SC approach to understanding JIT/Lean organizations

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The Toyota production system (TPS), known also as JIT, kanban production or lean system has been attracting the world attention since the 1980s. It has been implemented successfully in many companies world-wide. It is easy to understand, and does not required any sophisticated equipment. Its main tool, the kanban, needs just a piece of paper.[1] The system works in highly automated, computerized or robotized production environments as well as in production organizations that do not require or can not afford such expensive equipment.[2]

What continues however to strike the mind is the fact one could hardly find a company outside Japan that has sustained consistent quality products, successes and growth for decades thanks to JIT the way Toyota does. Many automobile companies such as HP, Federal Mogul Corp., Ford, and Peugeot, Daimler Benz[3] have implemented the system. But only Toyota itself and some Japanese companies like Funai[4] continue to sustain their growth and success thanks to JIT/lean methods. A keen observation shows that many companies have implemented JIT from the point of view of production system only, and Shingo[5] has played an important role in the JIT implementation in outside Japan. We contend that Toyota successes are due to its integrated supply chain approach to the JIT. The paper tries to show that the TPS means more than a production system: it is a logistics and supply chain management system.[6]

Key words: TPS, JIT, Lean, Kanban, SCM, Logistics, cooperation, integration, SC strategy

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1 See Ohno

2 the case of Toyota itself is very instructive, where you can find highly automated processes working in harmony with piece of paper attached to the vehicle on the assembly line.

3 Few of companies that implemented JIT with the help of Shingo, Shingo p. 247

4 Statement by Funai President and founder that I met a meeting of Japan Industrial Management Society

5 Refer to the literature, SMED books and Shingo Prize

6 Monden approach to TPS is complete. But one should not forget that Ohno's Toyota development history shows Toyota trains its suppliers

"However, Ohno taught through hands-on demonstrations to his direct reports, and his ideas were often counterintuitive and difficult to accept unless you tried them yourself. (This is still true today, as we have seen repeatedly)"
Womack and Jones, Lean thinking, 1996, p. 234

Introduction

SC management deals at least with a pair of stages of the SC. It might, for example, be supplier(s) and manufacturer; manufacturer and distributor(s); distributor(s) and wholesaler(s); and wholesaler(s) and retailer(s). Since our focus is on the manufacturing sector, and on other hand, for the sake of both simplicity and clarity, the presentation is going to analyze only two pairs: suppliers & manufacturer and manufacturer & customers. In other words, we consider the manufacturer to be the central stage of the simplified SC we are going to base our analysis and reflection on. In fact, the paper intends to show that the sustained performance and unrivaled competitiveness of Toyota are due to the SC organization and implementation approach of its lean production system within Toyota itself, within its partners and within the Toyota SC as a whole.

Brief historical approach to the JIT implementation at Toyota

A brief look at the history of TPS/JIT shows that Toyota implemented the system first at its own plants, then at its first-tier suppliers who at their turn taught the system to their own suppliers or second-tier suppliers.[7] This reveals in fact the important and necessary steps in the full implementation of the JIT System that can sustain over an exceptionally long period of time the performance and success of the SC in terms of both efficiency and responsiveness.[8]

Intra-company inter-process kanban or intra-plant kanban

TPS/JIT can be considered merely as an operation strategy and a set of production techniques. It can thus be implemented at the central stage of the supply chain (SC). In our case, the pivotal element is the powerful manufacturer. At that level, the accent is put on the identification and elimination of different

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[7] T. Ohno, Toyota Seisan hoshiki (in Japanese), 1978, p. 228-229, Y. Monden, Toyota Production System 1998, p. 37;, J. P. Womack and D. T. Jones, Lean Thinking 237. It is Womack and Jones who introduced the nuance according to which first tier-suppliers taught the system to their own suppliers.

