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Research paper



How Could an Urgent Order Disturb the Supply Chain? Case Study of an Automotive Industry

Mariam Houti[1]*, Laila El Abbadi[2], Abdellah Abouabdellah[3]

[1]Systems Engineering Laboratory, ENSA Kenitra Ibn Tofail University, Morocco
[2]Systems Engineering Laboratory, ENSA Kenitra Ibn Tofail University, Morocco
[3]Systems Engineering Laboratory, ENSA Kenitra Ibn Tofail University, Morocco
**Corresponding author E-mail: Mariam.houti@gmail.com*

Abstract

Global competition and the increased demand of today's consumers have given birth to many challenges in the industry and especially in the automotive industry, which has given birth to a lot of commands: normal ones and urgent ones. Our article deals with those urgent orders, it describes the parameters of urgent orders and the main problems that faces the whole supply chain during those orders.

Keywords: *automotive industry; challenge; normal orders; supply chain; urgent orders.*

1. Introduction

The era of industrialization is based on a radical transformation of manufacturing industry, focused mainly on the use of new techniques and practices, the development of new industries and strong growth in activity, giving birth to many challenges in the market.

Knowing that in a highly competitive industry, with an unstable and variable customer demand environment, demand uncertainty can evolve over the time leading to many urgent Orders; in these cases, each business unit should respond to those various customer demands to remain its positions in the market, and satisfy customer requirements within agreed time, while considering their cost structures which should have in high consistency to survive. Urgent orders could be a big challenge for automotive enterprises especially for the supply chain project planning.

Based on the literature review of demand uncertainty and especially urgent order, this article will describe the different parameters of those urgent orders, such as: information flow between customer and supplier, type of products, and the category of contracts/ partnerships.

Then a conceptual model will be established for a normal order, based on a case study of an automotive industry that specializes in the manufacturing of wiring harness, in order to be able to extract the problems resulting from an urgent order.

2. Background of studies

Demand uncertainty lead to many urgent orders that refers mainly to some human errors, such as: nature of demand, quantity, scheduling, categories, locations, and even to some unpredictable events us weather and sometimes machine breakdowns. Therefore, suppliers often receive urgent orders which are critical for their business, especially in automotive and aerospace manufacturers; they faced with sudden surges in consumer demand, may in turn place urgent orders of components to their suppliers [1].

To identify these urgent orders, many questions could be asked, such as: "Is information, which enables making a precise enough decision about future demand, clearly known? Is basic information lacking, which makes it difficult to know the true demand picture with a high degree of certainty? Is information known but additional detail required for greater clarity? Are there multiple factors whose outcomes are unknown and interdependent, which create such a high degree of ambiguity that it is extremely difficult to judge what will happen in the future? p. 135 [2], it could be also a form of errors in the demand forecast [3], changes in customer orders [4] [5], and competitor actions regarding marketing promotion [5].

When we evolves urgent orders, safety stock is required to cover the possibility of stock outs created by uncertain demand, and companies may increase the inventory buffer, that causes generally problem in Lean philosophy. Companies often use constructed Economic order quantity "EOQ" on regular demand, that highly influence on stock out [6]. Thus, to overcome the threat of stock-out is by increasing the reorder point by putting extra stock which is safety stock. The spare stock preserved to cover the possibilities of stock -outs which may be caused by supply or demand variation is defined as logistician's expression in safety stock terms [7].

Knowing that there are two possible cases in urgent orders:

- The customer requests the execution of an urgent delivery at the seizure of the order (it depend if the order have been already forecast in the monthly schedule or the order have never been forecast and ordered for the first time)
- The customer asks to expedite the delivery of an order already issued.

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2.1. Information

Transfer and sharing information from supplier to customer are the keys to deal with an urgent order. Knowing that information sharing allows firms to improve their supply chain performance resulting in higher revenues and margins [8]; Nevertheless, information sharing should be at the right time in order to respect the harmonization of information systems, thus avoiding a build-up of problems in the supply chain, such as increasing stocks level.
Several methods to manage information sharing e.g. Radio Frequency Identification (RFID) technology that increases data quality and the availability of operational information allowing firms to improve processes such as manufacturing, distribution, and transportation [9, 10], so all stakeholders in a supply chain could visualize the information flow from upstream to downstream using an effective connections between both internal and external supply chains via Lean ERP system that provides high customer service and shorter lead times .

2.2. Products

Global competition is the key parameter of the unpredictable variety and multiplicity of products on the market, which impact on product's life cycle; reduced life of a product increases the uncertainty of the demand and consequently urgent orders.
There are two critical steps in the life cycle of a product: forecasting "when the new product is introduced to the market, there is a problem of quantity prediction as there is no previous data" and obsolescence " when there is a risk at the end of the life of the product since the product becomes obsolete if it is kept in stock" [11]. Moreover, a diversity in available products for supply chain drives also to costs up [12] and forces companies to adapt new process updates and changes to the supply chain.

