THE INLUENCE OF SUPPLY CHAIN CONFIGURATION ON A CUSTOMER SERVICE LEVEL IN A MINING MACHINE-BUILDING ENTERPRISE

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Abstract

The authors discussed issues concerning the supply chain configuration of metallurgical products and its influence on the level of logistics customer service. The study was undertaken in a selected machine-building enterprise, a manufacturer of machinery and equipment for companies in a hard coal mining sector, to analyse factors determining logistics customer service. The study proved a magnificent importance of a supply chain configuration for the effective execution of logistics processes in make-to-order contracts realised by a selected company. The study indicates that in a competitive environment, further changes in a supply chain structure are crucial for the future of effective activity of an analysed company.

Keywords: Machine-building company, supply chain configuration, logistics customer service

1. INTRODUCTION

Supply chain configuration is one of decisive indirect factors affecting the level of a customer service. Currently, logistics processes are highly sophisticated, and they are crucial in a contract realization. It derives from significant changes in a market environment. Finally, the high level of a customer service creates the value for an end customer, and determines the competitiveness level of a company [6]. Contracts, developed in a machine-building sector, are concentrated on better and better adjusting to individual requirements of a customer. Satisfied clients make it possible to develop a machine-building enterprise in a mid- and a long-term perspective.

In the face of an economic downturn on domestic and international coal markets, and the related necessary technical and technological changes to improve the productivity of a technical system in coal mines in Poland, the key investments will be modern longwall complexes. In this context, knowledge and experience of Kopex Machinery allow to adjust appropriate solutions in the field of machinery and equipment for coal producers, and other recipients. A good example is a Polish copper producer, KGHM, in which it is being considered the implementation, on a large scale, longwall exploitation systems. Developing individual solutions, as an order by Kopex Machinery, needs to ensure adequate storing of technological knowledge, as well as further improving a logistics customer service, including designing, manufacturing, delivering and after-sales servicing, mainly of high-tech solutions in the field of mechanized longwall complexes.

The article is focused on determinants affecting a customer service in accordance with the configuration of a supply chain. The study concerns Kopex Machinery, the supplier of machines and equipment for hard coal mining. The study was based on the analysis of source materials and direct interviews with engineering and technical staff of a selected company. The study results have indicated the influence of the configuration of a supply chain on a customer service, and necessary actions to improve the economic situation of a given company.

2. DETERMINANTS OF SUPPLY CHAIN CONFIGURATION AFFECTING A CUSTOMER SERVICE LEVEL IN A MAKE-TO-ORDER SECTOR

Present supply chains have to take into account many factors, both external and internal ones due to dynamic changes in a market environment and changing recipients' needs [8]. The point is that companies have to compete on rapidly changing markets and it needs searching for reorientation of enterprises' strategies [1]. The new situation requires more versatile and innovative business models as a contemporary form of model capture of concept of the strategy and organization system [2].

To make a supply chain work effectively and efficiently in order to satisfy a customer, it is necessary to undertake actions due to general strategic objectives. Main decisions, related to the supply chain configuration, concern problems as follows [4]:

- What is the current supply chain performance?
- "What if" analysis?
- How to improve customer service?
- How to improve supply chain robustness and delivery reliability?
- Could supply chain be made more profitable?
- Is supply chain sufficiently flexible?
- How to improve cooperation?
- How to comply with local requirements?
- Whether to pursue outsourcing?
- Which partners to choose?
- Where to locate supply chain facilities?

Answering these questions leads to formulation of general supply chain configuration decision-making objectives. These objectives can be formulated on the basis of performance attributes identified in the Supply Chain Operations Reference (SCOR) model [9]:

- Objective 1: To improve supply chain delivery reliability. The performance of the supply chain delivering the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer.
- Objective 2: To increase supply chain responsiveness. The velocity at which a supply chain provides products to the customer.
- Objective 3: To increase supply chain flexibility. The agility of a supply chain in responding to marketplace changes to gain or maintain competitive advantage.
- Objective 4: To optimize supply chain costs. The costs associated with operating the supply chain.
- Objective 5: To improve supply chain asset management efficiency. The effectiveness of an organization in managing assets to support demand satisfaction. This includes the management of all fixed assets and working capital.

Objectives can similarly be identified on the basis of discussion provided by Beamon, such as [1]:

- Objective 1: To improve customer satisfaction and customer responsiveness.
- Objective 2: To improve flexibility and risk aversion.
- Objective 3: To improve information and material flow integration.
- Objective 4: To optimize costs (other related performance measures are total cost, sales value, profit, inventory holding cost, return on investment, and others).
- Objective 5: To optimize suppliers' performance.

In many cases, it is necessary to identify disruptions determining the level of a logistics customer service. It can be worked out in line with the indication of different logistics service elements. In the process of disruptions identification, it is also possible to point to an order realization [7]:

- pre-transaction elements (customer service policy, flexible service system, service procedure),
- transaction elements (order information, expedition of goods and services, the availability of substitutes),
- post-transaction elements (guarantee, instalment, complaint, returns and replacement of products and spare parts).

