INCREASING THE EFFICIENCY OF THE SUPPLY AND DEMAND CHAIN

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Abstract

This paper is focused at increasing the efficiency of the supply and demand chain in a company engaged in the assembly and production of individual components for the automotive industry. Each company uses different tools to increase its competitiveness. One of the important tools is logistics, the purpose of which is the regulation, organization, control and integration of flows, which are associated with various processes aimed at optimization. Supply chain evaluation based on joint planning and management offers the opportunity to dynamically adapt orders in individual organizations to the individual requirements, and thus can optimize lead times.

Keywords: Supply and demand chain, competitiveness, efficiency, supplier evaluation

1.   INTRODUCTION

A part of the supply-customer chain are correct supply-customer relations, the basis of which are individual elements and activities in production, transport or trade. Due to various reasons, the supply and demand chain is interrupted, which ultimately affects the company's profit as well as its image. In the event of such a situation, the role of the company's management is to make correct and responsible decisions. In order to maintain and increase the competitiveness of the company in the market, it is essential to focus on increasing the efficiency of the supply and demand chain.

2.   LOGISTICS CHAIN SPECIFICATION

The primary task of supply chain management is to connect and manage processes and resources with the goal of satisfying end customers through one or more logistics chains and creating an integrated system. The acronym SCM comes from the English Supply Chain Management. SCM focuses on the following areas:

- structure - connects the location of operations and processes at individual levels of the logistics chain,
- organization - it is important to determine which organization is directly responsible for each individual link in the logistics chain, within which it is necessary to define inter-organizational links and relationships,
- processes - focused on planning, performance as well as controlling.

The logistics chain consists of the following levels [1]:

- level L0 - the highest aggregate level, which includes a complex of all organizations that participate in their own value-creating processes to ensure customer satisfaction. The complex flow to the customer (customer) begins with the original supplier of components and continues with sub-sections, which are managed by the respective companies. The right logistics chain consists of sub-sections that need to be coordinated and interconnected at the strategic, tactical and operational levels due to the functioning of the complex,

- levels L1 and L2 - include the planning process and other executive processes such as sourcing, production or manufacturing, delivery as well as backflows.

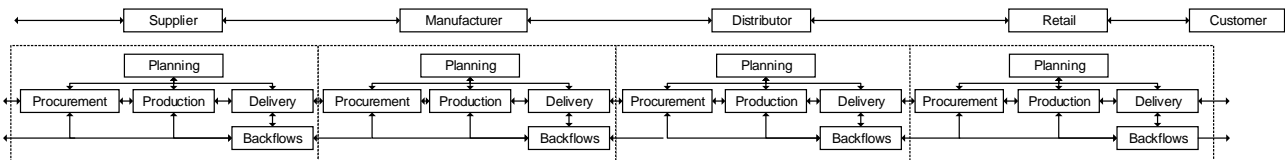The specification of logistics chains at the L1 and L2 levels is presented in **Figure 1**.

Figure 1 Logistics chain [1]

Customer priority is a major competitive factor. The organization's focus on its own core business, which is linked to cooperation with other companies, can contribute to meeting customer requirements. The interconnection of the logistics and supply chain creates an opportunity for direct contact with the customer. The starting point is the assumption of a specific strategy in terms of certain market conditions with the application of the PULL principle. The principle of the move must be set so that it is possible to solve 2 problems within the value chain:

- company guarantee, in terms of fast and efficient delivery of the required product directly to the customer,
- increased pressure to eliminate inventories, ultimately reducing tied capital.

The optimization of the specified problems tends to lead to an undesirable production outage in case the inventory is reduced to a minimum. In terms of production activities, it is important:

- increase the planning speed,
- ensure the continuity of the actual course of processes,
- shorten production lead times, preferably product processing times.

It is necessary to ensure compliance with the basic indicators on the part of production:

- meeting deadlines,
- cost of production,
- quality,
- length of lead time,
- inventory turnover,
- order delays,
- value of orders.

Supply chain evaluation based on joint planning and management offers the opportunity to dynamically adapt orders in individual organizations to the requirements, and thus can optimize lead times. The supply chain can be assessed in terms of [2]:

- optimization of lead times and delivery times by half,
- faster and more flexible market entry,
- halving stocks,
- halving the number of currently managed production orders and orders,
- long-term estimation of sales planning data to reduce risky stocks.ength of lead time,

Measurement of supply chain efficiency can be realized through several indicators. The breakdown of indicators is realized in terms of the following aspects [2] (**Table 1**):

- time efficiency of the chain - delivery times, order deadlines,
- process costs - direct and indirect costs, specific costs for chain management,
- financial efficiency of processess - use of resources, profitability,
- fulfilment of chain goals - fulfilment of deliveries, provided services, quality of deliveries, customer satisfaction.

