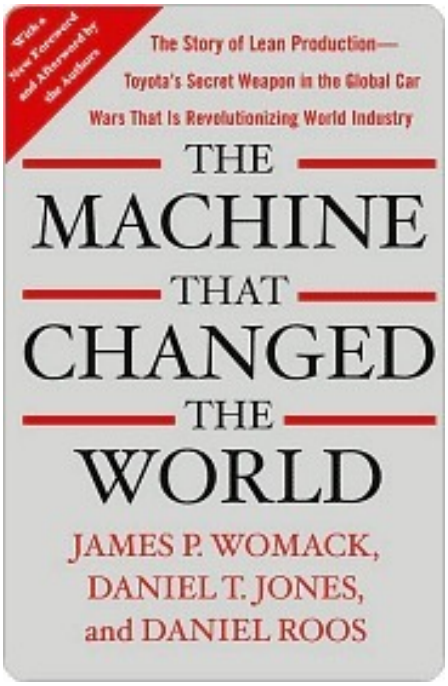

The Machine That Changed the World: The Story of Lean Production

James P. Womack (Contributor) , Daniel T. Jones (Contributor) , Daniel Roos (Contributor)

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When *The Machine That Changed the World* was first published in 1990, Toyota was half the size of General Motors. Today Toyota is passing GM as the world's largest auto maker and is the most consistently successful global enterprise of the past fifty years. This management classic was the first book to reveal Toyota's lean production system that is the basis for its enduring success.

Now reissued with a new Foreword and Afterword, *Machine* contrasts two fundamentally different business systems -- lean versus mass, two very different ways of thinking about how humans work together to create value. Based on the largest and most thorough study ever undertaken of any industry -- MIT's five-year, fourteen-country International Motor Vehicle Program -- this book describes the entire managerial system of lean production.

Nearly twenty years ago, Womack, Jones, and Roos provided a comprehensive description of the entire lean system. They exhaustively documented its advantages over the mass production model pioneered by General Motors and predicted that lean production would eventually triumph. Indeed, they argued that it would triumph not just in manufacturing but in every value-creating activity from health care to retail to distribution.

Today *The Machine That Changed the World* provides enduring and essential guidance to managers and leaders in every industry seeking to transform traditional enterprises into exemplars of lean success.

The Machine That Changed the World: The Story of Lean Production Details

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From Reader Review The Machine That Changed the World: The Story of Lean Production for online ebook

Fahim says

I read this book for one of my Six Sigma, continue improvement class. The book was interesting at the beginning when it talked about the history of lean production and improvement. There are lots of great examples about mass production and lean improvement in Ford Company. It also talks about Toyota and other car companies who adopted lots of changes in their manufacturing process based on their market knowledge. This book can be interesting for the people who are in auto business and industry, or have a passion for cars and whatever relates to cars. I did not enjoy this book that much because of its technicality. I'm not too much into cars, so that is my problem.

Ooi Ghee Leng says

A much needed narrative on how rethinking in every aspect from management, product development to value creation, is still relevant today as we're moving towards vertical integration.

Euclides Jitsukawa says

Li este em 2014 para uma disciplina de produção.

É interessante como o autor coloca o carro como o produto mais importante do séc XX, descreve as linhas de montagem e principalmente o sistema de produção enxuta da Toyota.

A parte que mais me chamou a atenção foi a importância da relação entre a montadora e os fornecedores de componentes.

Ray says

Book compares the progression from craftsmanship (by hand and custom manufacturing) with mass production and lean production. The authors had surveys and contact with car manufacturers and summarized the results in the book. As you'd assume, craftsmanship has the slowest production rate and highest errors, whereas lean production had a better production rate with the least errors and mass production, according to the numbers, seemed to have a higher production rate with a moderate amount of errors. The production types also had implications for employee advancement and morale, where lean production allowed workers to constantly think about improvements as opposed to just doing only your assigned task. There are a lot of details in the book and it was a bit overwhelming to the point of sounding repetitive. Good book for anyone interested in improving a process or production. Although it's geared toward mechanical products (cars), many concepts could apply to any process.

David says

This book is an important work in the business literature. While focused on the auto industry, the application of Lean thinking, and Lean management is nearly limitless. I worked in the Car Rental business for a number of years, and I can say I learned far too much about the quality, or lack there of, for the American manufacturers of the 1990's. While this book, at times, may seem like a love letter to Toyota, certainly Toyota has done a spectacular job since the 1950's. Yes, they lost their way, but are still a force in the industry. I think the points are quite, clear, and this is a good starting point to understand the origins of lean. The updates are particularly useful additions.

Casey McClarnon says

Great for anyone in manufacturing. Or anyone in consuming because this is what created our world of inexpensive products.

