

DEVELOPMENT AND ASSESSMENT OF CHOSEN SUPPLY SYSTEM STRUCTURE IN THE CZECH CHEMICAL INDUSTRY

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Abstract

Integration in the area of international trade also affects business entities in the Czech Republic, which merge with each other to form larger business units to maintain a competitive level of their offer. Thus vast, structurally more and more complex supply systems are developed, through which products and services are provided to the customers. These systems have to be able to respond promptly to any changes in the business environment and to any changes in the customer requirements. Therefore, there is a changeover from static supply systems to systems with a dynamic structure, which changes with each opportunity, order, or product. This transition requires solutions to a number of problems, such as e.g. implementation of highly sophisticated ICT, arising increased coordination costs, setup of the ways of cooperation between the entities inside supply chains. Application of different forms of cooperation is dependent on a lot of problems like technical equipment, system compatibility, different corporate cultures, willingness to share information, branch characteristics, characteristics of the manufactured product, and other factors. Therefore, this paper identifies and evaluates, on the basis of comparison of literature research outcomes and analysis of a twenty-year development of creation of the structure of a particular chosen supply system in the chemical industry, the ways and conditions of the genesis of the given structure and the advantages resulting from creation of a supply system and cooperation of the partners therein.

Keywords: Supply chain, structure of supply system, forms of cooperation, chemical industry

1. INTRODUCTION

Creation of a logistics system leads to another opportunity for improving customer services and decreasing costs. However, creating a logistics system is a very complex task consisting in harmonization of various activities and different systems. Integration is achieved within different periods and in steps [1], [2]. The traditional chains with discontinuous flows are gradually replaced by chains with continuous flows, which can only exist in case of mutual cooperation. The need for reforms in the company is also supported by the finding that the source of the value is not in the company units, but in the company processes [3]. Firms have been gaining ground above all in the market that can establish and continuously deepen cooperation with their partners who are involved in creating value for end customers [4].

Creation of supply systems within which businesses cooperate mostly on the basis of partnerships correlates with the current trend of interconnecting individual economic entities to achieve synergistic effects, such as increased competitiveness, improved negotiation power, and maximization of the value created by the system [5], but also sharing and common creation of knowledge [6]. The value is generated in the entire structure of the supply system. Therefore, this paper aims, based on the outcomes of an analysis of a twenty-year development of creation of the structure of a particular chosen supply system in the Czech chemical industry, to describe, identify and assess the ways and conditions of the genesis of the given structure and the advantages resulting from creation of a supply system and cooperation of the partners therein.

The applied research methods and sources included the targeted literature search in the scientific literature focused mainly on defining the basic supply system characteristics and structures and the possibilities of

cooperation of individual supply system members, the analysis of annual reports and web pages of selected companies, and the method of in-depth interviews with managers in chosen companies.

2. THEORETICAL BACKGROUND

The effort to integrate corporate process beyond the company limits started to appear as early as in the 80's of last century. The main impulse was the idea of increasing effectiveness of transactions between partners and improving their mutual relations. There was a process of horizontal integration, which resulted in the genesis of a supply chain [7]. It is mainly a result of gradual globalization on the one hand, and deepening segmentation of markets on the other [8].

2.1. Supply system

The supply chain is defined by Waters as a sequence of events performed to satisfy the customer [1], while Fiala defines it as a multilevel system of suppliers, manufacturers, distributors, sellers, and customers [9]. Also, Christopher describes it as a network of organizations involved, in and against the direction of the material flow, in different processes and activities that bring the value in the form of products and services in accordance with the requirements of the final customer [10]. Similarly, Lambert perceives the supply chain as a network of companies and bonds among them [11], while Pernica as sequences of steps intended for satisfying customers [7].

Therefore, the supply chain can be perceived either as a sequence of activities, or as a certain set of organizations, or as their combination. Gros, Grosova state that it is essential to separate the activities from the bearers of these activities, i.e. to distinguish the term 'supply chain' as a set of activities from the 'supply chain' as a set of organizations and bonds [2]. They define the supply system as a purpose-defined set of organizations and bonds among them, which share planning and performance of the sequence of activities defined in the supply chain. It is possible to define a lot of systems on an actual object on the basis of assessment of all the substantial facts with respect to the possibilities of solving the given problem [2]. This approach is also preferred by the authors of this paper. The primary purpose of the supply system is to create products by adapting to the demand for them in accordance with the requirements of the customers on the base of CRM principles [12]. It is an open, dynamic system with adaptive behaviour of the economic type, which responds to the impulses from the surroundings in the way it is beneficial for the system [7].

