

# Toyota Production System

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The **Toyota Production System** (TPS) is an integrated socio-technical system, developed by Toyota, that comprises its management philosophy and practices. The TPS organizes manufacturing and logistics for the automobile manufacturer, including interaction with suppliers and customers. The system is a major precursor of the more generic "Lean manufacturing." Taiichi Ohno, Shigeo Shingo and Eiji Toyoda developed the system between 1948 and 1975.<sup>[1]</sup>

Originally called "Just In Time Production," it builds on the approach created by the founder of Toyota, Sakichi Toyoda, his son Kiichiro Toyoda, and the engineer Taiichi Ohno. The founders of Toyota drew heavily on the work of W. Edwards Deming and the writings of Henry Ford. When these men came to the United States to observe the assembly line and mass production that had made Ford rich, they were unimpressed. While shopping in a supermarket they observed the simple idea of an automatic drink resupplier; when the customer wants a drink, he takes one, and another replaces it. The principles underlying the TPS are embodied in The Toyota Way.

## Contents

- 1 Goals
- 2 Origins
- 3 Principles
  - 3.1 Long-term philosophy
  - 3.2 The right process will produce the right results
  - 3.3 Add value to the organization by developing your people and partners
  - 3.4 Continuously solving root problems drives organizational learning
- 4 Results
- 5 Commonly used terminology
- 6 See also
- 7 Notes
- 8 References
- 9 External links



## Goals

The main objectives of the TPS are to design out overburden (muri) and inconsistency (mura), and to eliminate waste (muda). The most significant effects on process value delivery are achieved by designing a process capable of delivering the required results smoothly; by designing out 'mura'(inconsistency). It is also crucial to ensure that the process is as flexible as necessary without stress or 'muri'(overburden) since this generates 'muda'(waste). Finally the tactical improvements of waste reduction or the elimination of 'muda'(waste) are very valuable. There are seven kinds of muda(waste) that are addressed in the TPS:

1. over-production
2. motion (of operator or machine)
3. waiting (of operator or machine)
4. conveyance
5. processing itself
6. inventory (raw material)
7. correction (rework and scrap)

The elimination of 'muda' has come to dominate the thinking of many when they look at the effects of the TPS because it is the most familiar of the three to implement. In the TPS many initiatives are triggered by 'Mura' or 'Muri' reduction which drives out 'Muda' without specific focus on its reduction.

## Origins

This system, more than any other aspect of the company, is responsible for having made Toyota the company it is today. Toyota has long been recognized as a leader in the automotive manufacturing and production industry.<sup>[2]</sup>

Toyota received their inspiration for the system, not from the American automotive industry (at that time the world's largest by far), but from visiting a supermarket. This occurred when a delegation from Toyota (led by Ohno) visited the United States in the 1950s. The delegation first visited several Ford Motor Company automotive plants in Michigan but, despite Ford being the industry leader at that time, found many of the methods in use to be not very effective. They were mainly appalled by the large amounts of inventory on site, by how the amount of work being performed in various departments within the factory was uneven on most days, and the large amount of rework at the end of the process.<sup>[citation needed]</sup>

However, on a subsequent visit to a Piggly Wiggly<sup>[citation needed]</sup>, the delegation was inspired by how the supermarket only reordered and restocked goods once they'd been bought by customers. Toyota applied the lesson from Piggly Wiggly by reducing the amount of inventory they would hold only to a level that its employees would need for a

small period of time, and then subsequently reorder. This would become the precursor of the now-famous Just-in-Time (JIT) inventory system.<sup>[citation needed]</sup>

While low inventory levels are a key outcome of the Toyota Production System, an important element of the philosophy behind its system is to work intelligently and eliminate waste so that inventory is no longer needed. Many American businesses, having observed Toyota's factories, set out to attack high inventory levels directly without understanding what made these reductions possible.<sup>[3]</sup> The act of imitating without understanding the underlying concept or motivation may have led to the failure of those projects.

