CERTAINTY AGAINST FLEXIBILITY – THE CONCEPT OF FROZEN HORIZON – CHANCES, PROBLEMS AND SOLUTIONS

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ABSTRACT

This scientific article is about the complexity of supply chains, the problematic of fixed order points and the potential of regulated agreements between the Original Equipment Manufacturer and its Suppliers. There are two different perspectives. On the one hand, the OEM tries to be as flexible as possible, whereas the supplier needs a clear certainty about future orders. To be competitive on the current market, it is not enough just to improve the internal processes of a specific company, but rather the whole supply chain has to be optimized. Consequently, one main point has to be focused within the supply chain – certainty against flexibility. With the implementation of individual contracts between every direct cooperating business, the frozen horizon could help to avoid the arising waste by the bullwhip effect which is exclusively attributable to the uncertainty of the supplier. The OEM has to realize that a reduction of its own flexibility and control leads to a tremendous optimization of the entire supply chain and thus to a better position in the market as well.

INTRODUCTION

Today, in the twenty-first century, supply chains are continuously replacing individual firms as the economic engine for creating value. Production companies have lowered their range of manufacturing intensively in the last years and former supply chains are developed to the added value networks. This change is based on the growing relevance of globalization, specialization of manufacturing companies and outsourcing of different business sections, which is mainly significant for the automotive industry (c.f. Piontek, 2013, p. 149).

Consequently, the relationship between supply chain management and supply chain performances progressively becoming more important. Under the pressure of business competition, performance measurement is a major tool for the leadership of a company.
Companies are forced to face an increasing competitive pressure on the market. Hence it is necessary to implement optimized internal organization and production processes and moreover improved external processes of the whole supply chain to guarantee the ability to compete. Consequently, the realization of lean processes through the whole network of suppliers and customers is required. Just an optimized supply chain without any types of waste offers the opportunity to compete on the market and to generate profit (c.f. Arndt, 2008, p. 48).

Especially the level of inventory influences the business processes massively. On the one hand avoidable inventory generates waste by high capital commitment, the need of space and higher organizational effort. On the other hand, undelivered materials or parts could lead to a production breakdown and therefore to huge financial losses. As a consequence it is absolutely necessary to draw up guidelines regarding the point of orders within the network of suppliers and customers to be sure about future inventory, especially because every process is connected to each member of the supply chain. This regulation about the period of time for fixed appointments is called frozen horizon.

**OBJECTIVE OF THE PAPER**

This scientific paper informs the reader about the problems of managing inventory and order processes for any members within the supply chain which constantly occur in the field. It gives information about the different needs of suppliers and customers, the chances of an improved process of appointment and the solution for the given problem, all based on the known theoretical background.

**THEORETICAL PRINCIPLES**

Modern supply chains consist of several members which generate a complex network with the original equipment manufacturer (OEM) as its center. Fig. 1 gives a schematic example of such a structure and its main functions. The OEM is responsible for the determination of the future production demand which influences the manufacturing processes of any supplier. There are two different types to determine the material need:

- forecasting method;
  - stochastic procedure,
  - consumption-based procedure,
  - demand-oriented procedure,
- program-oriented method;
  - deterministic procedure.
The forecasting method is based on historical data which could be determined by the production program or the inventory level of the past. Following this, the given data has to be extrapolated to the future need. Constant, trend-setting and seasonal demand has to be differentiated. In contrast to the mentioned prognosis the program-oriented method focuses on required future capacities for production processes, often by analyzing given customer orders. Consequently, the needed quantities for material and parts are defined by the end customer and can thus be fixed. In many cases the replacement time is longer than the period of time between the determined production plan and the process of purchasing with the result that the OEM is forced to define the capacities by using the forecasting method.

With the aid of the forecasting or the program-oriented method, the OEM is able to calculate the independent demand. The independent demand informs about the amount of finished goods which is influenced by the customer needs. Based on this information the dependent demand could be defined. It determines the demand of materials, components and assembly groups.

The process of sourcing is divided into two different approaches:

- long- and medium-term dependent demand planning;
- short-term dependent demand planning.

The long- and medium-term planning rests on framework contracts with additional information about general delivery volumes. The goal of the OEM is to reach a stable business relationship and certainly low prices. The short-term demand planning again focuses on the generation of the forecast delivery schedule which consists of the order quantity as well as the delivery moment and place.
PROBLEMS

The theoretical principles sound reasonable, but the complexity (shown in Fig. 2) of the whole system relies on the details and their respective problems.

![Supply chain framework](source)

**Fig. 2. Supply chain framework**

*Source: Bowersox, Class, Cooper, & Bowersox, 2013, p. 7.*

The perspectives of the co-operating supplier and manufacturer differ in one fundamental point: The supplier needs a planning certainty to order the required materials from the 2nd-tier supplier and the manufacturer is forced to offer their customers a great variability of the product range and a maximum timeframe for their decision. All in all it could be summarized as ‘certainty against flexibility’.

The whole supply chain depends on the customer’s behavior. Because of the development from a seller’s to a buyer’s market and the business competition, the customer regulates nearly all processes.

Further issues lie in the communication between the different members of the supply chain. A well performing network is characterized by process transparency through the whole value chain but in fact the supplier often has no opportunity to monitor these processes and the needs of his customer (e.g. the OEM). This leads to a cascading procedure of planning which means that for every additional supplier a time delay arises and a lag for the system is given.

The consequences of the different perspectives in the supply chain can be seen in Fig. 3. Every member of the network is connected indirectly. The failure of just one part in the supply chain leads to a complete breakdown and thus maybe to
a loss of customers and benefits. As a consequence, every supplier arranges his own safety stock to prevent a failure which nevertheless leads to a generation of waste and ineffective processes.