3. THE INFLUENCE OF SUPPLY CHAIN CONFIGURATION ON A CUSTOMER SERVICE LEVEL IN AN ANALYZED MACHINE-BUILDING ENTERPRISE

Machine-building industry in Poland is of significant importance in accordance with its role as the supplier of machinery and equipment for other industrial branches and sectors. The effective and efficient activity of machine-building industry affects the general level of production and products' quality. Machine-building enterprises' activity is determined by, inter alia, the access to qualified engineering and technical staff, research facilities, the resource base (mainly steel products) and markets [6]. One of the key aspects in the activity of make-to-order enterprises is knowledge management including implementing new technology, dealing with knowledge deficits in logistic processes, applying changes in infrastructure, optimizing human resources, and making use of up-to-date methods and tools [5].

Kopex Machinery is the largest manufacturer of machine-building industry in Poland. Kopex Machinery offers machinery and equipment dedicated to different industrial branches, especially complete solutions for coal companies, for all longwalls' heights and the power adjusted to customers' requirements. The company's activity is aimed at meeting all customers' demand, mainly to execute make-to-order contracts for coal mining (longwall shearers, heading machines, haulage longwall complexes, transport equipment, equipment for mechanical processing of minerals). The key issue is to meet customers' needs implementing innovative techniques and technology. Highly qualified and experienced specialists are able to provide adjusted individual solutions of the highest quality. Kopex Machinery makes use of modern design systems based on 3D software (e.g. 3D Autodesk Inventor). The quality of manufactured machinery and equipment is confirmed by the most technologically advanced measuring machines.

Generally, the level of a logistics customer service is determined by many factors deriving from a supply chain. For a machine building enterprise, the level of a customer service strongly depends, among others, on three main groups of logistics determinants. It could be given as a following dependency:

$$CSL = f(A, B, C, X)$$

CSL - customer service level
A - factors concerning supply logistics,
B - factors concerning production logistics,
C - factors concerning distribution logistics,
X - other factors.

Restructuring changes in the capital group of Kopex Ltd., mainly in the field of employment and organization, led to the changes in the structure of a supply chain from a distracted structure into a compact one, based on subsidiaries [6]. In **Figure 1** the structure of a supply chain in Kopex Machinery is presented. The structure is adjusted to logistics processes realised in the analysed enterprise.

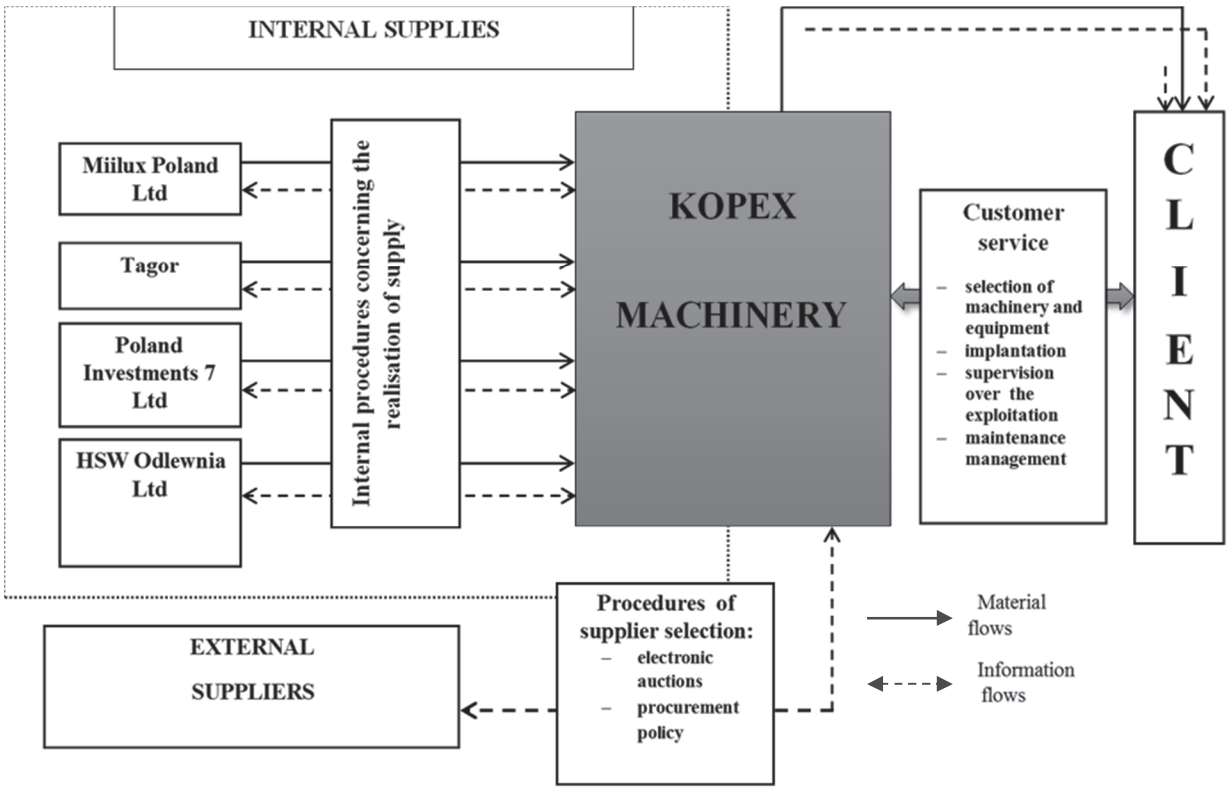

Figure 1 The structure of a supply chain in Kopex Machinery [6]

