

CHOSEN PROBLEMS OF EFFECTIVE SUPPLY CHAIN MANAGEMENT OF COMPANIES

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Abstract

The article presents certain aspects of decision of effective management of supply chains organized for companies. Companies service issues have been identified both in the supply and distribution area. Were defined factors affecting the organization of operating in various spheres of companies. It was pointed out that the basic functions directly related to the core business of companies resulting from the industry, the size and the conditions of competition, e.g. for the production facility, it could be manufacturing process itself, while for the commercial company implementation of marketing strategies and building brand image. The paper also presents the factors affecting the costs and benefits companies interested in outsourcing their logistics providers of comprehensive services.

Inter alia the essence of the supply chain functioning, integrated management model of supply chain network including flow of stream of goods and flow of stream of information, objectives of supply chain management, decisions of effective supply chain management concerning on minimizing cost of logistics services and high level of quality of delivery services, performance evaluation measures of processes in the supply chain are presented in the paper.

Keywords: *effective management, supply chain management, supply chain efficiency, supporting management decisions*

1. Introduction

A market economy requires enterprises many different forms of organization of the distribution network of goods related to the operation of both small and medium-sized towns and economic and industrial large urban areas with complex needs in the field of logistics services [10, 17, 18, 28, 31, 34]. Proper selection of the organizational structure is dictated on the one hand spatial, technical and technological aspects and on the other hand, legal and economic aspects.

Companies operating in conditions of multi-stakeholder competitive market, able to identify correctly their strengths and weaknesses are trying to focus on developing those aspects of its operations that bring them immediate profit and influence on competitiveness. At the same time, they seek to isolate those areas of its operations that are not essential and can be implemented by other operators with better results. These activities are aimed at more-effective adaptation to market needs.

Efficiency is defined as the ratio of the effects of the specific actions to the expenditures for its implementation. It is a measure of the effectiveness of specific actions. Greater efficiency means that when incurring the same costs can be achieved better results of operation. Efficiency can be measured wherever there is a need to choose the method of a specific operation to assess the quality and rationality, or take a specific decision of all concerned. Therefore, effective action is one that allows you to choose a solution, which brings the greatest benefit of all the possibilities. As the author writes [20], efficiency is a measure of implementation of principles of rational management and it is an interactive relationship involving phenomena within the organization and between it and the environment.

Companies outside the scope of their activities always implement a business process consisting of a specific set of actions aimed at satisfying customers' needs while ensuring the company a profit. At the same time should be distinguished basic functions that perform and other functions.

Basic functions are functions directly related to the core business of the company resulting from the industry, size or conditions of competition. For example for the production company it is, in general, the manufacturing process itself, while for the trading company is the implementation of marketing strategies and building brand image.

Other functions are efforts to support the achievement of the basic objective, facilitate and sometimes even enable the implementation of basic functions. In most cases, they concentrated on auxiliary functions. For example, it may be transportation services, warehousing, spedition, courier, etc. Correct separation the fragment of the business process responsible for the basic functions is a key element, as it allows specializing in this fragment and the continuous improvement of the offer of the company.

One area of such activity concerns the choice of an appropriate supply chain, including proper functional structure. Entities such as shippers, storage facilities, others that deal with the implementation of other functions, separated and commissioned by various companies, specialize only in this sphere of services. Aggregation of demand for implementation of a specific service allows those operators to take advantage of so-called economies of scale. This effect assumes acceptance for implementation high number of orders of a similar nature, so that it becomes profitable to use more expensive – specialized technology handling these orders and yet more efficient on a large scale. In this case, the implementation of a large number of orders with small profit per unit, will translate into substantial profits overall.

Transportation services, as well as logistics services of companies in supply chains made use standard technology – characteristic of the whole market. Entities operating in the supply chains compete against each other in the area of quality of service, including the time of the service, prices of services or other items added, such as: monitoring, simultaneous streams of information services and financial settlement.

