

BUSINESS COOPERATIONS ALONG THE SUPPLY CHAIN

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Abstract. Cooperation between and within the companies can be an important success factor. Based on trust, companies at present have created formal and informal network structures in which cooperation between them plays a special role. In the present times, the economic importance of supply chains can be observed in almost every industry regardless size: multinational companies and even small and medium-sized enterprises are actively involved in global value-creating chains. More and more business leaders recognize that when consumers are about to decide on their purchases, not just performance of a company is evaluated but that of the entire supply chain and supply network. Forms of cooperation in the supply chain affect the companies in several ways: we can investigate its impact on growth, operation and thus, on the effectiveness of the supply chain and competitiveness. Both cooperation between and within companies are important in creating the ultimate value added. This paper aims to explore the functional fields in which companies cooperate with each other, i.e. how and in what manner they are connected to each other. Results and conclusions are based on in-depth interviews and a questionnaire filled in by companies in Hungary.

Keywords: supply chain; supply network; cooperation; relationships; business strategy

JEL Classification: M10; F14

Introduction

Due to increasing competition and the continuously changing environment, the competitiveness of a company is influenced by many special factors (for example, size, innovation, financial situation) and also the connection with the enterprises in the supply chain network. Corporate cooperation has always played an important role both inside and outside the company. As Rigby (2017:5) perceptively states, “Over the past few decades, management tools have become a common part of executives’ lives. Whether they are trying to boost revenue, innovate, improve quality, increase efficiencies or plan for the future, executives search for tools to help them. The current environment of globalization, rapid technological advances and economic turbulence has increased the challenges executives face and, therefore, the need to find the right tools to meet those challenges.” There are a lot of management tools that are useful in helping company executives with leadership to be successful. According to an American consulting company’s survey (Rigby, Bilodeau 2015), it can be stated that supply chain management has become the focus of thinking. According to Bala (2014:949) in the last years, “supply chain has moved up on the chief executive officer’s list of priorities, but it is not always for the right reasons, in many cases, CEOs only pay attention to the supply chain when they want to cut costs or when something is wrong.”

The aim of this research was to examine whether companies are aware of the importance of the field of logistics and how they cooperate along the supply chain, i.e. what are the most frequently used methods to keep connections and thereby we can also see how closely they are connected to each other and how much these independent companies are integrated into the supply chain.

More and more business executives recognize that consumers, when deciding on their own purchases, do not evaluate the performance of individual businesses, rather, they evaluate the performance and

value added of the whole supply chain network. The overall performance of the supply chain is determined by the forms of cooperation within the chain, the balance of power within the chain and the power positions.

In the current economic environment, relatively few companies are able to operate competitively that does not take into account the direct or indirect external relations. Complex processes take place in the course of globalization when specialized companies engage in networks, and there are countless new challenges that are still waiting to be answered. At this moment, the most important question is how to provide a new competitive advantage for companies for which strategies and network concepts or management tools are available. Effective management and the coordination of paradigms given by new perspectives can enhance corporate efficiency and affect the current corporate practice, the tools required and the leadership/management reform.

The objective of this study is to explore the cooperation between the participants of the supply chain. In addition to the systematic analysis of Hungarian and international literature related to the topic, this study is also based on primary examinations.

Therefore, the paper is focused on introducing the key business processes of supply chain management and interpreting the structure of supply chain network from a theoretical point of view. The objective of the primary research was to demonstrate the cooperation and relationships that exist in the Hungarian supply chain network.

Literature Review

The continuous and rapidly changing environment has set new requirements for companies. Organizations face unique challenges in managing their supply chain by integrating their internal functions as well as the entire supply chain (Christopher, Jüttner 2000). From the value added perspective, the key internal processes include inbound logistics, operations, outbound logistics, marketing and sales and service (Porter, 2001). The key task in managing these functions is to ensure a process of interaction and collaboration in which they work together to achieve the mutual objectives of the supply chain.

From a supply chain perspective, we can define the key business processes of integration, from raw-material suppliers through end users that provide products, services, and information that add value for customers and other stakeholders. These are the following: customer relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, supplier relationship management, product development and commercialization and return management (Lambert, Cooper 2000).