2.3. Contracts / Partnerships

There are various kinds of supplier contracts, the most used in the manufacturing industry are:

- **Revenue-Sharing Contracts:** the retailer and the supplier agree on the wholesale price, typically discounted wholesale price, and in return the supplier receives a given fraction of the revenue from each unit sold by the retailer" [14].
- **Buy Back Contracts:** depends on unsold goods that the seller buys them from buyer in some agreed price higher than salvage value. This gives incentive to buyers to order more units however there is increased risk for supplier [13].
- **Quantity-Flexibility Contracts:** the seller provides full refund for unsold items in limited quantity that is differentiated from buy-back contracts. In buy back-contracts partial refund for all returned items is essential [13].
- **Sales Rebate Contracts:** This provides incentive to the retailer to increase sales by means of rebate paid by the supplier for any item sold above a certain quantity" [13]. "The contract is designed such that the increase in production quantities more than compensates the distributor for the increase in risk" [13].
- **Cost-Sharing Contracts:** This contract occurs when manufacturer and distributor shares the production cost [18]. In this contract, distributor's benefit is the discount on the wholesale price accordingly when manufacturer decreases their cost [13].

Each one of these contacts is suitable in particular circumstances, they play an essential role in urgent order for suppliers and customers during sudden changes. For example, if, after the purchase of raw materials, the customer's request changes, the contracts could provide a way to return back raw material or some others ways to hold the situation according to laid down by contracts.

3. Conceptual Model

3.1. Normal order

In this article, a conceptual model based on the supply chain of an automobile industry, will be established linking the whole supply chain from the supplier of the raw material to the customer, while trying to schematize the process of a normal order and its various stakeholders, which will allow us to understand the process management of an order of the company studied and to be able to extract the problems resulting from an urgent order afterwards.
At first sight a model of the first steps of a supply chain project planning should be presented to understand the process, figure 1 depicts this.

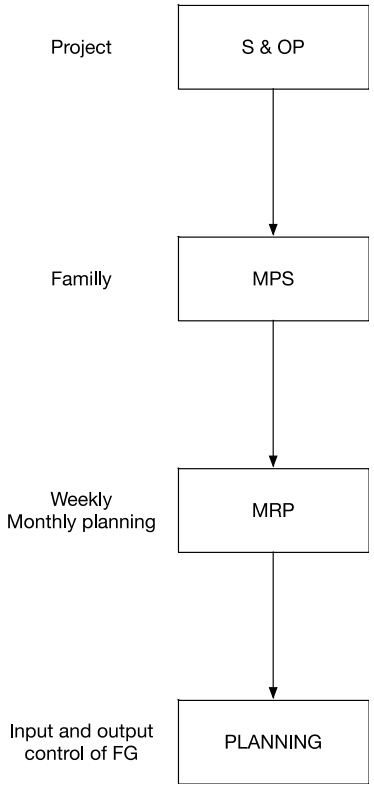

Fig. 1: Supply Chain Project Planning

Upon receipt of an order, three basics steps of the strategic planning are concerned, mainly: "S&OP: sales and operation planning" that is specialized on the planification of the whole project, the "MPS: Master planning schedule" which is focusing on the planification of the different family of the project, and the last step of the strategic planification is the "MRP: Material required planning " that establish a forecast monthly and weekly for the subfamily of the project.
After that the planification of the order passes to the operational planning of the input and output of the "FG: finished good", that is well explained on the next value stream mapping (figure 2) which describe the planification of a finished good from the supplier to the customer.

