

Going beyond “The Machine ...”: The story of Taiichi Ohno and the Toyota Production System

An economic legend in its own lifetime, Toyota represents the apogee of Japanese post-war economic success. Even in these turbulent economic times Toyota's market capitalisation comfortably outstrips all of its 'Big Three' American rivals. On 2007 figures, Toyota had overtaken Ford and drawn level with General Motors in global sales, despite taking substantially fewer man-hours per car. Toyota's president Katsuaki Watanabe said in a newspaper interview that he was not aiming for Toyota to become the biggest car company, but that 'What is important is to be number one in quality'. In effect, all later claimants to 'lean' principles have continued to measure themselves against the TPS. How has Toyota managed to achieve this success? In essence, the answer is method. The TPS is based on a different way of thinking about the design and management of work, and is the product of half a century of application and learning of this method.

The Machine that Changed the World

The tale of the superior performance of Toyota over its mass-producing competitors was first brought to widespread Western attention by *'The Machine that Changed the World'* (Womack, Jones and Roos 1990). This book also coined the term 'lean production'. *The Machine's* focused much attention on finding 'a better way to organize and manage customer relations, the supply chain, product development, and production operations'. It documented the history of management thinking in the automotive industry, from the early craft manufacturers to the mass production techniques exemplified by Ford/GM, before telling the story of the TPS's creation (circa 1950) and that of Toyota's 'production genius' Ohno. Through necessity, Ohno had developed a contrasting approach to the mass production of the US firms. Competitive advantage could not be won by Toyota through taking on the American giants at their own game – by competing to achieve economies of scale. Through experimenting firstly with simple die-change techniques (ways of stamping metal sheets), Ohno found a way of reducing the time taken to change a die (and thus leave the machine idle) from one day to three minutes. In doing so, he made the first of a series of counter-intuitive discoveries: it cost less to make small batches of stampings than to produce in large batches. How could fewer units and greater variety actually result in lower costs? Ohno discovered that the true costs of production were end-to-end, and that more variation in his line left fewer parts tied up in inventories and work in progress. While the unit cost for each product was higher, total production costs were considerably lower. Through his experiments Ohno learned that economy of flow was superior to economy of scale, and to see this flow, he needed to understand his organisation as a system.

Taiichi Ohno's Story

It is worthwhile exploring a bit more about Ohno's story. Born in Manchuria, China, in 1912, Ohno graduated from Nagoya Technical High School as a mechanical engineer before joining Toyota in 1932. He initially worked in Toyota Spinning and Weaving before moving to Toyota Motor Company in 1943 where he became machine-shop manager six years later. Then, during the formative period of the TPS (roughly 1945-1965 when Toyota was fighting to survive) Ohno came to the fore. The day World War II ended, Toyota's then president Toyoda Kiichiro set a remarkable challenge:



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‘Catch up with America in three years. Otherwise, the automobile industry of Japan will not survive.’

Toyota was verging on bankruptcy during much of this period and could not afford major investments in new equipment or massive inventories. Despite these constraints, Ohno's leadership instituted a new way of thinking and a new work culture in the company. Appointed director in 1954, he rose through the senior ranks of the company to become executive vice president in 1975. In the early 1980s, Ohno retired from Toyota and became president of Toyota Gosei, a Toyota subsidiary and supplier. Taiichi Ohno died in Toyota City in 1990.

By all accounts, Ohno was a difficult character. He was described as a ‘doer’s coach’ as opposed to a consultant or professor, and he was certainly not a conventional manager. He preferred a role close to the action, disliking the office. It took Ohno 25 years to get the TPS accepted throughout Toyota and its first tier suppliers. Jim Hutzinger describes him as a ‘relentless S.O.B. who struggled tirelessly (yet was often frustrated) to PUSH his ideas throughout Toyota and its supply base’. Even in the machine shop that he directly managed, it took him eight years to get things finally moving. The workers were not cooperative with what they called his ‘goofy’ changes. Rumour has it that they would groan and say, ‘Oh no, here comes Mr Moustache!’ when they saw him. Cardiff University lecturer John Bicheno agrees that Ohno was not the great paragon that people may have thought. In fact, he was the ‘engineer’ who had relentlessly translated the concepts of Sakichi Toyoda, the founder of the Toyota group.

Ohno had a reputation for creating fear in others. Bicheno says that ‘there are still some older Japanese that worked with Ohno around - and virtually all who have worked with these guys say that they give orders, are highly critical, and expect it to be done’. His desire to drive out waste from the Toyota system was ruthless. There is a story that one day Ohno walked into one of the large warehouses and said to the staff of managers around him:

‘Get rid of this warehouse and in one year I will come back and look! I want to see this warehouse made into a machine shop and I want to see everyone trained as machinists.’