While customers expect their goods to be delivered to the right place, at the right time, in the right amount, in the perfect condition and all at the lowest price, companies face difficulty with satisfying these demands individually. So, they have to closely cooperate with other companies. Cooperation can occur in different forms.

Cohen and Russel (2005) differentiated four models of collaboration (Fig. 1):

- Transactional — Efficient execution of transactions between partners
- Cooperative — Higher level information sharing
- Coordinated — Reliance on each other's capabilities
- Synchronized — Information developed jointly with longer horizon.

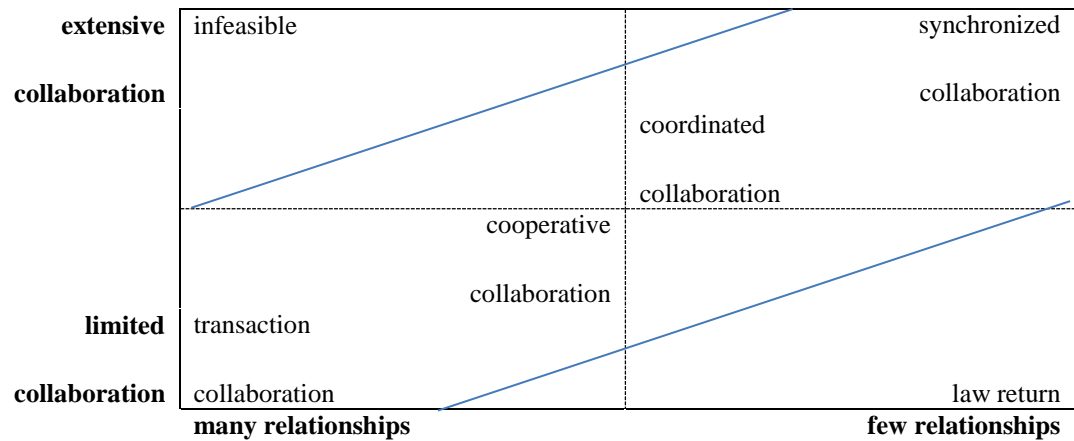


Fig. 1. Four basic models of collaboration: the collaboration spectrum (Source: Cohen and Russel, 2005)

To achieve more customer satisfaction, more profit and competitive advantages in the value-added supply chain, the following supply chain management strategies can be used by the companies: vertical and horizontal cooperation in a supply chain (Szegedi, Prezenszki 2003). Vertical cooperation means when a company expands its business into areas that are at a different stage of the value chain. Horizontal cooperation means when two or more companies in the same industry and in the same supply chain stage of production work together and produce or distribute the same products. The main goal of cooperation is a better economic situation for the members in the cooperation's practice.

Network-based business models are organizational structures that allow companies to operate as interconnected configurations across its value chain usually consisting of partnerships, collaborations and optimized cross-organizational activities (Mentzer 2008).

Supply chain strategy includes "two or more firms in a supply chain entering into a long-term agreement; the development of mutual trust and commitment to the relationship; the integration of logistics events involving the sharing of demand and supply data; the potential for a change in the locus of control of the logistics process" (La Londe, Masters 1994). Effective supply chain management requires an intra-corporate relationship between companies cooperating in the supply chain. The supply chain must be managed to ensure efficient operation. Improving the quality and efficiency of value-creating processes and managing the flow of material efficiently and economically can only be achieved through actual and relevant information. The right strategic tool for that is the use of information technology and management information systems.

According to Gelei-Nagy (2011), many Hungarian companies do not use any identification to manage their processes; most of the examined companies apply no standard codes but corporate-specific codes.

Mentzer et al. (2001:10) cite the definition of supply chain management as "the process of managing relationships, information, and materials flow across enterprise borders to deliver enhanced customer service and economic value through synchronized management of the flow of physical goods and associated information from sourcing to consumption."