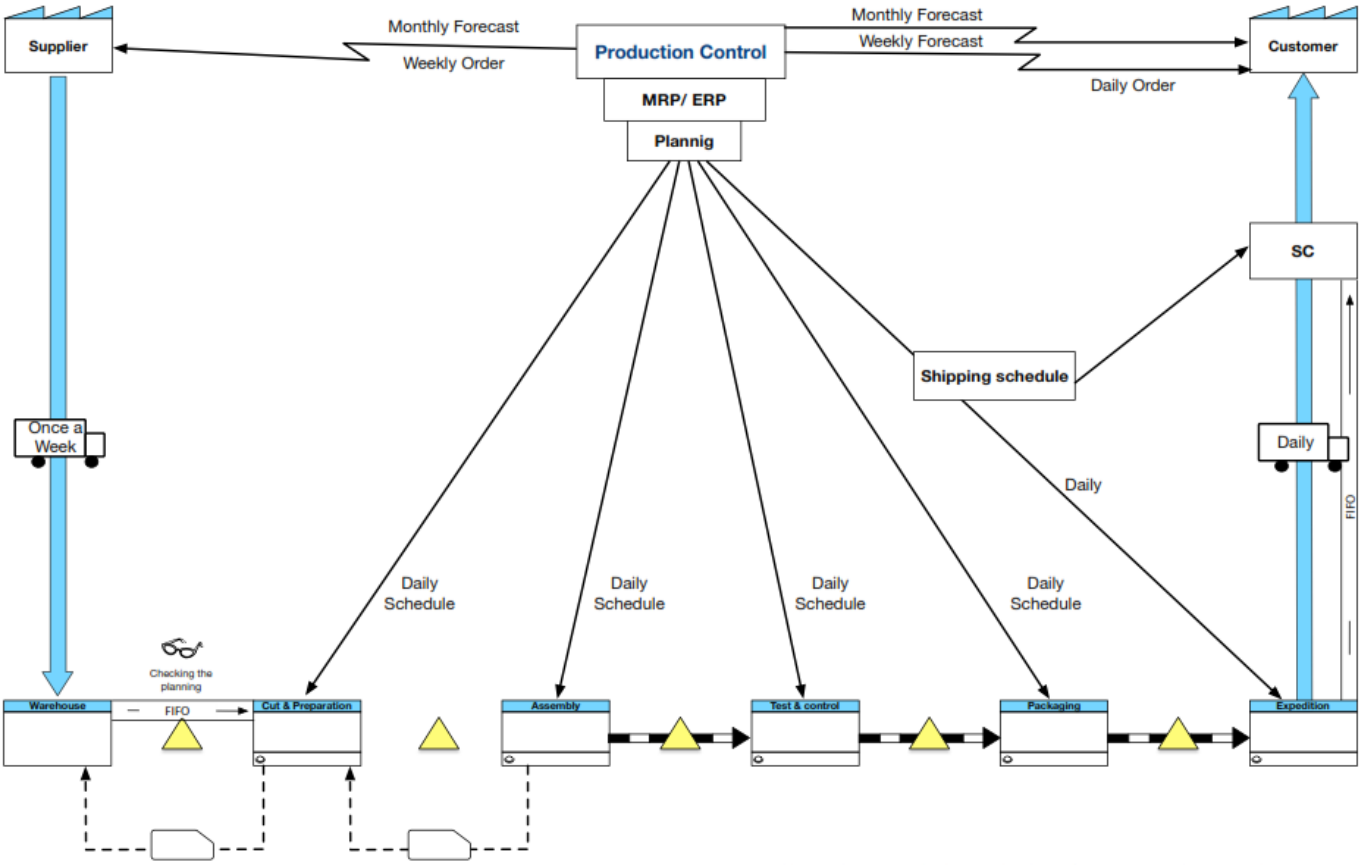

Fig. 2: Value Stream mapping of the planification of an FG

This enterprise sends via the production planning a monthly forecast to the supplier, that will be confirmed with a weekly firm order, and receive a monthly and weekly forecast from its customer that it will confirmed with a daily firm order of ten days.

Thereafter, the supplier will ship the order once a week, once arrived, it will be delivered to the warehouse. At this point, the manufacturing process can begin since the raw material is in the company's warehouse.

The first phase of the production will start with a planning check, once it is done the Kanban production system is sent to the warehouse to get the raw material in order to start the cutting and preparation process that is principally based on FIFO principal; another Kanban production is sent from the assembly to cut and preparation workstation to get the material required to the assembly, after this the flow becomes a pushed flow between the workstation of the quality control and electrical test, packaging and finally the expedition to be daily shipped to the "SC: Service Center" following the FIFO principle .

The yellow triangle represents the work in progress which are very reduced during a normal order while respecting the philosophy of the lean manufacturing which is applied with its pull flow, thus with the Kanban cards which are used during the first stages of production namely preparation & cutting and also the assembly.

Knowing that the workstations of: cut & preparation, assembly, test &control and packaging have a daily production schedule, while the expedition and SC receive a daily shipping schedule.

To well understand the relation between de Service center, customer and supplier, we have established the figure 3 that explain the types of information between the three stakeholders.