2. The essence of the supply chain functioning

The term supply chain exists in the literature in terms of subject, logistic and institutional as well as in terms of functional and management organization. In the first case, the flow of materials between suppliers and production companies and finished goods between producers and end-consumers [30]. In the second, as a set of cooperating with each other entities (firms, companies or institutions) [4, 29, 36]. However, in functional terms as chains of successive links (companies, institutions) which are involved in the movement of products [1] and in terms of the management organization as an integrated process management of material flow from suppliers to end-customers [1].

The supply network includes all activities associated with the flow of materials, from the sourcing of basic raw materials and ending with the sale to the final purchaser the final product and disposing of this, what will be of the product after use [5, 7, 9, 25]. At each stage of the movement may appear returns, meaning materials rejected by the next company in the chain or waste that require disposal.

Today's supply chains are becoming more complex, thereby increases their exposure to disruptions and danger. Grows importance of risk management in this type of logistics structures [5, 11, 12, 13, 17, 22]. The supply chain is cooperating in various functional areas mining, manufacturing, trade and service companies and their clients, among which flow of streams of products, information and funds. In the structural and subjective interpretation, the supply chain can be (Fig. 1):

- single company (internal supply chain),
- steam or chain of companies in relationships: supplier – receiver,
- network, that is a group of co-operating, and/or competing with each other companies.

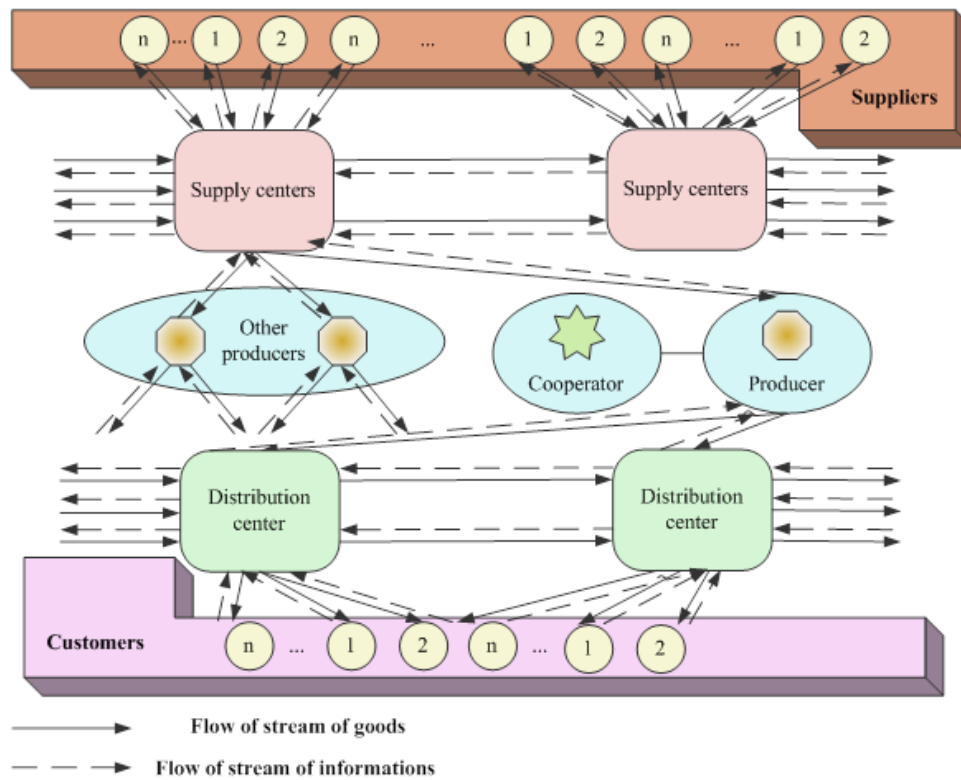


Fig. 1. Integrated management model of supply chain network [11]

As the analysis shown in Fig. 2, an integrated management model of supply chain network, the company may be a link of several supply chains simultaneously. The entity that is responsible, generally, for the efficient and timely organization of the supply chain from supplier to customer according to the customer requirements, is logistics operator. Can say that he is responsible for comprehensive supply chain management, in terms of both organization, as well as technical and financial.

