

From Hype to Ignorance – A Review of 30 Years of Lean Production

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Abstract—Lean production (or lean management respectively) gained popularity in several waves. The last three decades have been filled with numerous attempts to apply these concepts in companies. However, this has only been partially successful. The roots of lean production can be traced back to Toyota's just-in-time production. This concept, which according to Womack's, Jones' and Roos' research at MIT was employed by Japanese car manufacturers, became popular under its international names "lean production", "lean-manufacturing" and was termed "Schlanke Produktion" in Germany. This contribution shows a review about lean production in Germany over the last thirty years: development, trial & error and implementation as well.

Keywords—Application, JIT, lean production, review, trial and error.

I. INTRODUCTION

JUST-IN-TIME (JIT) was developed by Taiichi Ohno and Shigeo Shingo in the 1950s and was only later labelled "Toyota Production System" (TPS) [1], [2]. Yet it was not until the first oil crisis in 1973 and Toyota's success during

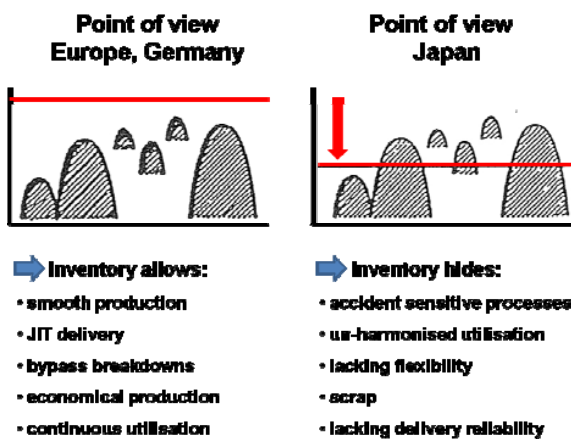


Fig. 1 Comparison point of view about inventory in Europe and Germany vs. Japan

this period that JIT began to attract attention. As the oil price began to stabilize, JIT came to the fore. In 1979/1980 the second oil crisis followed, leading to one of the most severe recessions in German history in 1981/82 with subsequent changes in the political landscape.

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At this very moment in time a publication comparing average sizes in stock in Europe and Japan made headlines (Fig. 1). In short: While the production itself was comparable, the Japanese logistic, which utilized simple, manual KANBAN-cards (material requirement card, developed by Toyota's Ohno in 1947), was considerably more efficient and straightforward at very low costs. Over the next decade all attempts to implement KANBAN-systems were unsuccessful. JIT was not seen as JIT production but as JIT delivery. The prerequisites such as Zero-Defect-Production, production methods with a smoothed assembly via short setup times, small production batch sizes, multifunctional workers, standards as well as reliable facilities (Total Productive Maintenance TPM) were largely ignored (Fig. 2), while little notice was taken of English literature published after the year 1980 [3]. Hence JIT was sometimes discredited as Just-in-congestion". Opinions such as "stock on wheels" were popular. However, nothing could be further from the truth – distances are covered on streets, not spaces of time. Demand and supply are coordinated via pull-production. German manufacturers attempted to become more competitive through automation and "Computer Integrated Manufacturing" (CIM).

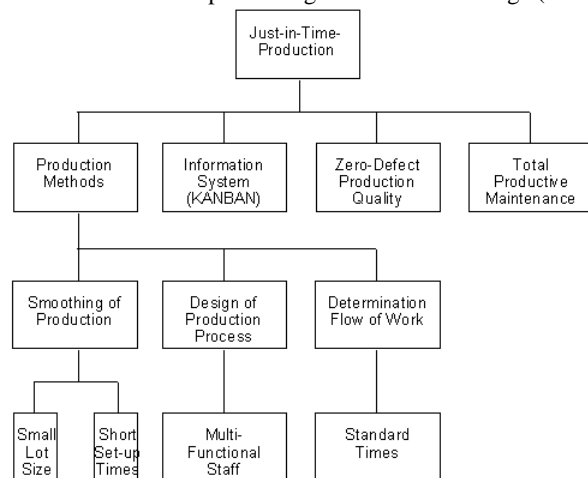


Fig. 2 Just-in-Time Production [3]

II. DEVELOPMENT OF LEAN PRODUCTION

A. After the Great Flood: A Dry Spell

In 1990 the report of MIT's "International Motor Vehicle Program" (IMVP) was published as book under the title "The second revolution in the automobile industry" [4]. It illustrated the principles of a production system, which was superior regarding productivity and quality and gave it the

name “lean production”. Such a “Big Bang” had rarely been seen in this industry. Seminars and conferences on this topic as well as pilgrims to Japan by legions of managers and consultants demonstrated the frantic activity resulting from attempts to close the gap. Books depicting new methods of management were published every few months – looking back this could be called a “wave of new methods”. Among other things, one would have been able to discover a book on “Six Sigma” – this, however, would be largely ignored for another ten years [5]. With the elimination of the seven types of waste (Muda) according to Toyota’s definition, the “Sea of inventory” became relevant once again. Continuous Improvement (CIP), and workplace organisation (i.e. 5S or 5A) were among the principles to achieve prominence [6]-[9].