2.2. Structure of supply system

When defining the structure of the supply system, it is necessary to identify its members and differentiate their effects on the company to establish adequate bonds with each of them. Within these bonds, there are interactions of tangible and intangible character including resource flows from the suppliers to the customers, and also reverse flows and the relating information flows [7], [9]. Each member occupies its position, which defines the design of the supply system for each member differently. All the segments of the supply system transform the inputs to outputs in the way to achieve certain economic effects through provision of services.

The structure of the supply system (network) disintegrates for each segment to a network of suppliers and a network of customers. From the point of view of the company, it can be defined according to the number of members, the type of process bonds, and the spatial arrangement of the network. The members of the supply system can be all the companies with which the company cooperates, directly or indirectly, from the point-of-origin to the point-of-consumption [11]. There are two types of segments, i.e. companies in direct contact with the central company, and other entrepreneurial entities [2]. Another possibility is segmentation to primary members and supporting members. Primary members are autonomous organizations or SBU that actually perform and/or manage activities within a corporate process that creates particular outputs for the customers or the market. The supporting members are companies providing the primary members with resources,

expertise, tools, or assets [11]. A company can be a primary member and a supporting member at the same time with respect to the fact that they might be members of more supply systems.

Among individual supply system members, it is possible to identify controlled, monitored, uncontrolled bonds, and bond out of the controlled system [11]. Controlled bonds are with the primary members in direct contact with the company [2]. The company tries to integrate the corporate processes with them, or to establish a relationship of a close cooperation. Monitored process bonds direct to members without such a significant influence on the company. In most cases, the corporate processes are not integrated, but it is desirable that the company steers the relations with them in a suitable way. Uncontrolled process bonds are with the members with hardly any influence on the company. There is no integration of their processes, and the company does not steer bonds among these companies. The mutual relationship is based on confidence. Bonds outside the controlled system are characterized as bonds between separate systems [11].

Management of the entire supply system is, from the point of view of a growing number of members and bonds among them, too complicated and often even impossible from the point of view of the company, so when it is being identified, it is necessary to consider the influence of the other members and bonds among them on the company. Increasing, or decreasing, the number of the supply system members affects its structure. The current trend is shortening of its length to reduce the costs and enhance the customer service through faster material and information flows [1]. This is why companies focus on performance of the key activities only and on outsourcing of various activities [13]. However, there are also vast, structurally complex network systems that include several mutually interlinked supply chains, which are not necessarily in the same branch of business. They obviously aim to cover raw material and goods flows effectively from the initial raw materials to manufacturing of the final products, their distribution and sale [8].

When designing the structure or when restructuring the supply system, it is in the first place essential to separate abstract requirements from executors, i.e. to define all the activities that are necessary for implementation of the customer value and, in the second step, to assign individual activities with particular executors [2], [9]. By analyzing the executed current activities, it is possible to identify redundant activities, or activities that do not bring any customer value and eliminate them [8]. A design proposal of the supply chain structure is closely relating to the location of the decoupling point in the supply chain, which radically moves, together with the transition to a synchronous type of chains, to the very beginning of the chain [2], [9], [14].

2.3. Cooperation in supply system

Systems with a dynamic structure are continuously changing with each opportunity, order, or product. In practice, it means that the company has established a cooperation relationship with a larger number of suppliers and customers and cooperates with a certain supplier or customer on the basis of the current conditions. These structures are also known as Virtual Production Networks [15]. This is connected with the problem of increased coordination costs of selection of partners and contract negotiation, etc. [9]. This transition requires application of highly sophisticated ICT and cooperation within the supply system. In the conditions of the developing ICT, it is possible to make use of a number of alternatives for optimization or construction of the supply system structure. There are a number of methods that are gradually developing and are applied within supply systems, e.g. QR, ECR, CRP, VMI, or CPFR.

The level collaboration in supply system is closely associated too with the product clock-speed and designs a firm's supply chain. Ling suggested two distinctive approaches, efficient and responsive supply chain [16]. The efficient SC model best fits the environment in which demands are highly predictable, forecasting error is low, product life cycle is long, new product introductions are infrequent, product variety is minimal, production lead-time is long and order fulfillment lead-time is short. Therefore the chemical industry fits here. The purpose is to coordinate the material flow and services to minimize inventories and maximize the efficiency of the manufacturers and service providers in the system. The purpose of responsive supply chain is to react quickly to market demand by frequentl new product introductions and supply chain flexibility [16].