[8] See Chopra, SCM, 2007

muda, in the reduction of the setup time, in breaking physical barriers between processes, in eliminating inventories and warehouses, in freeing spaces at the production site, etc. It is in fact the implementation of the different techniques that the prerequisite to the kanban-pull system of production.[9]

The second step consists in integrating the different production processes so as to create a flow, ideally a continuous flow of material, i.e., a one-piece-at-time flow of materials. At this level, the dual kanban known also the inter-process and in-process can be introduced. The inter-process kanban is the kanban that authorizes the transfer of product from one process to the subsequent process within a production site whereas the in-process kanban function consists in giving production orders. That is why it is also called production order kanban. Since the dual kanban is used within one plant, it is referred here to as intra-plant kanban. If things are looked both from both the company and plant of viewpoint, then it can called intra-company intra-plant kanban (see Figure below). The intra-company intra-plant kanban is divided into two kanban: inter-process and intra-process kanban.[10]

The dual intra-company kanban are the elements that achieve the internal integration of intra-plant processes or processes that are geographically close to each others and generally situated within the same production site.

Intra-company inter-plant processes kanban or intra-company supplier kanban

Another lesson that might be learned is that once the JIT as a set of manufacturing techniques has been put into place at the different production sites and the intra-plant kanban implemented, the next step consists in linking the part maker plant with the assembly line or subassembly line or components maker plant.

Figure: Types of integration kanban

	Intra-plant	Interplant
Intra- company	● Inter-process kanban or withdrawal kanban ● Intra-process kanban or production (order) kanban	Supplier kanban

[9] See Kupanhy, Boston 2005; 1995

[10] Kupanhy, Monden. Most authors call them inter and in-process kanban, or withdrawal and production kanban. Because we looking at the matter from the SC point of view we thought we needed to be specific in order to avoid confusion between kanban in used in company and those uses in different company. Intra-company is opposed to inter-company kanban

Inter-company		Supplier kanban

And the kanban that will be used to withdraw the part is the withdrawal kanban. It is a supplier kanban. Such a kanban is tentatively referred to here as an intra-company inter-plant kanban or intra-company supplier kanban. It means that the supplier plant belongs to the same company as the assembly line, for example. This kanban represents the integration of plants or production units of the same company that are geographically not located at the same place. The use if an intra-company or in-company inter-plant kanban seems useful in order to make it clear that the two stages of the SC belong to the same company and have thus achieved an internal integration of their processes, that their process are linked; materials are pulled by processes of the downstream stage and not pushed by the upstream stage.

Intercompany inter-plant process kanban or inter company supplier kanban

Once the kanban system as a SC production and information tool linking intra- and inter-plant processes within the pivotal stage has been realized, one can consider extending it to the suppliers, especially to skeptical suppliers, i.e. supplying plants that do not belong to the manufacturer's group. The first thing to do would be to get supplying company's top management visit the manufacturer's parts plant and assembly line. Such a visit has more convincing power than simple explanation or arguments. If the supplier agrees, the manufacturer would better help the supplier implement the system, at the manufacturer's expense or shared expense. If the system becomes functional, then a supplier kanban will be used to link supplier's JIT-plant to the manufacturing JIT assembly line. The part manufacturing plant of the manufacturer and the supplier plant should be treated the same way in terms of the sharing of information, forecasting, the way of pulling materials by the manufacturer. Because they are both first tier supplier.

Helping the supplier implement the JIT consists thus in the knowledge transfer, in training by the manufacturer. Employees of the supplier may undergo a training at their own plant or they might be dispatched to the manufacturer's plant to learn by practice and observation how JIT works. In order to strengthen its SC, Honda of America and China dispatched a team of its knowledge employees to go assist its American and Chinese suppliers improve their

manufacturing and management capabilities.[11] Toyota did in Japan and in the USA.

Of the many plants I have visited in France and Germany, I could identify the implementation of JIT only that took place years before, companies tried to implement some JIT techniques. And for most them, what could be witnessed were just vestiges of tentative trials of JIT implementation.

Most of the time, they did so to try to react to the Japanese competitor by using the weapon the latter was using. In fact, they were comparing only end of the supply chain. The quality of product, the JIT system drive the whole SC. It is a strategy to share production technology and knowledge. It is strategy to work with suppliers. But it is also logistics system that coordinates the movement of materials and transportation between Toyota and its parts suppliers.

In the West, as well as numerous Japanese companies, JIT has been approached as production system. As such, the accent has been mainly on production techniques[12] and on muda elimination in order to create the productivity, that value added activities.[13] Seven muda, 5S, z-goals, s-goals, TPM, TQM, CI, SS, QCC.[14]

JIT in the framework of lean thinking. Muda is recognized as such. The lean approach. Lean authors put forward the concepts value. Value creation, value stream besides that of (flow, and pull and perfection are clear in the JIT).