The effective operation of the supply chain is influenced by the information shared by the actors, such as inventory, allocation status, sales, demand and production forecasts, sales promotional strategy and market strategy. However, Wong et al. (2015) found that information exchange among companies in the supply chain is not enough to satisfy customers' needs at a higher level. It is the IT-enabled collaborative decision making in the field of planning and managing inter-organizational activities that can really help. According to research carried out by Arantes et al. (2018), supply chain management has to be treated as a multidimensional concept where information sharing itself is only one of the factors that can determine the performance and not too high level of explanatory power was found for it. Trust, partnership, cooperation or collaboration and coordination have to be taken into consideration as well, and altogether 79% of the performance can be explained by them. While sharing information, managers

perceive several types of risks and try to mitigate them. That can influence the performance of the supply chain as well (Tran et al. 2016).

Methodology

We have been analysing the place and role of the Hungarian enterprises in their industrial supply chain for almost four years. Our analyses cover the following areas: the role of logistics in the company, its relationships with customers and suppliers, the presence of green logistics, expansion strategies along the supply chain and business supply chain management. When we were planning the scope of this research, we took into consideration our previous experiences and results and looked for companies that have logistic embeddedness. A questionnaire was created and sent to them to examine the following:

One of the aims was to investigate whether companies are aware of the importance of the field of logistics. To achieve this aim, we were curious in the questionnaire whether they had a separate strategy for logistics itself in the corporate strategy. If yes, the awareness can be confirmed and we can assume that this field is of a high importance for them. On the other hand if there is no separate strategy for logistics, but there is an organizational unit to deal with this field, we can also assume awareness in the company. In case of a separate strategy for logistics, separate organisational unit can be expected. The importance of this field can be indicated by the use of different IT systems too.

The main goal was that the most frequently methods/tools – used by companies to keep connections with each other – can be revealed. From these we can conclude how deep, i.e. strong, the relationships are and how much the companies are integrated into the supply chain. A five-level Likert scale was used when the questions were posed: “How important the use of the following techniques, methods and tools are in the cooperation in the supply chain?” The list of these methods was compiled based on answers given in one of our previous research for another question, and consisted of 19 items, such as EDI, bar codes, RFID solutions, vendor-managed inventory, cross-docking and so on.

It is worth considering how much these methods are related to the size of companies. The size, expressed either in number of people employed or in annual revenue, may explain the tools used most frequently. On the other hand, if we would like to state about the most frequently mentioned tools that they support the success in business, we have to focus on successful companies, i.e. companies that have been increased in headcount and/or revenue.

To evaluate the data collected by our questionnaire between April and December 2017 in Hungary, both descriptive and inferential statistic methods were used, for example, frequency and relative frequency distributions, crosstab analysis, chi-square tests and Wilcoxon signed-rank tests. After cleaning the database, 119 responses have been left in the database. The analysis, discussed below, refers to that number of companies unless otherwise indicated. If only a few questions have been left unanswered, the whole company was not excluded from the investigation but only from the evaluation of those questions.

The general characteristics of the sample are the following: as regards the size of companies (i.e., the number of employees), the sample consists of 41% big enterprises, 48% SMEs, and 11% micro enterprises (see Fig. 2).

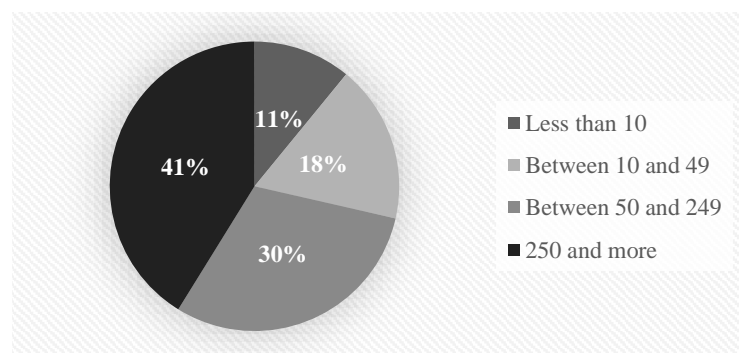


Fig. 2. Relative frequencies based on the number of employees in 2016 (Source: authors' compilation)

Companies filling in the questionnaire play a role in different sectors of the economy (see Fig. 3).