## **Principles**

The underlying principles, called "The Toyota Way" are outlined as follows:

### **Long-term philosophy**

Main article: The Toyota Way

Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals.

### **The right process will produce the right results**

1. Create continuous process flow to bring problems to the surface
2. Use the "pull" system to avoid overproduction
3. Level out the workload (heijunka). (Work like the tortoise, not the hare.)
4. Build a culture of stopping to fix problems, to get quality right from the first
5. Standardized tasks are the foundation for continuous improvement and employee empowerment
6. Use visual control so no problems are hidden
7. Use only reliable, thoroughly tested technology that serves your people and processes.

### **Add value to the organization by developing your people and partners**

1. Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others.
2. Develop exceptional people and teams who follow your company's philosophy.
3. Respect your extended network of partners and suppliers by challenging them and helping them improve.

### **Continuously solving root problems drives organizational learning**

1. Go and see for yourself to thoroughly understand the situation (Genchi Genbutsu, 現地現物);
2. Make decisions slowly by consensus, thoroughly considering all options (Nemawashi, 根回し); implement decisions rapidly;
3. Become a learning organization through relentless reflection (Hansei, 反省) and continuous improvement (Kaizen, 改善).

The Toyota production system has been compared to squeezing water from a dry towel. What this means is that it is a system for thorough waste elimination. Here, waste refers to anything which does not advance the process, everything that does not increase added value. Many people settle for eliminating the waste that everyone recognises as waste. But much remains that simply has not yet been recognised as waste or that people are willing to tolerate.

People had resigned themselves to certain problems, had become hostage to routine and abandoned the practice of problem-solving. This going back to basics, exposing the real significance of problems and then making fundamental improvements, can be witnessed throughout the Toyota Production System.<sup>[4]</sup>

## Results

Toyota was able to greatly reduce leadtime and cost using the TPS, while improving quality. This enabled it to become one of the ten largest companies in the world. It is currently as profitable as all the other car companies combined and became the largest car manufacturer in 2007. It has been proposed<sup>[5]</sup> that the TPS is the most prominent example of the 'correlation', or middle, stage in a science, with material requirements planning and other data gathering systems representing the 'classification' or first stage. A science in this stage can see correlations between events and can propose some procedures that allow some predictions of the future. Due to the success of the production philosophy's predictions many of these methods have been copied by other manufacturing companies, although mostly unsuccessfully.

## Commonly used terminology

- Andon (行灯) (English: Signboard)
- Genchi Genbutsu (現地現物) (English: Go and see for yourself)
- Hansei (反省) (English: Self-reflection)
- Heijunka (平準化) (English: Production Smoothing)
- Jidoka (自働化) (English: Autonomation - automation with human intelligence)
- Just In Time (ジャストインタイム) (JIT)
- Kaizen (改善) (English: Continuous Improvement)
- Kanban (看板, also かんばん) (English: Sign, Index Card)
- Manufacturing supermarket where all components are available to be withdrawn by a process

- Muda (無駄, also ムダ) (English: Waste)
- Mura (斑 or ムラ) (English: Unevenness)
- Muri (無理) (English: Overburden)
- Nemawashi (根回し) (English: Laying the groundwork, literally: Going around the roots)
- Poka-yoke (ポカヨケ) (English: fail-safing - to avoid (*yokeru*) inadvertent errors (*poka*))

## See also

- Taiichi Ohno
- Shigeo Shingo
- W. Edwards Deming
- Lean manufacturing
- The Toyota Way

## Notes

1. ^ Strategos-International. Toyota Production System and Lean Manufacturing.
2. ^ Brian Bremner, B. and C. Dawson (November 17, 2003). "Can Anything Stop Toyota?: An inside look at how it's reinventing the auto industry". *Business Week*.
3. ^ Theory of Constraints, Eliyahu Goldratt, North River Press, 1990, p 30
4. ^ A study of the Toyota Production System, Shigeo Shingo, Productivity Press, 1989, p236
5. ^ Theory of Constraints, Eliyahu Goldratt, North River Press, 1990, p 26