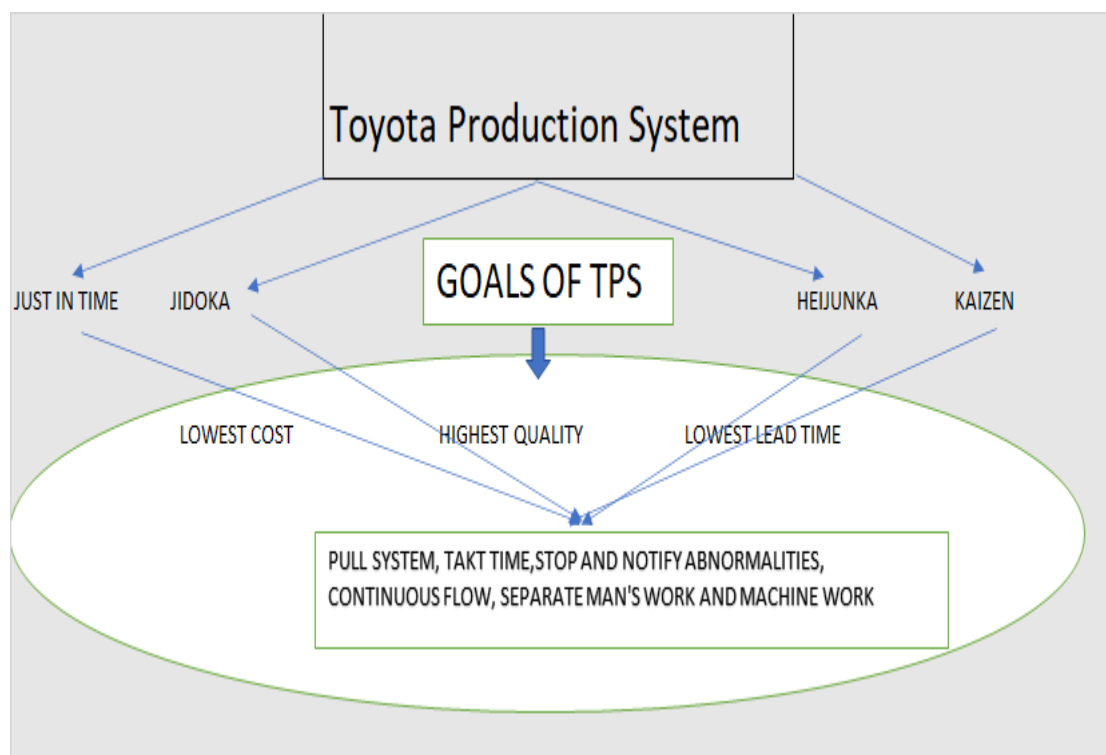
Exhibit 1: Innovation at Toyota



Plug-in Hybrid cars used as external power sources

Using a different plug, electricity can be directed for use as shown in the picture, to cook rice and bake using an oven

Source: Retrieved from 30th May 2021 from <https://global.toyota/en/detail/11373994>

Exhibit 2: Toyota Production System (TPS)

Source: Representation by author

Exhibit 3: Lean Inventory Strategy

Step 1: Identify 500 priority items that would need secure supply in next six months



Step 2: Appoint Part Suppliers for different types of Micro Controller Units (MCU)

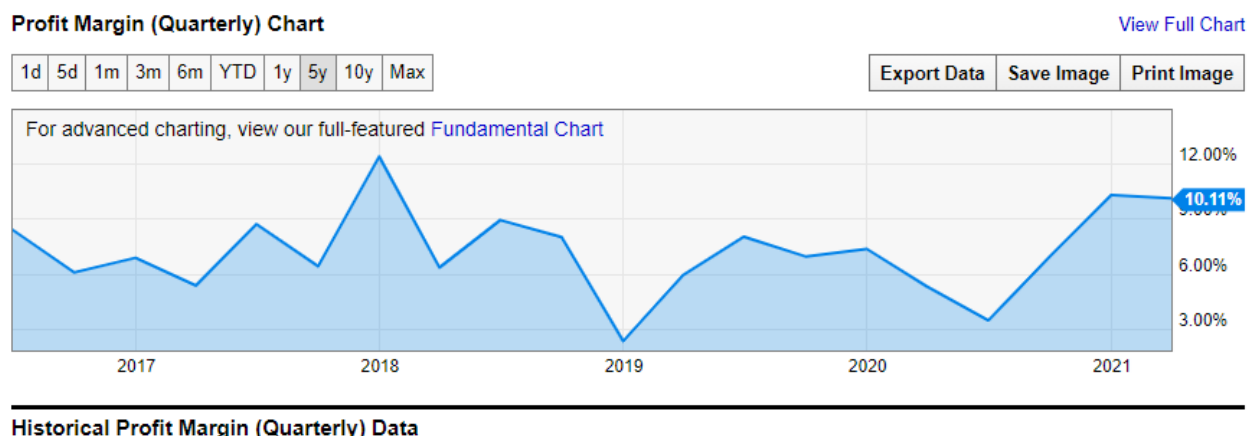


Step 3: Maintain a Business Continuity Plan such that the Supplier is obliged to prioritise and maintain supplies of inventories for longer periods.



Step 4: Toyota shall pay the Supplier for its stockpiling arrangement by returning a portion of the cost cuts it demands from them each year during the life cycle of vehicles under the so-called annual cost-down programmes

Source: Representation by author

Exhibit 4: Toyota Motor Corporation quarterly profit margin January- March, 2021

Source : https://ycharts.com/companies/TM/profit_margin

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