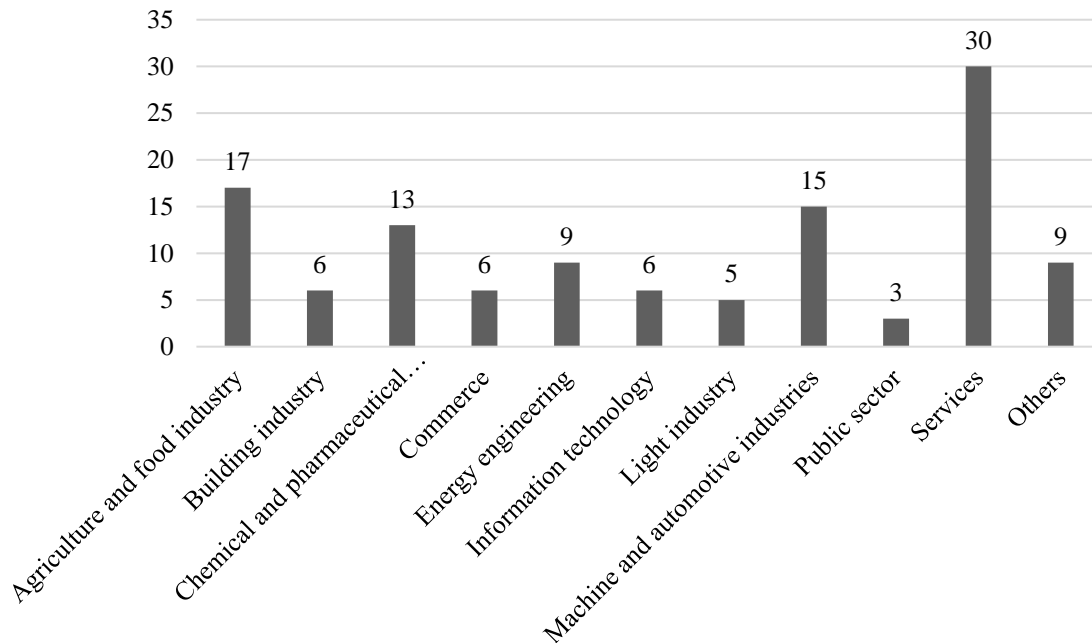


Fig. 3. Frequencies based on the sectors in the economy (Source: authors' compilation)

In the sample, the relative majority of the enterprises (38%) have a revenue of more than EUR 50 million (see Table 1).

Table 1. Frequency and relative frequency distribution of revenue in 2016 (Source: authors' compilation)

Revenue	Frequencies	Relative frequencies
Less than EUR 2 million	25	21%
Between EUR 2 and 10 million	23	19%
Between EUR 10 and 50 million	26	22%
More than EUR 50 million	45	38%
Total	119	100%

Here Cramers's V, whose value is equal to 0.55, can be used as a measure of association between the number of persons employed and the revenue. Based on this measure, only a middle-strength relationship can be observed between the variables mentioned above, i.e. the former attribute itself is too few to explain the latter one; however, it obviously plays a role.

Results

In the corporate strategy, there is a separate strategy for logistics itself in 55% (65 cases). There is a department as a separate organisational unit for logistics in 79%, i.e. 94 cases. ERP system with a special module for logistics is used in 72% (86 cases).

Interestingly, we can point out that where there is no logistics strategy, the probability is almost two times higher to have a separate organizational unit for logistics (19 to 35). If there is a logistics strategy, one may suppose that this field plays a very important role. But in five cases out of six, there is neither organisational unit for that nor an ERP system (see Table 2).

Table 2. Joint occurrences (Source: authors' compilation)

Separate organizational unit for logistics	ERP system with logistic module in use	Logistics strategy		Total
		No	Yes	
No	No	12	5	17
	Yes	7	1	8
	Subtotal	19	6	25
Yes	No	6	10	16
	Yes	29	49	78
	Subtotal	35	59	94
Total		54	65	119

Examining the use of ERP systems, it seems there is a relationship with the number of people employed, but it is only of medium strength (Cramer's $V = 0.47$). Interestingly, the Cramer's V shows the same strength (0.50) when ERP systems and the revenue is compared. In the machine and automotive industries, ERP system is always used and, with one single exception, we can state the same applies to the chemical and pharmaceutical industries.