A relationship of mutual cooperation is based on creation of a strategic partnership between two or more partners. There are various close forms of cooperation based on mergers, acquisitions, strategic alliances based on joint ownership (joint venture or concern) or strategic alliances that are not based on joint ownership but on contracts of formal or informal character [17]. What is particularly essential for the studied supply system is cooperation based on common ownership, so-called vertical integration. Waters evaluates it as the highest possible form of integration, where one company buys another company within the supply system to decrease the costs and enhance the level customer services [1]. Therefore, it has belonged to the favourite ways of cooperation in the recent years [3].

3. DEVELOPMENT AND ASSESSMENT OF CHOSEN SUPPLY SYSTEM STRUCTURE

The supply system was described, analyzed, and assessed from the point of view of a selected joint-stock company, which is nowadays the second largest group in the Czech and Slovak chemical industry. The company originally dealt solely with trading in chemical products on the Czech market. Gradually, with respect to the highly competitive environment in the trade, it first invested in the distribution network and subsequently also in manufacturing, extended the scope of its business with agricultural commodities, foodstuffs, but also e.g. with raw materials and fuels. It invested into acquisitions of ZZN (agricultural supplies and purchase) and ACHP (an agrochemical company) type companies. Since 1993, an industrial manufacturing concern has been formed together with a number of supply subsystems, which have mostly been established on the basis of raw material, or material, flow continuity.

The company first identified what activities are essential for implementation of the customer value in agriculture, on the basis of which it then defined all the inputs and outputs and gradually started to build a supply system through capital acquisitions. The basic strategy was based on creation of a vertically integrated group covering the supply chains aiming to achieve a leading market position in the key business segments. The established concern is being continuously restructured with the primary goal to increase the effectiveness. The system is both horizontally and vertically integrated and forms a conglomerate of seven segments where the companies are classified in accordance with the performed activities, see Fig. 1.

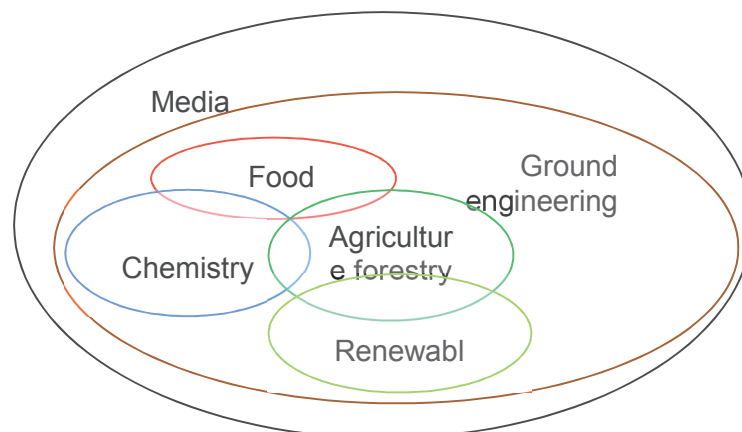


Fig. 1 Conglomerate of seven segments

The concern is a complex, extensive system, which has reached the number of 268 companies in the last 20 years (as of the day 12/ 31 2013). Therefore, its management is difficult and significantly decentralized. The companies act within the concern to a certain extent as independent economic entities, which are however in certain aspects subordinated to the decisions of the parent company. For example, in the area of making investment decisions, in contracts exceeding CZK10 million the intent must be approved by the parent company. The inter-company relations are based on long-term cooperation aiming to achieve maximum

possible flexibility and maximum possible utilization of synergistic effects resulting from the cooperation. Within the continuous growth, the parent company still mainly focuses on acquisitions of companies that fit in the concept of building an integrated agricultural and food complex in the area of Central Europe, but also on building new manufacturing capacities.

The segment of chemistry has already been built since 1996, where there was the first acquisition of a chemical company. It is the second largest segment from the point of view of the number of employees of the entire concern (about 27% employees). Its gradual building and continuous restructuring have resulted in the supply system structure where the core companies of the segment of chemistry are located in a horizontal line. As much as three quarters of the production is exported to European markets or overseas. A large emphasis is placed on the area of research and development.

As of the day 12/ 31 2013, the company owned 23 chemical companies and 1 chemical concern (i.e. 9% of the entire concern), where the parent company was a 100% owner of 21 companies, a majority owner of 1 company, and a minority owner of 2 of them. They were joint-stock companies; in case of foreign acquisitions they were companies of a similar legal form. 14 companies were located in the Czech Republic and 10 abroad. The acquisitions were made in the way to support the basic corporate strategy, i.e. creation of vertically integrated supply systems covering entire supply chains in the given industrial sector. Successful implementation of acquisitions was mainly based on the confidence of banks, due to which it was possible to restructure the newly acquired companies and make them more efficient.