![Diagram]

**Fig. 3.** Collaborative demand and capacity planning


Moreover, seasonal fluctuation and unsteady customer wishes render an accurate and meaningful forecast planning impossible for the OEM. As a result, the order is often changed by the manufacturer shortly before the delivery is planned. On the one hand the problem lies in the fact that all subordinate suppliers are involved in this change and on the other hand the logistics provider is included, too. Therefore, last-minute changes lead to a huge organizational effort, ineffective processes through the whole supply chain and consequently a weaker position in competition with other companies.

**CHANCES**

The primary aim for every member of the supply chain should be the realization of standardized and optimized business procedures within the network, especially the avoidance of waste.

Improved order processes and strict regulations regarding the moment of appointment could lead to an enhanced effectiveness of the whole network. The knowledge of a precise amount of materials or components could help to decrease the safety stock as well as the organizational effort by every supplier. The idea of lean would be implemented through the entire value-added chain and a possible bullwhip effect within the network by accumulation of inventory due to interferences in the organization could be avoided.
Associated with the implemented stringent order regulations and an optimized supply chain performance, the relationship between customer (e.g. OEM) and supplier could be stabilized and strengthened. Further contract negotiations could lead to better conditions for future collaboration and synergy effects could be achieved by expanding the product range for example. As a result of this, the complexity of the network could be reduced and the risk to cause failures as well whereas the dependency between customer and supplier would grow considerably.

Supplementary to this, a key advantage by optimizing the order procedure is stable advance planning and therefore the opportunity to integrate and organize the logistics provider precisely and utilized to capacity.

All in all, the chances to improve the processes of the entire supply chain and their members itself are enormously high by regulating the procurement procedures. The performance could be raised tremendously and therefore the market position could be upgraded.

**SOLUTIONS**

Ultimately, the point of interest lies in finding a way to handle and improve the purchasing methods within the supply chain. How could a solution look like and what are the compromises the suppliers and customers have to accept?

The biggest problem for the network is that short-range modifications of the procurement lead to non-productive processes through the entire value-added chain including all its members. The fundamental principles inside the network need to be co-operation; transparency and response speed supported by strict regulations and defined standards. On the one hand the utilization of the same or compatible system is of great significance and on the other hand unchanging order quantities optimize and stabilize the supply chain significantly.

The original equipment manufacturer has to realize that not just their own processes are responsible to compete on the market but rather the performance of the entire network. Hence, it is necessary that the customer is willing to accept compromises to provide improved processes. Fixed purchasing periods may lead to a reduction of flexibility but on the contrary, the performance and the profit of the whole system could be improved. This is the deciding reason why the manufacturer should understand and accept that a slight flexibility decline of its own processes could lead to a higher performance level, a better market position, a higher turnover and better contract negotiations within the supply chain for all its members.

Accurate order sizes could just be realized by individual contracts consisting of precise commitments regarding procurement time frames. It has to be determined until which point of time it is possible to change the appointment. Therefore a frozen horizon has to be implemented between every directly cooperating
customer and supplier to guarantee a planning certainty for the supplier and its subsuppliers as well. Fig. 4 presents a schematic concept of the mentioned time zone for customers from which moment on appointments are fixed and unchangeable.

![Fig. 4. Defined order procurement](image)

As shown in the diagram, the OEM continuously provides information about the prognosticated demand regarding the future production. The fluctuation is due to the mentioned problems in chapter 0 (e.g. unsteady customer orders and seasonal fluctuation). Considering the information about the general demand the suppliers could roughly prepare their organization and processes for future needs. The predicted data is communicated to the supplier more than one full year in advance.

Then it is necessary to determine two special time frames with the aid of an individual contract between the OEM and the supplier. The ‘detailed planning zone’ should inform the supplier about nearly precise order quantities without any guarantee of true figures whereby the supplier is able to brief their sub-supplier to be prepared for the next order. The ‘frozen zone’ again is responsible for a fixed appointment. During this time frame the provided order cannot be changed by the customer any more. Consequently, the supplier as well as the logistics provider could be absolutely sure about the next order. No changes are permitted and therefore neither a waste arising nor an additional organizational effort is expected by urgent procurement modification.

The key point is that the customer has to be willing to reduce their flexibility to strengthen the whole supply chain and therefore to ensure the supplier’s higher certainty. Hence, the forecasting methods by the manufacturer have to be as exact as possible to ensure ideal processes.

The ‘frozen zone’ as well as the ‘detailed planning zone’ have to be determined for all directly co-operating companies by individual contracts. It is not possible to constitute a categorical time period for them because it always depends on the specific type of material or component.
Besides the delivery and packaging conditions another important and final point is that contractual penalties must be fixed for cases of unfulfilled or unsatisfied tasks. These conditions should support the avoidance of a breakdown risk by setting them relatively high.

CONCLUSION

This scientific paper presents a solution to optimize the entire value-added chain. Just by changing the distribution and degree of flexibility and certainty between the customer and supplier it is possible to improve the whole network. The original equipment manufacturer is admittedly forced to reduce its flexibility regarding possible last-minute order changes, but ultimately the performance of the total processes within the supply chain is massively increased. That is the most important point of this research. The competition on the market is not determined by the performance of the single manufacturer, but by the efficiency of the entire supply chain.

By knowing about detailed and fixed order quantities it is possible to realize optimal processes through the added-value chain. Furthermore, the logistics providers could be implemented and planned much more efficiently which leads to a reduction of organizational effort, to faster processes and especially to increasing profits.

Summarizing, the method of defining a frozen zone for every direct cooperating company within the network leads to an enormous improvement of the planning certainty and thus to a reduction of safety arrangements as well as the avoidance of waste.

REFERENCES


