

# How JUST IN TIME changed the world economy: a Japanese perspective

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## **Abstract**

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All Japanese firms are characterized by a common problem concerning their production process practices: they have little land available to use as a warehouse for their finished products and items. The same problem was also faced by a very well-known car producer which, in the 40s and 50s, was just a little company not so profitable with respect to its American competitors: we are talking about Toyota. In the end of the 50s, Toyota engineers realized that despite the small room available, another production method was possible: a new method where the main problem was easily overcome. In practice, inventory was no more needed. In addition, other positive consequences would have followed the implementation of this method as an increase in flexibility, a huge costs reduction and a great reduction of the manufacturing cycle time. This paper analyzes how Toyota implemented the JIT production method and the important consequences the new method introduced.

## **Introduction**

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The philosophy underlying the JIT production technique can be summarized by saying that “inventory is waste” (in Japanese the word *muda* denoted the concept of waste): however, JIT is more difficult to implement than what it seems. Many firms have also tried to copy Toyota production system but unfortunately what they obtained was only a bad result due to their only “formal” copy activity as compared to the “substantial” copy activity that is required in order to fully enjoy all the benefits deriving from such a production method. In addition, some precise steps should be undertaken during the implementation of JIT: for example, a good and strong relationship with suppliers is required together with the prerequisite of assuring quality since the beginning of the production chain.

The aim of this article is the one of analyzing how Toyota was able to put into practice the JIT method and which main steps this international car-producer followed in order to fully and completely implement it.

As a consequence, the paper will be in this way structured:

1. Part I: the first part aims at giving a basic definition of JIT practice and some information about the history of this concept and its predecessors; in addition, evidence of how Toyota engineers designed the process and how this process is different from the others will be given;
2. Part II: the second section describes the steps Toyota followed during the execution of this program;
3. Part III: the last part concludes the article providing evidence of the results achieved through the use of JIT practice and drives the main conclusion.

It is commonly said that the one who invented JIT production system is Toyota. However, this sentence is not completely true. To find the origins of the JIT practice we have to go back to the end of the 18th century when, in 1799, Eli Whitney took a contract from the US Army for the manufacture of 10,000 muskets at the price of \$ 13.40 each (a very low price for that period). How was Whitney able to produce such a huge amount of muskets under constraint of such a low price? The solution was found through the concept of *interchangeable parts*, which enables Whitney to accomplish the tasks maintaining the price of the muskets as it was stated, so at \$ 13.40 each.

However, Whitney's tasks regarded only the production of a single specific thing, which are muskets. But what would happen in the case of multiple products to be produced? Further engineers developed other important theories and studies, as Taylor, who first began to look at individual workers and work methods: the result was the introduction of the well-known Scientific Management.

Then, at the beginning of the 20th century, Henry Ford and his right-hand man Soresen, created the first comprehensive Manufacturing Strategy: they took into consideration all the main ingredients of the manufacturing process (people, machines, tooling and products) and combined them in a continuous system, the result of which would be the famous T Model car.

The final step towards the achievement of the full perfection of this method was reached by Sloan at General Motors. By the mid of the 1930s, General Motors had passed Ford in domination of the automotive market [*Stratego – consultants engineers strategists*].

In the successive years, Ford methods and derivatives were also used by the US Army and are regarded to be one of the deciding factors that permitted the Allied victory during World War II.

All the positive news caught the attention of the Japanese managers and engineers who carefully studied the different American production methods, especially the ones proposed by Ford and Sloan.

As a result, during the 1950s, two Toyota engineers, *Taichii Ohno* and *Shigeo Shingo* gathered and analyzed all these information and merged different techniques into a new one called Toyota Production System that was based on the use of JIT. In addition, one of the most important and distinguishing aspect of the Japanese approach was the great emphasis it gave to **inventory** and **people**. In fact, the two Japanese engineers immediately recognized the central role of these two factors.

The first important consideration was the uselessness of inventory. Inventory was conceived as a waste of time and money, stopping the progress toward higher flexibility and innovation. The other focus was on people. When analyzing Ford approach, Ohno and Shingo immediately realized that workers have much more to offer than only physical strength and work. In fact, the two engineers designed a new way of introducing the workers into the production system: employees were becoming more important and their contribution in the process was fundamental. That's the reason why the center of JIT is the use of team-works and cellular manufacturing.

