Just-in-time supplier selection: a case study in an automobile assembler in Brazil

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Abstract

The objective of this paper was to analyze the Just-In-Time supplier development procedures employed by a multinational automobile assembler located in Brazil. For that purpose case study was used as the methodological approach complemented by semi-structured interviews as the data gathering technique. Results enabled a thorough understanding of the process.

Keywords: Just-in-Time; Vendor development; Lean Manufacturing; Brazil.

Introduction

The manufacturing companies located in Brazil have been facing a fierce competition from international products as a result of the generalized globalization process. Kumar et al. (2006) suggest that one of the strategies to sustain a competitive advantage in this kind of environment is to improve the flexibility of the manufacturing process. According to Duclos et al. (2003) and Lummus et al. (2003) the manufacturing flexibility can be understood as the capacity to respond to the changing needs in terms of products, volumes and delivery times. To do that, thorough supply chain coordination is required comprising operations, market, logistics, organization and information flexibility.

However, if no other consideration is made there is always a risk that the enlarged flexibility is obtained through additional inventory levels. To avoid that, lean manufacturing techniques propose a new production paradigm where increased flexibility is obtained simultaneously with reduced inventory levels, higher quality,just-in-time delivery and lower costs. Many scholars state that the lean manufacturing also includes a complete set of complementary and mutually reinforcing inter-relations in the manufacturing practices, usually referred as guidelines that aim to eliminate activities that do not aggregate value to products throughout the supply chain (Narasimhan 2006).

In fact, as widely known, the just-in-time (JIT) delivery was created in the 50's as an integral part of the Toyota Production System (Moura and Banzato 1994). It considers delivering to each production process the needed items in the exact necessary quantity, at the required

quality level, at the precise moment, minimizing as a result the in-process inventory (Shingo 1996). However, Uhlmann (1997) states that the term just-in-time has expanded its original meaning. Presently ithas frequently been used as a synonymous of lean manufacturing. In this sense, Bernardes and Marcondes (2006) indicate that the ideal objectives of the JIT production aim: zero defects, zero setup times, zero inventories, zero movement, zero breakage, zero lead times and single piece production lots. Of course those are theoretical objectives, but illustrate that JIT production should be always looking for improvements and waste reduction no matter how good the production process might be.

According to Bernardes and Marcondes (2006), a production system to become JIT should go through deep structural changes, involving also a paradigm shift. The classical process arrangement is now replaced by manufacturing cells comprising all the required facilities to produce a family of similar parts or products. The direct labor is formed by multifunctional operators, performing many different tasks including quality control. They become fully accountable for the parts or products they make.

Martins and Laugeni (2006) state that a JIT manufacturing system should rely on some basic principles without which its implementation could be in jeopardy. They are:

- Kanban: It is the main technique used to allow the pull system to work accordingly. In a JIT environment a small quantity of finished parts are stored in a given manufacturing cell. When one of these parts are required by the subsequent process, the respective container is moved to the new location and the corresponding kanban authorizes the preceding cell to make one additional container of the recently moved parts. If no containers are moved and no kanbans are sent to the previous process, that particular manufacturing cell stops and keeps idle until a new kanban is received. Kanban is a sub-system of JIT. They are not synonymous.
- Set-up times: To allow a high flexibility operation minimizing inventory levels (central objectives of JIT manufacturing), production lot sizes should be as small as technically possible. To accomplish that at a minimum cost, set-up times should be very small, ideally negligible.
- Multi-functional operators: To perform effectively in a manufacturing cell where multiple kinds of equipment and operations are required, operators should have multifunctional skills. Also, they should be capable of performing the required cell set-up to produce different types of parts or products, accomplishing routine equipment maintenance and small repairs (TPM – total productive maintenance) and developing quality control functions as part of their regular tasks.
- Layout: The plant layout in a JIT factory is quite different from traditional manufacturing. Instead of fabrication areas organized by process, in JIT plants the production is pulled through a sequence of manufacturing cells by a flow of kanbans. WIP is very limited and stored in the factory floor as opposed to the extensive use of intermediate storages in mass production. As a result, floor space requirements for JIT are a lot lower as compared to traditional manufacturing.
- Quality: Quality is essential for the JIT production system. Besides being wastes, defects can generate production losses as there are no more inventory to cover mistakes. However, JIT favors the generation of good quality as bad parts and products are identified by the operator in the precise moment they occur. The entire

production system is designed to expose mistakes and not to generate excess inventory to cover them.

- Suppliers: Supplier relationship is radically different under the JIT approach. It is governed by cooperation and partnership rather than by dispute and conflicting objectives as in traditional manufacturing. This enables materials and parts to be delivered in precise quantities, at a predetermined times and at the required quality level. No more income inspection is necessary.