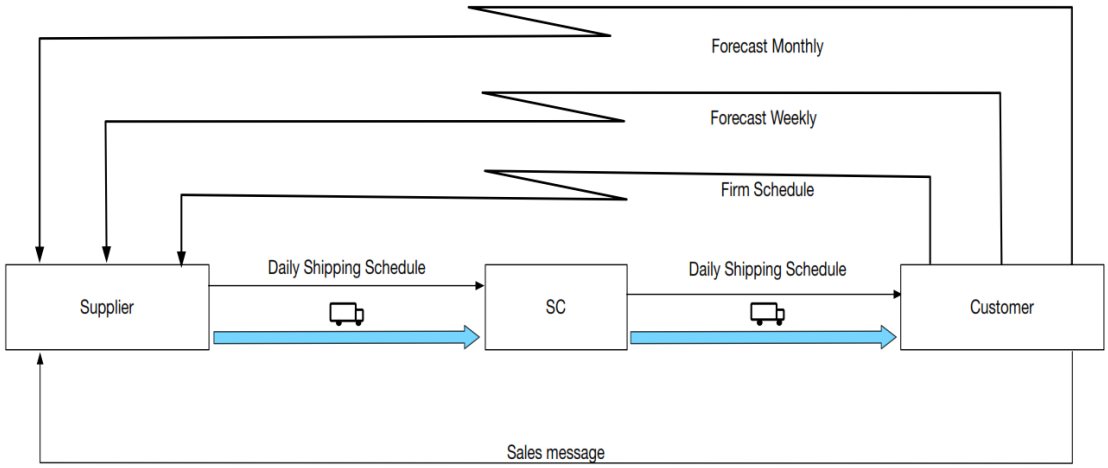

Fig. 3: The relation between service center, supplier and customer

The supplier sends a daily shipping schedule to the service center that sends it thereafter to the customer, once he receives his order he sends a sales message to proceed to the payment.

3.2. Urgent order

In an urgent order the process of managing a normal order changes taking into account the importance of the customer in the portfolio of the company, that means if it is a significant customer he must be satisfied at all costs is needed despite the problems that may result.
Two case studies have been established in collaboration with the logistics department of the wiring harness manufacturing company:

- The case of an urgent order which has not been provided neither in the monthly or weekly forecasts;
- The case of an urgent order that has just been sent in the weekly forecasts and not before in the monthly forecasts.

In the first case of an urgent order which was not provided in the forecasts and has been issued when sending a firm order, this process will give rise to a multitude of problems throughout the supply chain from the supplier of the raw materials to the final customer, many workstations and process will be directly impacted, namely:

- Creation of new Kanban cards with a priority label (for example a different color from the other Kanban cards) compared to those already circulating in the shop floor;
- The warehouse will be impacted due to the lack of raw material, so it will prompt the company to issue urgent orders in turn to its raw material suppliers; This will result in a high cost of the supplier and consequently an additional cost of raw material, over time and extra cost for the shipment.
- The cutting and preparation workstation will be directly impacted, since the first free cutting machine will receive the Kanban card with the priority label which will imply a change of the set-up time that will require a lot of adjustment. Knowing that a high set-up time will involve additional costs for the company since this is a time when the machine is stopped and cannot produce an added value. In some cases of major emergency, the company can stop the production and passes Kanban cards with the priority label which will cause a bottleneck.
- In the side of the assembly: the work in progress will be increasingly high, which will impact the quality of finished goods; an extra cost will be added also due to the storage, over time of the manpower as well for shipment, all these elements will contribute to a high decrease in productivity, resulting in additional high costs for the company.
- Information flow will be additionally disrupted by the fact that an order should be prioritized than another, so the whole planning and scheduling part of the business is going to be impacted.
- The FIFO principle will no longer be applicable because of the inconvenience caused by the urgent order since the priority is given to the element of this order.

In the second cases the same workstations and process will be impacted except the first stage of the warehouse, since the company has already ordered the raw material from its suppliers.

4. Conclusion

This article has allowed us to deal with urgent orders in the automotive industry, which helped us to understand the progress of these orders at the level of the entire supply chain: from the supplier of the raw material to the end customer.
This study has helped us to discover the different cases of an urgent order and the resulting problems in the supply chain, which are mainly:

- Additional cost in Raw Material;
- Overtime;
- Shipping extra cost;
- High set-up time;
- High work in progress;
- FIFO principle is not applied…

Besides many other problems that have been dealt in the article, those problems will be the subject of future research, in order to treat an urgent order while respecting the basic principles of lean manufacturing; which have a direct relation with the three aspect of the enterprise: economic, social and environmental [15], and its tool could help managing urgent orders and decrease the WIP Level that is generated through these orders.
In the other hand implementing new technologies, such as the ERP system: which is a software used by many companies to gather all the information of the enterprise [16], and its requires the involvement of several departments within the enterprise itself and its various stakeholders, to establish a direct transfer of purchase and manufacturing information between the enterprise and its various stakeholder [17].
A Lean ERP system could be also a solution for the urgent orders, which integrates the benefits of Lean Manufacturing and ERP into a unique initiative through the development of ERP modules that offer lean manufacturing tools in their ERP systems [18], such as the electronic Kanban which the basic functionalities of Kanban system are kept at the level of electronic Kanban [19].

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