CIP’s usefulness was certified as complete success by Lopez’ office at VW in 1994 as it had led to a 21 percent increase in productivity and had saved several billions. The target figures in 1994 were between 5000 and 6000 CIP-workshops and the training of 800 CIP moderators for VW and their suppliers [10]. The Japanese real estate and stock market bubble in Japan burst and lean production was largely forgotten about in most companies over the course of the next ten years. The great flood was followed by a ten-year dry spell.

B. Chinese Whispers

The engagement with lean production was comparable to the game “Chinese whispers” (Fig. 3): Toyota/TPS gained prominence as “lean management” (the term was coined in the US). The concept was adapted in Germany. However, direct exchanges between TPS/Toyota and its German users remain relatively rare [11]. And why would there be? Following the bursting of the bubble ideas from Japan were no longer held in high regard. While a lot was tested, only a few companies would continuously work towards the implementation of lean production with a shift of their production culture in mind.

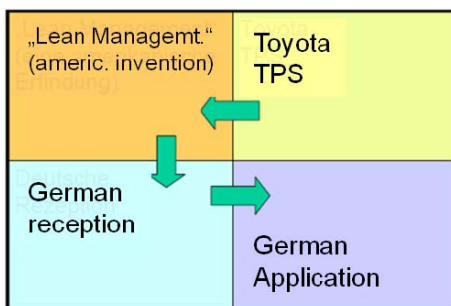


Fig. 3 Model “Chinese whispers” [11]

At the time sustainability was still a widely unknown concept. The majority of companies were too preoccupied with other matters (Development of a global player, deep slumber, destroying capital etc.).

C. Awaking from the Slumber

The Toyota Prius, the first mass-produced hybrid car in the world, was introduced in Japan in 1997 and in Europe three years later. As the Prius was named “Car of the Year” by the European media in 2005 and Toyota replaced Ford as the second largest car manufacturer in the world, the car industry was torn from its sleep: Toyota displayed development competence and was poised to become the market leader and then to hold that position for a long time.

These news were – once again – followed by frantic reactions. Associations such as VDA and VDI organized seminars and workshops as [12], [13]. Once again the elimination of waste was made a top priority – the removal Muda in accordance with Toyota’s 1950s concept: Over-production, Unnecessary transportation, Inventory, Motion, Defects, Over-processing, Waiting. While it already had been alluded to twenty years ago, only lately the importance of the eight form of waste, the unexploited potential of the labor force, has been fully recognized. If implemented mechanically without real values and conviction the 5S or 5A workplace organizations can reach grotesque dimensions. These particular problems had already been identified during the introduction of lean management in 1992 [14]. Yet again a great fuss was created and had little impact.

Over the course of the last few years various companies implemented derivatives of the TPS. Case studies show the success lean production has had in the removal of waste as well as its potential to streamline processes. Possible shortcomings are the employees’ qualification as well as the prevention of waste which are presented in seminars on the topic “Reckoning for the last 15 years” [15]. The focus lies predominantly on waste (i.e. Muda). Unevenness (Mura) as well as overburden (Muri) are marginal topics.

D. It is Crucial to Understand the Basics

How to proceed was outlined 1991 in [16]: “The key is not to adopt the methods and the systems but to understand their foundations. The next step is to assess which parts can be adopted or adjusted to the circumstances at hand and, most importantly, what could be improved. Extensive English literature on the Toyota production system as well as Japanese production methods has been in circulation for the last ten years. If it required research at MIT to understand the signs of the time, then many companies have misinterpreted the development of an entire decade. This period in time cannot be made up for by imitation, but rather through development leaps or innovative products and production methods. This is a challenge German car manufacturers will now have to face. It is important to make use of the time while the industry remains healthy, which is illustrated by the current situation in the East. If the necessary structural

5 S's zu 5A's und wieder zu 5S's - Welch ein Fortschritt		
•Seiri:	Sortiere aus!	Sortieren
•Seiton:	Stelle ordentlich hin!	Sichtbare Ordnung schaffen
•Seiso:	Säubere!	Sauber halten
•Seiketsu:	Sauberkeit bewahren!	Standardisieren
•Shitsuke:	Selbstdisziplin üben!	Sichern und ständig verbessern
•Ausordern		Sort
•Ausräumen (Arbeitsmittel ergonomisch anordnen)		Stabilise
•Arbeitsplatzsauberkeit		Shine
•Anordnung zur Regel machen		Standardise
•Alle Punkte einhalten und verbessern		Sustain

Fig. 4 From 5 S's to 5A's and back to 5S's again - What a progress [17]-[19]

changes are left to late, crisis management will become the order of the day”.