Ashutosh Pandey says

Best lean book so far

Mike says

Fascinating history of the development of mass production at the Henry Ford factory in early 1900's and how it excelled in terms of efficiency over European craft production. Large amount of statistics and graphs that were satisfying to me. Shows how the continuing use of cost and efficiency per part produced as the prime motivator in a company can be disastrous. Discusses the new idea of "Lean Production" where manufacturing flow, flexibility, and value added per customer are important. Written about 20 years ago so somewhat dated. Wish author had done a better study of Japanese culture, number of engineers, average math/science score, what is defined as a good job in Japan, since I think this plays a role in why Toyota is so much better at making cars than an American company. Great read for anyone with an engineering or management interest.

Jonathan says

This book is about applying the LEAN method in industries, when it got released automobile industries already using the techniques. Techniques & tools for Controlling, Quality & monitoring are good lessons.

Brad Dunn says

A little technical but some good interesting insights about Toyota in its early days.

Nirvana says

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Bill Shavce says

A good overview of the origins of lean production. Although focused on the automotive sector, it gives a fairly compelling case for the adoption of lean in virtually any industry. It was published in 1990, so it lacks some of the more recent developments.

Amit says

Though this book was written in the early nineties, it remains relevant today, not only to the auto industry but to many other industries.

The key idea, that the responsibility for quality of any component of a larger system rests with the persons closest to it (one person, a team, a supplier), taking out all crutches to ensure that quality issues are extremely visible, and then fixing the process that created the problem rather than the person, is a powerful one. This focus on product quality increases productivity (because less time is wasted in rework) and increases revenue over the long term.

But accomplishing this is not easy. This study brings out many facets of how this is accomplished by Japanese auto manufacturers. For instance, they standardize the process making it easier for different functions to work together. Though accomplishing standardized process is not easy, it is essential. As someone I know use to say, the process sets you free.

It is also interesting to see how Japanese companies are willing to rotate people through different functions, and how every person in the company has some exposure to the core function of the company (manufacturing).

The book also has a very interesting discussion of the Japanese supply chain, of how OEMs and their suppliers are tightly interlocked. In my opinion, this system can make it very difficult to start a new business. Suppliers are beholden to their existing customers, so they are not going to supply the new entrant. It is therefore no surprise that new entrants have to rely on foreign suppliers. Long-term they have to build a domestic supply base to get the quality they need to remain competitive.

Western companies are going to find it very difficult to supply in Japan, unless they embrace the same quality standards. Which is why luxury brand companies do well (LV, Apple) but mid-market companies often struggle.

Mike Badgett says

A few things to point out.
1) This shouldn't be the only process or business management book you ever read.
2) It's old and dated and is talking about an industry you probably don't work in.

Having said that, this is a fantastic book. If you approach it with some patience and curiosity, you will likely learn a few things. I work in software and this a fascinating glimpse into a powerful, influential, and altogether related field.

Rafael Rosa says

TL;DR
The original book about Lean in the western world, written in 1990 it provides an interesting peek into the past, the "japanese industrial invasion" and the world before the height of globalization, all through the lenses of car manufacturing. However, it's pretty outdated, which reduces it impact and direct applicability.

Opinion
Lean was born on the japanese auto industry and it spread the world. Unfortunately, I'm not familiar enough with factories, so my interests lie on the use of Lean ideas to software development, where it has a lot of followers and I'm trying to have a better understanding of its basics.

The book describes the results of a 5-year research program during the 80's where they visited 90 factories around the world, comparing the performance of traditional mass production factories vs lean ones. The result is that lean manufacturers usually had better productivity, better quality, lower inventories and capital requirements, etc, the difference in the results was mostly explained by how "truly lean" a factory was, not everybody that called themselves lean or even where based in Japan, had good results.

One important thing I realized is that they split Lean in many parts (manufacturing, product design, supply chain, customer relations, management) and the one that is probably most applicable for software development is the part about product design, which is pretty close to the ideas around agile development. I'm sure I can find more insights by researching this specific aspect of Lean. The management part, however, was the least sophisticated, which is expected, since they were at the beginning of the process.

Some cool things the books mentions, but are mostly trivia:
* Since then they were considering the impacts of electric and self-driving cars
* No mention whatsoever to the Internet or the unification of communication, looks like it came as a surprise
* They missed the Asian Tiger phase, the fall of Communism, rampant globalization, NAFTA, EURO zone, the Japanese crisis, etc. It seems they were pretty optimistic
* The NUMMI factory closing wasn't in the cards back then, now resurrected by Tesla
* The authors never hint the possibility of expanding the use of Lean beyond manufacturing, but perhaps they assumed this was obvious
* They mention China twice in the book.

Much of the book predictions were dependent on macroeconomic trends and the regulatory situation of the time, I wonder if they would have changed their predictions or recommendations if they knew about the

changes in world economics since that time. I guess they would. Also, they expected that Lean manufacturing would replace mass production by the end of the 20th century, I'm not sure how far we are from that on this day.