When he returned a year later, the building had duly become a machine shop. Ohno had not told them how to do it. Instead, he just demanded that they do it. As he matured, he became a mentor to Toyota's TPS leaders one-on-one, or in small groups, sending them out to see reality, understand it thoroughly, and in turn to develop supervisors and working people to improve the processes around them themselves. All of Ohno's students remember thinking that they had mastered the TPS only to have another penetrating question send them out to learn more. It is said that later in his career, his manner had remained so challenging that it caused him to be politely pushed aside by Toyota.

Near the end of his life, Ohno was asked by a journalist from *The Economist* why the TPS had developed. Being a down-to-earth type, he responded that it was ‘the last fart of the ferret!’ (when a ferret is cornered, it emits a powerful odour like a skunk). The TPS emerged as a structured, systematic response to the challenges that Toyota faced after 1945. Over time the internal and external context (strikes, Korean War, oil shocks) for Toyota changed greatly, but



Ohno's approach remained unwavering: his focus was always on eliminating waste and improving the system. When he was asked, 'What is Toyota doing now?' Ohno responded:

'All we are doing is looking at the time line from the moment the customer gives us an order to the point when we collect the cash. And we are reducing that time line by removing the non-value adding wastes.'

Ohno's leadership method

Ohno's method is described as placing people first and foremost in the company, instead of the conventional assumptions that companies are mechanisms which need capital, generate cost and attract revenue. His method was radical in assuming that machines and systems should serve the people, their masters, rather than the other way round.

<u>The Method</u>
1. Mentally force yourself into tight spots (something like a gun to the head concentrates the mind).
2. Think hard; systematically observe reality.
3. Generate ideas; find and implement wise, ingenious, low-cost solutions.
4. Derive personal pleasure from accomplishing kaizen.
5. Develop all peoples' capabilities to accomplish steps 1-4.
Everyone learns kaizen by doing it. Managers and staff learn to support workers, proposing only big-step improvements. They learn not to control self-functioning workers

Figure 1 Ohno's Method (from Nakane and Hall 2002)

Ohno's favourite word was 'understanding', meaning 'to approach an objective positively and comprehend its nature'. His method was developed as the way of achieving such understanding of his work as a system. Ohno described the workings of business as systemic and similar to the human body where the nerves 'cause us to salivate when we see tasty food'. It is the recognition of the systemic nature of an organisation that led him to try and fashion the TPS as the equivalent of a nervous system, responding to external stimuli by 'making judgements autonomously at the lowest possible level'. He emphasised that 'Management's role is leadership, developing all the people to autonomously work toward common ends.' He also advocated that all should 'strive for a targeted ideal system', but to remember that conditions change and that 'all systems are transient, so people and systems must be flexible and adaptive, not just 'optimal.'

Ohno's method leads to organising for people and process flows, around problem seeing and problem solving, rather than for control. Proximity to the direct action is a requirement for the support workers and managers, so that internal processes can be linked back to the customer's perspective. Nakane and Hall compare the workings of Toyota to what a military organisation

calls 'readiness': the development of first-line people to run and to improve processes autonomously, so that everyone's contribution is maximised within the umbrella organisation. This enables the organisation to be excellent by conventional measures, but also to retain the ability to be nimble and flexible when required.

Reclaiming Ohno

Throughout 'The Machine that Changed the World' by Womack, Jones and Roos and 'Toyota Production System' by Ohno, there are examples that document where the development of the Toyota Production System broke with conventional thinking, and consequently saw counter-intuitive results. Subsequently, however, the more recent purveyors of 'Lean Thinking' have forgotten that the principles behind the TPS required these consistent dramatic rethinks and have reverted to the assumptions behind conventional theory in their further developments of 'Lean Thinking'. Kate Mackle of Thinkflow has noted that Ohno called the Toyota Production System 'mōkeru' or 'profit making industrial engineering'. Mackle calls for a return to these values, implying that the tools and techniques of the TPS were just Ohno's way of solving Toyota's specific problems. These problems are not the same in a service environment. One example of the unthinking misapplication of ideas from the TPS is the search for Ohno's 'Seven Deadly Wastes', which include:

- Overproducing
- Waiting
- Transport
- Overprocessing
- Inventory
- Motion
- Defects or correction

The search for such waste, applied without a change of managerial mindset, does not make sense in a service environment. In his manufacturing environment, Ohno was able to 'see' the waste in his system (for example inventory stockpiled in a warehouse). In a service, the biggest causes of waste are hidden in the flow: for example, 'failure demand' cannot be 'seen' in the same way. It is necessary, therefore, to go beyond a superficial analysis of Ohno's discoveries and the tools developed in the TPS. Ohno understood that the Toyota Production System is just that - a system; the failure to appreciate that starting-place leads many to fail to grasp what is, without doubt, a significant opportunity for learning and improvement. Indeed, Vanguard's whole raison d'être is to help managers see service organisations as systems. With different knowledge gained from this insight, Vanguard's solutions differ from the ones Ohno invented for the TPS. Ohno should therefore be seen in the tradition of the systems thinkers, who recognise how the parts of an organisation combine to produce the whole and who constantly search for feedback on how they are performing. It is only when this systems perspective is understood that service organisations can realise their potential to perform like Toyota.



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