Another key point is product variety. When analyzing Ford system, the engineers saw it was based on a unique central product, the Ford T, which was never changed. This approach was not the right one in a world where product differentiation was demanded. As a consequence, through direct on-work observations, Toyota was able to find the right way to produce

different products in the same working line without wasting too much time for the setup of the machines: the result is a continuous flow like the original Ford concept, with a new fundamental characteristic that is flexibility and product variety!

## **PART II: HOW TOYOTA IMPLEMENTED THE JIT METHOD**

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When Ohno and Shingo decided to adopt the JIT method, they perfectly knew that some radical changes were needed. First of all, the efforts to reduce inventory raised the importance of flexibility and the possibility for improving quality when problems could be caught immediately and corrected. In order to do so, however, empowerment was needed in order for workers to act on local information. In addition, other important steps were required and each of them corresponded to a precise objective:

- a) Reduce setup times;
- b) Reduce lot size;
- c) Involve & empower employees;
- d) Require quality at the source;
- e) Equipment maintenance;
- f) Pull production;
- g) Involve suppliers.

In order to reach the implementation of each objective, some specific actions needed to be undertaken. For what concerned the reduction in setup times, Toyota decided to reorganize and redesign the whole production process also using the kanban (a new method that enabled the firm to manage information in order to control the quantity to be produced in each production phase) and decided also to use training programs in order to train workers who would then be able to do the setup procedure by themselves. Through direct observation, Shingo was able to reduce the cycle time from weeks to hours and minutes.

The other objective was the one of reducing lot size. If a firm produces things in large batches, this means it will have huge setup costs and inventory. Given that Toyota was able to dramatically reduce the cycle time and the setup times, it was also able to produce a variety of products in small quantities. This allowed the lot size to be reduced and inventory to be kept at the minimum level.

The other important requirement was employees' involvement and empowerment. When Toyota engineers observed and analyzed Ford system, they immediately identified one major negative aspect concerning the role of employees at Ford: in fact, in the American firm, employees were not required to be actively involved in the production process, they just needed to be passive, performing each task in the way and time previously established and no deviation from these standards were allowed. On the contrary, Toyota wanted its employees to be a dynamic part of the whole process and this is the reason why this giant car producer began to provide training programs for its employees, assigning them major responsibilities and accountability. In addition, Toyota let its workers work in teams and each team had a leader who also works as one of them in the line.

The other necessity was the one of assuring quality at the source. JIT process is based on the assumption that product quality is maximized and monitored and the best place where to monitor it and find possible defects is the production line: for this reason, workers are assigned the role and responsibility of finding defects and solve them and if they cannot be fixed, they can stop the line by pulling a cord. Quality should be checked at the beginning of the process, not at the end of it! In addition, another way of ensuring quality is obtained by creating strong relationships with materials suppliers: suppliers involvement is one of the other prerequisites of the JIT technique and Toyota was able to create such strong relationships

through the use of *Kapital Keiretsu* (Toyota owns a minority stake, often as much as 49%, in most of the companies that supply its components).

In addition, equipment maintenance (as fixing component problems and improve equipment performance) and the concept of “pulled production” needed to be entered into the company’s culture. In fact, in order to keep inventory low, Toyota introduced the concept of the pull production method: supply is pulled exclusively by demand! As a consequence, the quantity of work performed is designed only by the demand for materials from the next stage of production.

### **PART III: RESULTS & CONCLUSIONS**

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Thanks to the introduction of JIT technique, Toyota was able to soon become one of the largest and more profitable car manufacturers of the world. Clients immediately realized that Toyota cars provided higher quality and better performance and this enabled Toyota to become even more profitable and to gain clients trust, also thanks to the great emphasis it gave on its workers.

As I previously introduced, other firms tried to copy Toyota production system but the results were not as expected: many firms send their managers to Japan to observe and collect information about the new Toyota Production System and the JIT method, but they came back just with the innovative idea of the Kanban and the quality circles, but totally forgot about the fundamental role played by workers, who instead continued to be treated as simple employees with no involvement in the production process. Fortunately, other companies as Kawasaki and General Electric adopted the method successfully and obtained positive outcomes.

Finally, I conclude stating that after the first implementation of JIT by Toyota, many other firms tried to copy the process and they obtained both positive and negative results. However, the main thing to take into consideration is the fact that JIT changed the way companies produced their products and enabled them to face in the right way the changing trends of the world economy. Nevertheless, when deciding whether or not to adopt a JIT technique, a firm should remember to put its attention not only on the process and the inventory problem, but also on another important factor that is becoming more and more important in these days: the role of the employees!

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