The productivity benefits of Lean are "obvious" but what should society do with workers that get displaced by the increased productivity and job cuts that these lean transformations entail? They have no suggestions beyond "the government needs to figure it out", which is pretty scary.

All in all, it's a very good historical perspective of manufacturing since Ford and cool insights into the original perspective on lean.

Summary / Notes
* Lean manufacturing
* "It transfers the maximum number of tasks and responsibilities to those workers actually adding value to the car on the line, and it has in place a system for detecting defects that quickly traces every problem, once discovered, to it's ultimate cause."
* Employees divided into small groups
* Every member of the group is trained to perform all the tasks
* Quality isn't guaranteed at the end of the line, but instead it's built in on every step
* Employees have the authority to stop the line to correct problems as they are detected
* Problems aren't just fixed, instead the root causes are identified through the "5 whys" method and the fixes are applied to the source, avoiding their recurrence
* Rewards are focused on group and system performance instead of individual performance
* Employees are not super specialized, instead they are generalists trained to solve problems
* They have time to study and work on improvements to the process on regular intervals, Kaizen
* Waste elimination is critical, be it inefficient processes or too much inventory
* Inventory minimization is a constant effort, to reduce the amount of capital needed to make goods. Just-in-time is a part of it
* There are concerns that Lean work is even less fulfilling then regular mass production work, given the pressure for constant improvement and reduction of waste, generating a lot of stress. The counter-point is that they are empowered to control their work and environment
* Lean product development
* Lean products aren't developed in white rooms by engineers isolated from the rest of the company and the consumers, fighting for support from departments across the company. Instead they are developed by multidisciplinary teams lead by an empowered leader, the *shusa*, who has the mandate to design the product and all the necessary process changes and tools to guarantee its success, and they have access to a lot of data from consumers, partners and factory workers.
* The shusa has authority to do whatever it takes to make the project move, including poaching and overriding other departments
* The designers are assembled from talent across the company for the project and then disassembled
* Designers' performance is evaluated by the shusa and they have more impact on their careers than their normal managers
* The high risk decisions of the project are tackled at the beginning of the project, not at its end, similar to the problem solving on the factory floor
* Design is done together with suppliers, tool manufacturers and factory workers, instead of working in isolation and fixing integration problems after the project is done
* Lean design projects tend to have a shorter cycle and stabilization times
* Lean supply chain
* Lean supply chains are a cooperative process with suppliers, where the company has full knowledge of the numbers and capacity of the suppliers and vice-versa, the goal is to optimize the benefits and profits for both parties. Quite different from mass production supply chains, where the company and the suppliers are at odds all the time, hiding information and trying to maximize their profits disregarding the common benefits

* Lean suppliers are long term partnerships
* Suppliers are active participants on product and production design. Proprietary information is often shared.
* Price isn't the only guideline for choosing a partner, quality and overall relationship is more important
* Suppliers are expected to start with a high price and lower it as they get more volume, expertise and improve their own process
* It's common for company executives to work as "attachés" at the supplier. Equity exchanges are also common
* Just-in-time inventory is used to reduce capital costs and space requirements on both sides. This require good integration between company and suppliers
* The company usually has a tiered supply chain, they have few suppliers of big components (like chassis, drive train, etc) that in turn have their own supply chain of smaller components. This reduces the amount of direct relationships each company has to manage
* Lean customer feedback
* Lean companies try to maximize the life time value of customers (they didn't use this specific term, but that's what they meant). To do that they try to create a strong connection between brand and consumer, spending more time and effort building relationships
* Dealerships are owned or partly-owned by the company, instead of having multibrand dealers
* In the 80's the sales was door-to-door, with the salesperson creating a strong connection with the consumers. In the 90's this moved to a showroom model, but the importance on the relationship remained
* On dealerships the salespeople were organized in teams of non-specialists, just like in the factories. Performance bonuses were dependent on the group performance, not individual.
* To improve the relationship, the salespeople gathered a lot of data about customers, like the modern CRM systems, and interacted with them not in random intervals, but in moments where the customers might need their products
* Lean enterprise management
* A lot of the financial power of the Japanese Lean manufactures came from their *keiretsu* structure, at least from the authors perspective. In a keiretsu money comes from affiliated banks and companies that have equity interests in each other
* Careers in Japanese companies are based not on skill but on seniority. Moving between companies means starting from scratch, which enforces the "job for life" employment. The lack of this kind of stability on Western companies have impacts on their ability to actually implement Lean.
* Lean is ideal for companies that can produce their goods near their consumer markets, reinforcing supply chain benefits and just-in-time production based on customer demand, for this reason the authors suggest that companies should open independent but connect subsidiaries on their target markets, with constant executive exchange programs to reinforce culture and share lean knowledge.
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