JIT emphasize muda. Lean approach seems to emphasize value creation. They are both mean the same. In order to tocreate the value creacting activity, you need to eliminate the muda. When you eliminate the muda, you contribute to value creating activity. But the muda approach may lead to losing sight of the importance of SC managemen although the supplier kanban system is there to remind of that important aspect. Unfortunately, all the plants I have visited in France and Germany, they would mention kanban but seldom the kanban that pull the product from the supplier. Most of the type you have those special kanban that the one at Toyota that authorize the production when the container or space becomes empty.[15]

In many situations, you do not even have the flow. The supplier would use, if he not on the JIT system, his tank of inventories to supply parts from, leaving thus the impression of being on the JIT time since he would respond quickly to the

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[11] See reference
[12] Schonberger, Shingo,
[13] Ohno: much as main part of any activity
[14] Kupanhy and numerous authors
[15] See Monden and Schonberger for references

demand the customer but in fact he is on the just in case delivery.[16]

To make sure that we are in the JIT, one has to check whether there are symptoms of bullwhip effect, that uneven level of inventory within the supply chain, i.e. few inventory at the assembler and pile of inventory at the upstream stage.

Another way to check is to see the overall profit of the supplier but the profit made on a unit sold and the unit cost. In fact by taking advantage of the volume and economy of scale, one may give the impression that the just in case works fine. But the slightest negative fluctuation that would affect demand, it will soon be revealed that there was too much inventories, muda. This may be the case in many Western companies. Many American companies with a lot of fanfare switched to JIT, they said. But their suppliers did not. As a result,

We can see in the same market, Toyota when even it was yet number 3 or 4, it would sell less but make more profit.[17] Toyota produces more and more with less and less (operations and resources)

Many look at Toyota only as though they make 100% of what they produce! What is strong is not only Toyota, but Toyota SC, and Toyota SCM efficiency.

Lean: value creation stream and not value creation

The concept of SC with its strength competitive advantage was was initially associated with the Japanese Keireitsu and Japanese production management. Unfortunately what one can see is in the West, many companies seem to separate them. In the 1980s the accent has been in the introduction of JIT technical and operational aspects only; and at only one stage at one company. Since the 1990s the focus seems to be on SC only. The introduction of the JIT, less its integration within the SC is not only overlooked but it has never been paid special attention. The competition that we have had in the market for decades and that handing the victory to the Japanese companies is due to the fact that companies, end stages of the Western suppliers chains again in competition against the whole and competitive Japanese not companies but SC that are represented by the companies like Sony, Toyota, Panasonic, etc. implementing JIT at just one stage of the SC would not making you as efficient as a whole SC. The quality of the value created and the cost of end product being the some of sum and cost created within the SC, an efficient SC can never compete with equal weapon against a stage of a supplying chain even though that stage is lean and mudaless. That is how we can explain why companies that have implemented JIT not through their SC but just at one stage of the SC have only limited results.

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[16] References?

[17] Toyota's profit > combined profit in 2003 of GM, Ford and DaimlerChrysler

JIT should be thought as operations technique and strategy, an process integrating tools regardless of the company they belong to. They are concern so far as they part of the value stream. It is a knolwdge that should be shared with the SC stages downstream and upstream. It is a SC strategy that should be in line with strategies of the different stages of the SC. It is an production information that should be shared by all the elements of the SC. It is value creating tools through the whole value stream but not just at one stage, be it the pivotal one. It is formidable competitive weapon that should be by all the member of the SC. It a logistics system that create the time and place value. It is a tool that make SC stage lean and the whole SC lean. It is tool that aim at perfection with its kaizen concept. Smart like, Aroka like, Toyota-kanban like, Dell-like, 7-eleven like

TPS can lead to losing sight of SCM
JIT may lead to emphasizing the operational level
Kanban: interprocess supply chain and integration (intra-plant kanban)
Inter-plant kanban or supplier kanban

- ✧ Incompany kanban: between two plant of the same companies
- ✧ Intercompany kanban: between the supplying company and its customer kanban