This is precisely what is taking place at the moment – costs and crisis management following decades of neglect. Advancements are made through real understanding not via the language exercises of the different translations of 5S and 5A as in [17]-[19] (Fig. 4). In fact this hardly comes as a surprise considering that waste is yet to be interpreted in a correct manner. This was illustrated as in [20]:

- 1) “Empowering the employees” vs. “Avoid waste”: It is important to minimize waste. However, this will only be sustainable if minimizing waste ceases being the sole target after a certain point.
- 2) Minimizing waste should be the result not the goal. It is more important to empower all employees to contribute to the accumulation of knowledge at their own work station in order to optimize procedures – otherwise the danger arises that the accumulation of knowledge will be neglected in favour of focusing all efforts on the avoidance of waste. In this case one will never progress beyond the initial success. When “Avoid all forms of waste!” is declared the sole target, many will hesitate to invest in areas, which have a history of underfunding. Typically this affects the local accumulation of knowledge. This situation even affects some of the big corporations, which have a history of lean production, because they failed to realize that.
- 3) The quintessence is not “avoid waste” but “empower the employees to not produce unnecessary costs”. The emphasis lies on “empowerment”.

“Muda” does not have the same meaning as “waste” – it is something, which you do in useless, something, which is done for no particular purpose. It is less concerned with material but rather with actions. Muda distinguishes between fruitless and useful actions. Tangible Mudas are always only the result of actions that had not been thought through. This is a point, which can not be stressed too often otherwise “the baby will be thrown out with the bath water” [20].

III. LATEST DEVELOPMENT

A. The Recall Debacle

How should one judge the current vehicle recalls by Toyota? For the company they are a disaster. Yet the fact that

Ford had to recall nearly 14 million vehicles at the same time was met with little to no public reaction. The question is: Why? The FAZ came up with its own answer [21]. According to their research the US wanted to hit Toyota and cover up negligence of their own administrative bodies:

“Toyota undoubtedly has problems. However, these vehicle recalls only became a worldwide scandal because they suited the needs of the American car industry. The company was caught up in the trappings of politics. (...) Others would interpret this as political opportunism.” [22], [23].

In Germany in 2008, there were 148 motor vehicle recall actions with KBA involvement, which were distributed amongst all manufacturers. Thus, the German car industry hardly qualifies as the paradigm of reliability either [24]. More importantly: How will the former model student, who gained an impeccable reputation for quality and reliability, be able to recover from this recent fall from grace? Anyone who has seen Toyota's apology as well as the statements made before congress by the leading figures of the US car industry, will recognize who has shown a greater sense of orientation, responsibility, personal honour and trust.

Here are the appropriate links for anyone who wants to see for themselves:

Toyota President Aiko Toyoda on Toyota Recalls:

<http://www.youtube.com/watch?v=ZZeiD2-Rbg4>

The 'Big Three' testify on Capitol Hill:

<http://www.youtube.com/watch?v=Ku7vYcRUF6E>

B. It is Still too Early to Sound the All-Clear

Toyota will return to their roots and will soon return to full strength. According to a statement from Toyota's procurement manager on June 18th 2010 the company aims to lower its total costs by 30 % by 2013 through the development of 165 model independent modules [25]. Another measure is a radical redesign of the components as in [26], [27], see (Fig. 5). Toyota already released a motor with 30 % less parts and potential savings of similar proportions as early as 1996 [28]. Even today this achievement has gathered little attention. Only four different types of screws are required for a motor whereas 24 are used in the German premium automotive market.

Once these vehicles, which have been assembled with significantly fewer parts, are on the streets, the rest of the automobile industry will once more trail ten years behind and

Radically redesign of components.

“Let's take nuts and bolts, for example. What if we were to develop components that don't require screws? That's the kind of thinking we're after.”

Mitsuo Kinoshita, senior managing director & chief purchasing officer

Our goal in the next years – to develop automobiles, which only “consists half of the parts” as well as save costs of 6,5 bn Euro or ca. 750 Euro per car in the next 3 years.

Toyota – Ex-President Katsuaki Watanabe

Fig. 5 Radically redesign of components at Toyota [26], [27] will be confronted with the failures of the last 25 years. Where should the competitive advantage come from if everyone uses lean concepts or engages in outsourcing, but nobody takes preventive action or advances their own developments? After all statements such as “Who only follow the trails of their predecessors, will never be able to overtake them” or “The best Japanese are the Japanese”, “Don’t imitate – innovate” and the like have been known for twenty years as in [29].

IV. CONCLUSION – THERE IS STILL A LONG WAY TO GO

It takes a lot of time and effort to understand and implement the Toyota production system as well as develop the employees as benchmark for lean production. It is also necessary to adopt sustainable process improvements with a new production philosophy and not to rely on efficiency programs, which ultimately turn out to be absurd austerity programs. Lean production is a successful way to enhance quality and productivity. Numerous case studies illustrate its successful implementations, which often had to get over trials and confusion or even an all-out re-start along the way. Few companies have interpreted it as one continuous path, which they have been following for twenty years and have since integrated into their production philosophy. This may be very, very good, but it is not good enough, it is not excellent.

The road with and towards lean production remains long and trying. But now is the time to make preparations for further development. In 2007 Peter Wickens, the Director of Personnel and Information Systems of the Nissan Motor Manufacturing (UK) Ltd. called for “a system of ‘lean production’ managed by people who care about people” [30]. The employees are to be regarded as the source of innovation and need to be further empowered. Lean production has to be advanced beyond production itself to include the basis of a “Lean and Green” agenda.

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