3. Objectives of supply chain management

The term „supply chain management“ first appeared in the 80s of the twentieth century. Initially was associated with a reduction in inventory within the company and cooperating with it companies. Then it began to define supply chain management in terms of logistics. It was conditioned by the need for close cooperation between companies in pursuit of implementation its strategic objectives. As writes [31] supply chain management stems from the strategy of integration, cooperation and shortening cycles. This is done through various forms of cooperation. As a consequence, this entails the integration of logistics systems of companies and integration of logistics processes, as well as seeking ways to increase trust and commitment of companies in the relations “supplier – customer”, including compatibility and linking computer systems [31].

In the supply, chain decisions regarding the development of the individual companies should take into account links with other entities operating on the market. For example, the author of the paper [36] writes that the concept of the supply chain has become an alternative to the traditional perception of the relationship “supplier – customer”, which is based on competition, using their own bargaining power and thus flipping the obligation to bear the increased costs [37].

Supply chain management in companies is possible if [2]:

- the supply chain is seen as a whole organization,
- delivery is a common objective of all participants in the chain, and strategic decisions regarding supply have an impact on costs and market share,

- problems are solved in a comprehensive manner,
- are considered economically justified stocks, reducing them to the most necessary size,
- integration of chain participants is based on the use of modern information technology and widely understood cooperation.

Thus, the basic objectives of supply chain management are primarily [25]:

- minimizing the total cost of the flow of products and information while maintaining the required level of quality of delivery service by customers,
- ensure the shortest lead-time and highest possible reliability, frequency and flexibility of supply at a given level of flow costs,
- optimization of stock levels in the scale of supply chain with its flexible adaptation to preferences concerning delivery service of individual market segments.

As writes [5], supply chain management is to manage relationships with suppliers and customers and with customers to deliver the highest value to the customer at lower costs for the entire chain (Fig. 2).

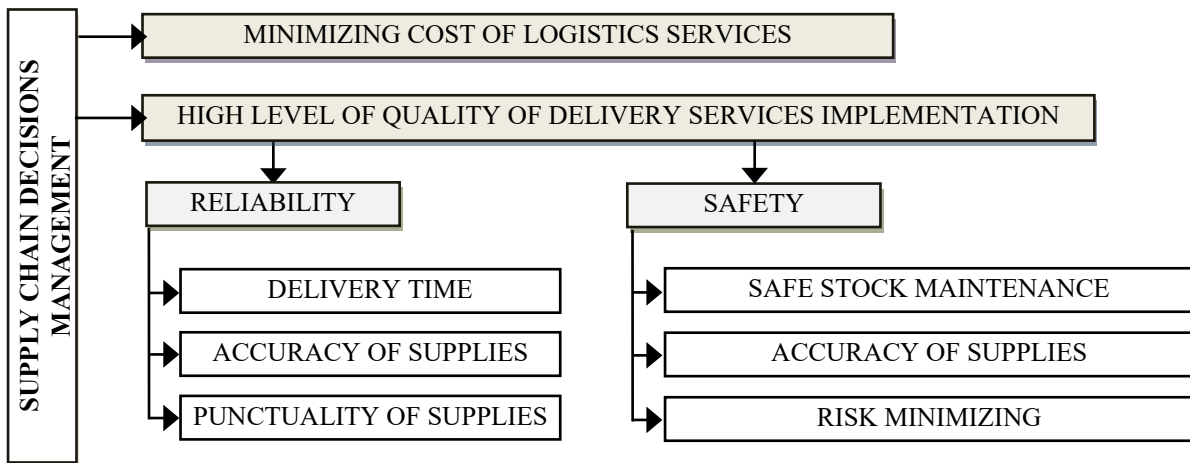


Fig. 2. Decisions of effective supply chain management

The concept of supply chain management is possible if collaborators of the company are its partners and not hostile competitors and if a company specializing in key areas for themselves and other, services are contracted to external partners [25]. This means that these spheres of activities that go beyond basic competence shall be delegated to business partners who specialize in specific services.