3.1. Supply logistics in Kopex Machinery affecting a customer service level

Based on deliveries of its subsidiaries, Kopex Machinery manufactures basic products i.e. longwall shearers, heading machines, conveyors and scraper conveyors and machines for coal enrichment and classification. Above-mentioned products are of high technical and technological advancement consisting of a great number of components. It is not possible for Kopex Machinery to produce all necessary components on their own. And therefore, it uses hundreds of suppliers of specialized materials, e.g. electronics, hydraulics, electrical motors, bearings and seals, castings etc. Steel products are also of great importance for a final product. Their share in total purchases is about 30%. Supplies of steel products, up to 55% are realized as internal supplies by subsidiaries. Other deliveries are supplied by external contractors which are not connected with Kopex Machinery. The largest subsidiaries of Machinery Kopex are: Miilux Poland Ltd., Tagor, Poland Investments 7 Ltd. and HSW Odlewnia Ltd. Miilux Poland Ltd. is a major supplier of hard wearing steel sheet used in the production of longwall scraper conveyors. Tagor is a supplier of sheet metal and alloy construction, which are components of shearers. Poland Investments 7 provides processed steel structures and the complex of heading machines, and products designed for vertical transport of excavated material and people, horizontal transport (conveyors), machines for enrichment and classification of coal. HSW Odlewnia Ltd. is the main supplier of steel and iron castings. Deliveries of HSW Odlewnia Ltd. cover almost the entire demand for castings in Kopex Machinery [6]. The internal supplies in Kopex Machinery have a significant impact on the quality of supplies, their timelines and pricing. The creation of consignment warehouses resulted in a significant decrease in inventories in the assortment of metallurgical products.

The reconfiguration of the supply chain, which took place in Kopex Machinery is a good example that shows how essential are flexible supply chains in machine-building enterprise for the effective implementation of products for individual customers' order. They bring benefits in reducing the number of defective materials in the process of completing a product, and on the other hand they enable to obtain the improvement of the

quality of a product for a final consumer. Kopex Machinery is going to continue solutions in the range of consolidation and optimization of an internal supply chain mainly by the development of existing assets and by the improvement of internal logistics systems.

3.2. Production logistics in Kopex Machinery affecting a customer service level

The activity of Kopex Machinery is focused on a unitary make-to-order production. Parameters of final products complies with customers' requirements. In case it is necessary, consultations are held with the producers of materials for the optimum selection of input components. The production cycle, in Kopex Machinery, includes building a prototype. On the other hand, product's construction is modular and it enables the use of components for different recipients. Due to a modular construction of products, the part of assortment can be classified as series production. It concerns mainly the elements of scraper conveyors, belt conveyors, and components used in longwall shearers and heading machines.

In relation to all products, any commercial order is independent and meets individual needs of a customer. Due to the international nature, the activity form of Kopex Machinery corresponds to conditions and circumstances of a country. For instance, in Poland, firm's activity is in line with the Public Procurement Law. Based on market research, the firm schedules production and maintains the minimum level of standard modules for all products. Depending on a product type, standard production is from 60% to 80%. Such an approach is aimed at optimizing production costs and providing the possibility of response to shortening delivery time of manufactured devices. Despite this approach, due to the individual nature of a final product and environment volatility, in which devices work, client's intervention is possible to change the form of a delivered product. These changes are most often associated with so-called accessories (cutting heads, driving elements), and constitute from 5% to 15% of delivery.

3.3. Distribution logistics in Kopex Machinery affecting a customer service level

The configuration of a supply chain enables more efficient after-sales service. The customer service, including maintenance services and the supply of spare parts, is a strategic activity of the company which makes it more competitive. Her character is dependent on the activity of a given market and covers all activities through their own subsidiaries. The company participates in both the selection of equipment, their implementation, supervision, and maintenance management.

In a mid-term horizon, the future of Kopex Machinery, given in the development strategy of the company, will focus on the diversification of final products due to a difficult situation on the domestic and international hard coal market, and the further reconfiguration of the business model, mainly in response to external circumstances.

4. CONCLUSIONS

The undertaken analysis in a selected mining machine-building enterprise, operating in a make-to-order sector, enables the following conclusions:

1) The factors determining a customer service level in an analysed machine-building enterprise indicate growing significance of supply chain configuration. Further changes are necessary in this area i.e. its flexible reconfiguration depending on a portfolio dedicated to end-customers (concerning products sold on domestic and international markets).
2) The changes which took place during last years in the organisational structure of Kopex Machinery group, and in ownership's relations suggest better and better adjustment of subsidiaries to realize logistics processes in the area of supply, production and distribution.

3) Kopex Machinery has to implement solutions for further optimization of supply chain configuration, as a key aspect, to improve logistics customer service, and as a result to create the value for an end customer.

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