As can be seen, the JIT production affects practically all the aspects of a manufacturing operation: lot sizes, scheduling, quality, plant layout, supplier and working relationship etc. In parallel significant benefits can also be noticed: substantial increase in inventory turns, superior quality and substantial lower manufacturing costs.

According to Martins and Laugeni (2006) the ten commandments for JIT manufacturing implementation are: throw away the old and ancient production methods; think on how you can make JIT works, not on how to justify why it does not; work with existing conditions and do not look for excuses; do not expect perfection, 50% execution is a fair start; correct mistakes immediately; do not spend too much in improvements; wisdom raises from difficulties; ask "why" at least five times until you reach the real cause; the wisdom of ten people is better than the knowledge of one; the improvements are unlimited.

The supplier development under JIT system can encompass limited efforts (like superficially evaluate a vendor and demand an improved performance) or extended efforts (like training the supplier labor force and investing in its operations). In both cases the objective is to nurture a long lasting relationship. One of the central objectives of the Purchasing department of a company is to maintain a network of qualified vendors (Krause 1997).

The supplier relationship management process provides the framework to integrate the company with its vendors, however the day-today activities take place at the operational level. The management is responsible for identifying which suppliers are critical for the success of the company and also make decisions on how the vendor relationships will be developed and maintained, including the development of the required supplier product and service agreements established between the company and each one of its suppliers. At the operational level firms usually deploy one working team for each key supplierand an additional one for each segment of non-key vendors (Enz and Lambert 2012).

Managing the relationship with suppliers and clients are critical connections that link the company to its supply chain. As a result, it is necessary for a firm to have the capacity to measure its relationship performance with vendors and customersin terms of the impact on revenues, costs and investment. This knowledge will enable the development of programs that improve the supply chain performance and the fair share of benefits and costs among its players (Enz and Lambert 2012).

According to Lambert et al. (2010), the company should develop asupplier product and service agreement (PSA) for its vendors. For each key supplier the company usually negotiates a mutually beneficial PSAthat includes a continuous communication and an improvement plan. For the remaining vendors a standard PSA is developed for each segment. They represent a minimum set of conditions to be followed by the non-key suppliers and their terms are not negotiable.

One aspect that has been frequently included in the PSAs is JIT delivery requirement. Suppliers are demanded to deliver its partsin the exact necessary quantity, at the required quality

level and at the precise moment. However, to comply with those requirements and to avoid excessive inventory levels / costs, vendors should also implement the JIT manufacturing system in their own facilities. If not, JIT supplying conditions will become at risk (Lambert et al. 2010). As a result, supplier JIT production system implementation seems a key factor to be accounted for in the vendor selection process by a manufacturing firm. To verify if this concern really exists in real-life situations, this paper proposes to investigate how the vendor selection process is carried out in a Brazilian automobile assembler, focusing mainly in the JIT requirements included in that procedure.

METHODS

Yin (2010) states that the case study should be the preferred research strategy when "how" and "why" questions are involved, when the researchers have low control over the researched events and when contemporaneous events in a real-life context are involved. Also Schramm (1971) says that the essence of a case study tries to clarify a decision or a set of decisions, the reason that lead to them, how they were implemented and which results were achieved through them. Investigating the JIT supplier selection in an automobile assembler in Brazil fulfills most of the aforesaid conditions, reason why a case study was employed to obtain the necessary information required by the proposed research.As data collection procedure a semi-structured interview technique was selected as this is one of possible and viable ways to obtain information when the case study research strategy is employed, as per Yin (2010).

Bryman (1995) points out that one of the most difficult problems faced by the researchers is the access to the organizations to obtain the required information for their research. Thus, the main criterion adopted to select the company to be included in the proposed case study was the researchers' access to the required persons that could provide the data needed to clarify the question posed by this work. As a result, the case study was conducted in a large multinational automobile assembler located is Sao Bernardo do Campo, State of Sao Paulo in Brazil, where the three executives responsible for vendor selection and development ware interviewed. The conversation took about one hour with each one of them. Supporting material as examples of PSAs was also obtained.

CASE STUDY

The company considered for the case study is a Brazilian subsidiary of a large multinational firm operating in more than 150 countries. It is located in a 470 acre property with more than 11 million sqft of constructed space, in Sao Bernardo do Campo, a city located about 15 miles South of Sao Paulo in Brazil. It employs 16,000 workers and its present production capacity in this facility is 1,600 automobiles per day comprising six different car models. The main manufacturing facilities are: press room, body assembly, painting, engine and gearbox manufacturing and final assembly.

In terms of industrial system, the company can be presently considered a full JIT manufacturing producer, since most of the lean techniques are currently being applied. Moreover, the JIT system is perceived by the organization not only as a production and logistics management tool but also as a strategic weapon that allows greater manufacturing flexibility at the same time it provides reduced inventories and lower labor requirements.