Table 1 SCM efficiency indicators [2]

Evaluation area	Types of indicators	Assessed aspect	Evaluation criteria
Time aspect	order processing process, fulfillment of delivery deadlines, continuous production time, duration of shipping and logistics services, production cycle, line movement, number of produced products per time period	Reliability	timely delivery
			timely processing of the shipment
			satisfying demand from stocks
			quality of the finished order
Cost aspect	direct costs (material, payroll), indirect costs (according to types of overheads), logistics costs, costs of warranty repairs, complaints, credit, interest	Flexibility	response time between chain links
			fluidity and assimilation of production
Financial efficiency	inventory turnover, inventory levels, land use, labor productivity, profitability of turnover and capital	Costs	Supply Chain coordination costs
			claims and guarantees
Chain goals	meeting deadlines, quality, completeness of orders, evaluation by customers, number of complaints, repeated purchases, customer loyalty	Assets	stock level
			inventory turnover

3. SUPPLIER EVALUATION AS A TOOL TO INCREASE THE EFFICIENCY OF SUPPLY AND DEMAND CHAINS

In order to increase the efficiency of the supply-customer chain, it is important that every company, in addition to recording supply errors, carries out supplier evaluations [3]. Otherwise, it is not possible to evaluate suppliers and then draw conclusions about their performance. Part of this paper is to provide a proposal for supplier evaluation for the given company. The evaluation of suppliers consists in assigning a point / quantified factor for a certain delivery error according to importance [4,5].

MS Excel is used to record errors in deliveries. As the overall evaluation for a certain period of time is not recorded, it follows that in case of multiple errors in the delivered materials, the supplier is not notified of its errors or escalation of the number of erroneous deliveries, which could result in an initiative for the change of the supplier [6,7]. Among the serious errors that are recorded: damaged packaging, undelivered material or only 50% were delivered from the requested amount, the quantity was not delivered in accordance with the agreed number of components in the delivery note, the components are not packed in the agreed packaging or alternative packaging specified in the delivery note, repacking, delivered unknown material, exchanged material, non-conforming batch, non-observed time of arrival of delivery [8].

3.1. Defining errors by importance

The next step was to create a scoreboard to define errors by importance based on the assigned factor. By assigning a numerically scored factor to a defined error, it will not only determine the significance of the error, but it will also serve as the basis for a formula for future supplier evaluation. In Excel, this table is associated with the vendor evaluation table for easier formula entry. Defined errors are listed in **Table 2**.

Table 2 Error specification

Error specification	Factor (F_n)
Not delivered, or missing material	5
Delivery delay	4
Order quantity mismatch with delivery note - the quantity is not the same as the delivery note	3
Delivery deficiencies (repackaging, misplaced labels, unknown or replaced material, packaging account mismatch)	2
Damaged packaging (packaging is repackaged and repacking costs are paid by the supplier) and non-conforming batch	1

Subsequently, based on the formula that has been developed for this project, it is possible to calculate the percentage error rate. Based on this value, the company will be able to draw conclusions regarding the performance and quality of suppliers.

$$Error\ rate\ (\%) = \frac{(DP \cdot F_1) + (UDM \cdot F_5) + (QDN \cdot F_3) + (R \cdot F_2) + (SL \cdot F_2) + (UKM \cdot F_2) + (EM \cdot F_2) + (NB \cdot F_1) + (PAD \cdot F_2) + (DDU \cdot F_4)}{\left(\frac{Quantity\ of\ deliveries\ per\ month}{Number\ of\ days\ in\ the\ month}\right) \cdot Total} \quad (1)$$

where:

DP – damaged package,

UDM – undelivered material / delivered 50% of the request,

QDN – the quantity does not match the delivery note,

R – repacking,

SL – swapped labels,

UKM – unknown material,

EM – exchanged material,

NB – nonconforming batch,

PAD – packaging account discrepancy,

DDU – delayed deliveries

F_n – given evaluated factor.

Another part of the paper is the identification of the level for the evaluation of deliveries from suppliers, which is shown in **Table 3**. The evaluation levels are color-coded due to the severity of the supplier's error rate. The supplier can be evaluated in green, which is problem-free, up to red, when the plant submits a complaint to the headquarters in case of a high percentage of unreliability.

Table 3 Levels of supplier evaluation

Level	Valuation (%)	Consequences for suppliers
1.	to 1	Acceptable, minimal disagreement
2.	1.1 - 2.9	First notice from the material planner
3.	3.0 - 3.9	Notice to senior material planners, official registration of complaints
4.	4.0 – 9.9	Escalation to Logistics Manager, supplier request for action plan
5.	10.0	Headquarters initiative

Based on formula (1) for calculating the error rate in deliveries, it is possible to determine the consequences for the respective suppliers. The results for the respective suppliers are presented in **Table 4**.

Table 4 Results of evaluation of relevant suppliers

Suppliers	Error rate (%)
Supplier A	0.08
Supplier B	4.52
Supplier C	0.22
Supplier D	1.09
Supplier E	0.14
Supplier F	0.24
Supplier G	2.35

4. CONCLUSION

One of the last parts of the paper was the creation of a scale for supplier evaluation, where the range of errors expressed as a percentage determines supply shortcomings from acceptable to the headquarters of the company, where the logistics manager informs the headquarters about the unreliability of their chosen supplier. Every company that seeks to increase its competitiveness uses a variety of tools. Competitive pressure is constantly growing, which is why companies are fighting for their customers. Important factors are especially fast delivery of goods to the customer, flexible response to changes and prices of goods. These aspects must be taken into account by every company, thus creating different partnerships with suppliers and customers.

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