4. Performance evaluation measures of processes in the supply chain

Effective supply chain management is the actions that will improve customer service and reduction of logistics costs. Participants of such cooperation share the benefits from it, and thus established cooperative system, “supplier – customer” becomes therefore more competitive.

Engineering approach to assessing the quality of companies logistics services involves the formulation of a set of measurable indicators and parameters, with which is possible to unambiguously describe the various aspects of the services provided by external actors, i.e. operating in the supply chain. In practice, it appears that the determination of values defined by analysts meters is difficult to perform and often impossible.

In general, measures are aggregated values, and the acquisition of their individual components is difficult to obtain due to the number of sources of information and amount of information to be processed. In addition, they can describe hard-measurable or non-measurable values, i.e. qualitative. For the comparative analysis and judgement, it is advisable that collected data were covering

a longer settlement period. It should also be mentioned that quite many data is so-called commercial data, therefore there is a serious barrier to sharing operational information of entities that are participants in supply chains [1, 7, 14, 23], and warehouse processes [15].

There are many factors, which have a direct impact on the selection of evaluation criteria and selection of the service provider-operator to complete the order and at the same time is sought compromise solutions because of the price and quality of logistics services [20, 22, 26].

Authors of the study [15] define logistics performance measures developed for the assessment of logistics services in most companies. They have identified four main groups of measures enabling a comprehensive view of the company's operations, performing assessment, and monitoring of logistics functions. They defined so called financial, quality, processes and resources measures.

Among the *financial* measures, authors draw attention to those, which allow assessing the short- and long-term gains ensuring an adequate position of the company. From a *qualitative* group were distinguished measures, which allow assess the quality of implementation of logistics services – particularly in respect to satisfying customer requirements. An important group of measures are the *process* measures that are used to assess the dynamics and consistency of the process. In contrast, the group of *resource* measures include measures describing the size of the stocks of different types to be utilize to achieve the required efficiency of the process.

What is important when measuring the performance of processes in the supply chain, as indicated by the authors of publication [31], random values should not be measured. Selection of appropriate values must be proper to the type of the assessment, the customer and business situation. Among the measures are distinguished:

- *delivery accuracy* as the key measure of assessing the quality of logistics services, expressed as the time elapsed between the date (time) of delivery, and the date set earlier,
- *timely deliveries* defined as the share of supplies that have been implemented before or after the deadline set by the customer.
- *forecast accuracy* defined as the ratio of the value of sales resulting from the forecast to the actual value of sales,
- *time of delivery*; the time measured from the point of view of the customer that elapses on average from the time of order submission until receiving the order,
- *the degree of execution of orders*; determines what percentage of orders can be implemented of materials which are currently in the stock within 24 hours,
- *α -level; level of logistic service* defined as the probability that incoming order can be fully realized of materials which are currently in the stock,
- *β -level of logistic service* defined as the percentage of incoming orders, which can be realized of materials which are currently in the stock,
- *γ -level of logistic service* takes into account the number of orders that can be realized of materials in the stock and the time of satisfying the entire demand,
- *addictiveness of the supply chain* – describes the supply chain's ability to respond to changes in the market (a measure very difficult to quantify)
- *planning horizon* – the longer the planning horizon, the less likely susceptibility to short-term market fluctuations,
- *return on capital* defined as the ratio of income to total capital – describes the ability of the company to good management of owned resources,
- *rotation of the material* defined as the quotient of the sum of recycled materials used for the complete stock of materials during given period (increasing the value of this measure most often is done by minimizing inventories),
- *standard stock* defined as the average time that the materials spend in warehouses,
- *added value of employee productivity* defined as the quotient of the difference of income and the value of resources used to develop that income and number of employees. Allows you to specify the value that each employee has added to the final product of companies.