In terms of JIT delivery, this approach is applied only for the key suppliers. They have specific PSAs and also there are dedicated teams assigned to their relationship management, with responsibilities evolving from the vendor development up to the daily JIT delivery performance.

For vendor development, the company has a well-structured and organized process that usually takes one year to complete. It involves five steps as summarized in Figure 1:

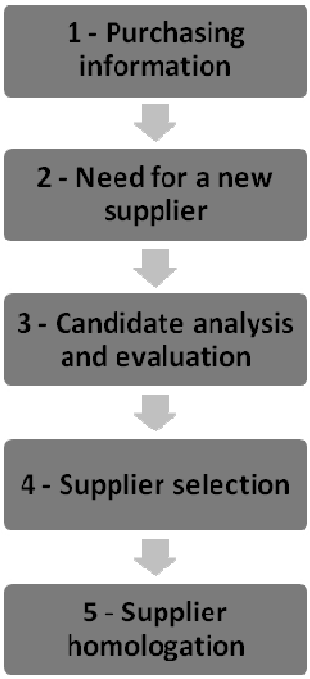

Figure 1 – Five step supplier selection process d by the company under study.

Figure 1 can be explained in more detail as follows:

- Purchasing information - The Purchasing area is responsible for maintaining in the company ERP updated information about actual and possible suppliers comprising: type of products supplied, vendor locations, delivery systems and packaging. This information is made available for all the areas responsible for materials management, including the Just-in-Time Process Department that can use this data bank to seek for possible just in time suppliers.
- Need for a new supplier - The need for a new just in time vendor is requested to the Just-in-Time Process Department usually in the following situations: new product development, introduction of design changes in current products, problems affecting current vendor performance or relationship or the need to increase delivering capacity of existing suppliers.
- Candidate analysis and evaluation - Based on the information available in the company ERP about existing and potential vendors, the Just-in-Time Process Department selects candidates for a first round of evaluations. In this initial phase there is an exchange of information required to evaluate the supplier capability to attend the requirements imposed by the Just-in-Time system. The main requisites are: Production capacity – The suppliers should have capacity compatible with the

client's demand; Flexibility – The vendors should be able to make quick changes to the production schedules as a result of its own just in time techniques and not as a consequence of high inventories on hand; Quality and Control – The supplier must have its quality system dully certified as per ISO TS 16,949, as the parts supplied will be sent directly to the client assembly lines, with no inspection; Location – Ideally suppliers should be located not farther than 10 miles far from the client's plant; Delivery – Vendor should be able to deliver parts on a daily basis (in some cases and depending on the item several deliveries per day are required);

- Supplier selection - The suppliers that will meet all the aforesaid prerequisites will be sent by the Just-in-Time Process Department to the Purchasing Department that will take care of the commercial aspects of the negotiation. Depending on the type of supplier being selected a specific PSA will be negotiated or a general purpose PSA will be imposed by the client to the vendor under consideration.
- Supplier homologation - In this phase of the selection process there are some issues to be assessed: Capacity vs. Demand – Does the selected vendor has sufficient capacity to support 100% of the client's demand or more than one supplier will be required? Facilities –Does the vendor need to make changes to its manufacturing processes its facilities to attend the required capacity and product technical specifications? Technology – Does the supplier have in place the technology required to adequately support product specifications? Does it invest in new technology? Price – Does the vendor meet the objective prices established by the client? Is it prepared to reduce this price with time? Confidence level – Is the vendor reliable enough to become the only supplier for the items it is being considered to provide?

Depending on the results of the aforesaid analyses one or more vendors could be selected for the actual supply of the new parts. This decision in made as a result of a joint analysis conducted by the Just-in-Time Process Department and Purchasing.

CONCLUSION

As alluded to before, manufacturing flexibility and inventory reduction have become a survival issue in a globalized world. The adoption of lean manufacturing techniques makes the flexible production of goods and the inventory reduction viable, but the true competitive advantage is only obtained if those aspectsare widespread throughout the entire supply chain.For that reason the Just-in-Time vendor development has become of paramount importance for companies trying to increase flexibility in their production processes at the same time they reduce their inventory levels.

Hence, the results obtained by this paper contribute to the Production Management theory and practice as they demonstrate how a company that makes an extensive use of the lean manufacturing techniquesselects its Just-in-Time suppliers. The same approach could be emulated by other manufacturing firms that desire to increase their manufacturing flexibility and to decrease significantly their inventories.

However, this paper has some limitations. In fact it is based on a single case study which makes the results obtained herein inadequate for generalizations. As a suggestion for further investigation about this subject, it is recommended that the same study be reproduced in other automobile assemblers located in Brazil, as a way to try to establish more generalized view of a typical Just-in Time vendor selection process.

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