Successful operation of the segment is mainly based on building long-term inter-company cooperation relationships within the segment and the entire concern, and on the maximum possible utilization of the synergistic effects resulting from it. The chosen type of cooperation is given by the characteristics of the chemical industry sector and the manufactured products. It is possible to apply the model of an effective supply system successfully because production of chemicals belongs to slow clock speed industries. We can identify three cooperation levels there: inter-company **cooperation** within the segment of chemistry, across individual segments of the concern, and **between the subsidiaries and the parent company**, where it is also possible to distinguish the administrative level from the level of business cooperation. On the administrative level, it is mainly issuance of guidelines (on purchase, sale), legislative or whole-company arrangements and other documents binding for the subsidiaries by the parent company. On the business level, it is mainly purchase, for which the parent company has established a central purchasing division. It particularly ensures purchase of items used regardless of the focus of activity of individual companies (e.g. paper, computers, and software), taking advantage of the effect of bulk discounts.

Cooperation of the companies and their SBU's within the segment of chemistry is significantly different. There are companies with different production focus and also with very specific products. The portfolio of the suppliers of raw materials for the production and the customers of these products is very limited. The concern thus also includes companies or SBU's that do not cooperate with other companies from the segment of chemistry in any way as there are no preceding or subsequent entities that would produce the given inputs or purchase or otherwise use the outputs. However, they take advantage of the facts that they belong to the concern, which is perceived as a strong, stable, and solvent corporation. It is for example when negotiating contracts with their customers or suppliers out of the concern. Cooperation in the segment is mainly focused on making common decisions on potential significant changes in the production, on the volume of the production and the related free or insufficient production capacities. Each company makes decisions about their production portfolio itself, only significant changes have to be approved by the responsible management of the parent company. There is no centralization of the production portfolio items in the segment of chemistry into individual companies, but the decentralized status, which ensures replaceability of items and better coverage of the market, remains in place. In the case of occurrence of an expected (shutdown) or unexpected situation of stoppage in production of the given item in one company, the demand can be satisfied from production of another company in the concern. This problem is closely relating to the central solution to the

capacities. The responsible workers of individual companies deal together with free or insufficient production capacities with the aim to create a half-year plan of material flows of selected items between companies, or with effective railway transport. A positive effect can mainly be seen in better utilization of the capacities of the companies and in lower logistics costs, which are then reflected in lower raw material prices. Improvements in the cooperation are also supported by so-called rotations of managers among the companies within the segment with the aim to take advantage of the acquired experience and knowledge and to support the willingness to share information. The effect can mainly be seen in rationalization of the production processes and distribution within the concern. Cooperation in the area of sharing information consists for example in sharing daily information about the volume of stock, volume of expected production in the way to synchronize the material flows of the company with the companies within the segment of chemistry, but also outside this segment.

Cooperation of the companies across individual concern segments mainly consists in ensuring an effective material flow, but also e.g. in implementation of common promotional events. A significant advantage resulting from creation of the given supply system is, according to a top manager of the company, the possibility of co-called profit transfers. If one of the system elements does not function for a temporary period, it is possible to settle the potential loss from the profits of the preceding or subsequent entities.

4. CONCLUSION

The created structure of the supply system in the form of concern which is based on cooperation is continuously restructured with the primary goal to increase the effectiveness, correlates with the current trends of interconnecting individual economic entities to achieve maximum possible flexibility and synergistic effects and brings a number of positives. The concern is a complex i.e. conglomerate of seven different segments, extensive system, which has reached in the last 20 years the number of 268 companies, of which are 24 chemical companies. Therefore, its management is difficult and significantly decentralized.

A positive effects from created structure can mainly be seen in better utilization of the capacities of the companies, in lower logistics costs, in rationalization of the production processes and distribution within the concern, in replaceability of items, in better coverage of the market, in ensuring of effective railway transport, in bulk discounts, in sharing the acquired experience, knowledge and information and in possibility to settle the potential loss from the profits of the preceding or subsequent entities. Companies they take advantage also of the facts that concern is perceived as a strong, stable, and solvent corporation, for example when negotiating contracts. Successful implementation of acquisitions was mainly based on the confidence of banks, due to which it was possible to restructure the newly acquired companies and make them more efficient and competitive.

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