Considering the above, the assessment of the effective functioning of the entire supply chain can be a criterion of the degree of utilization of both its components and the whole chain. The utilization rate of the entire supply chain can be assessed as the ratio of the total time required to transition of ordered raw materials for production through the supply chain in relation supplier-company to a maximum total period of stay of these raw materials in this chain.

Assuming that is known the maximum time $\tau \max_{om(ld), om'(ld)}^s(ld)$ of movement of a unit of s -th raw material between $om(ld)$ and $om'(ld)$ links of ld -th supply chain, then total maximum time $TP \max_{d,p}^{ld,s}$ of movement of s -th raw material for production through ld -th supply chain in relation $ld(d,p)$, i.e. d -th supplier – p -th producer can be written as:

$$\forall s \in \mathbf{SM}, \quad \forall ld \in \mathbf{LD}, \quad TP \max_{d,p}^{ld,s} = \sum_{(om(ld), om'(ld)) \in Z(ld(d,p))} \tau \max_{om(ld), om'(ld)}^s(ld). \quad (1)$$

Assuming that are known moments $\tau \rho_{om(ld)}^s(ld) : \tau \rho_{om'(ld)}^s(ld) \in T$: of appearance of s -th raw material ($s \in \mathbf{SM}$, \mathbf{SM} -set of raw materials submitted for the production, ld -th supply chain $ld : ld \in \mathbf{LD}$, $\mathbf{LD} = \{ld : ld = 1, 2, \dots, N\}$) in the nodes $om(ld) : om'(ld) \in \mathbf{OM}(ld)$ of the supply chain and moments $\tau \kappa_{om(ld)}^s(ld) : \tau \kappa_{om'(ld)}^s(ld) \in T$ of exit from that chain, then total time necessary for the transition of ordered raw materials to the production and delivered through the supply chain in supplier-company relation can be written as an expression:

$$\begin{aligned} & \sum_{om'(ld) \in \mathbf{OM}(ld)} \sum_{s \in \mathbf{SM}} (\tau \kappa_{om'(ld)}^s(ld) - \tau \rho_{om'(ld)}^s(ld)) + \\ & \sum_{om(ld) \in \mathbf{OM}(ld)} \sum_{om'(ld) : (om(ld), om'(ld)) \in \mathbf{LL}(ld)} \sum_{s \in \mathbf{SM}} (\tau \kappa_{om'(ld)}^s(ld) - \tau \rho_{om'(ld)}^s(ld)). \end{aligned} \quad (2)$$

Other important characteristics of assessing the performance of supply chains can be the reliability of the processes implementation in order to serve customers at the required level and the risk of not carrying out the tasks in accordance with the order. According to technical standards [15, 19], system or technical object reliability, is defined as a set of characteristics that describe the readiness of the facility and its impact on its reliability, maintainability and maintenance support. From the point of view of assessing the effective supply chain functioning both characteristics should be considered together. Determinants of the reliability of the supply chain are its weak links. Therefore, in general, is carried out the identification of such cells and they are subjected to detailed analysis [11, 24, 30].

5. Summary

Considering the expectations of a market economy, it should be noted that all elements of the supply chain must comply with its own distinct performance expectations. In addition, the elements in the chain can be regarded as a comprehensive system reliably working. Unreliability of one or more elements translates into unreliable of the whole chain. Conversely reliability of individual elements of the supply chain, makes it can meet performance expectations in all markets in their environment.

Research on the process logistics in the supply chain, enables the assessment of the transition time through the supply chain at predefined boundary conditions and limitations determined by chain equipment and different tasks i.e. different stream of notifications of orders into the system. Effective supply chains management are actions aimed at improvement of customer service and reduction of total logistics costs. To make this possible cooperation is necessary between the participants of implemented processes in the supply chain.

For measuring the effective evaluation of supply, chain management is required selection of appropriate evaluation measures. The choice of measures must be proper to the nature of the

assessment, the customer and business situation of a company or individual supply chain participants. Among the key measures are distinguished delivery time and reliability of the supply chain functioning.

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