Thirty-six percent of the companies use SAP, 2% LIBRA and 9% ORACLE. A relatively high number (78) of them use other or their own developed systems. The typical value for number of systems used is one (94 cases), but in 14 cases two systems were marked, three in four cases. In three cases, two systems are not even enough to satisfy all the requirements (see Table 3).

Table 3. Number of systems used (Source: authors' compilation)

The systems can keep track of all the processes	Number of systems used			Total
	1	2	3	
No	35	3	0	38
Yes	59	11	4	74
Total	94	14	4	112

In all the economic sectors, one is the typical number of systems applied. Thirty-five percent of the enterprises stated that the systems are not able to cover all the material flow processes, 14% say that it is not even important. In commerce, energy engineering, light industry and in the machine and automotive industries, there are no "No" answers for this question. In services, 30% say that it is not important, and that is the highest proportion that "No" could have reached. Regarding agriculture and food industry, 24% voted for "no." In other fields of economy only one case can be mentioned (except chemical and pharmaceutical industries, where it is two). Thirty-five percent of this total, 14% is microenterprise, another 35% is small, 18% medium-sized and 12% big enterprises.

If the number of people employed in 2016 surpassed that of the year 2013 and/or if the revenue in 2016 surpassed that of the year 2013, we consider the companies to be successful ones, i.e. they have grown during the years (see Tables 4 and 5)

Table 4. Change in number of people employed between 2013 and 2016 (Source: authors' compilation)

Employees in 2016 Employees in 2013	Less than 10	Between 10 and 49	Between 50 and 249	250 and more
Less than 10	12	3	1	
Between 10 and 49	1	17	7	
Between 50 and 249		1	28	7
250 and more				42

Table 5. Change in revenue between 2013 and 2016 (Source: authors' compilation)

Revenue in 2016	Less than EUR 2 million	Between EUR 2 and 10 million	Between EUR 10 and 50 million	More than EUR 50 million
Revenue in 2013				
Less than EUR 2 million	24	7	2	
Between EUR 2 and 10 million	1	16	6	
Between EUR 10 and 50 million			18	2
More than EUR 50 million				43

If there is no decrease in the two attributes mentioned above, it is very likely to be assumed that the later discussed methods/tools used by companies for keeping in touch with each other contribute to success. Regarding remaining in or falling out from a category (upwards or downwards), we observe that enterprises positioning themselves above the main diagonal in the matrix has increased either in number of people employed or revenue. Companies under the diagonal have decreased. However, they can overlap, and growth can also be observed inside a group to have a conclusion with the highest certainty. We investigated only those companies that have grown in at least one of the two categories. There was only one case where a certain growth in both the number of employees and revenue could have been observed. Based on these 25 enterprises, the average value of the importance in the growth in the supply chain was 3.80 on a 5-point Likert scale. Compared to the whole survey mean, 3.84, it is surprising that the value is somewhat lower.

While operating in the supply chain the following (the five most frequently mentioned) solutions are used (see Table 6). How often the solution is used had to be indicated by numbers from 1 (not at all) up to 5 (to a great extent).

Table 6. Solutions used in the supply chain (Source: authors' compilation)

Solutions	Mean	Standard deviation	Standard error of the mean
Supplier rating	3.88	1.22	0.11
EDI	3.84	1.28	0.12
Customer rating	3.54	1.35	0.12
Computer aided ordering (automatic)	3.51	1.59	0.15
Joint planning	3.39	1.23	0.11

Due to the fact that these variables were measured only on an interval scale (a typical five-point Likert scale was used) and the means are very close to each other, related-samples Wilcoxon signed-rank nonparametric test can be executed to check whether there is a real difference in the means, i.e. the order is a real order. Paired-samples t-tests is not an appropriate choice because on a Likert-scale normal distribution cannot be interpreted (the scale cannot be considered continuous). Without mentioning the t-values, a table can be constructed to indicate the p-values (see Table 7).

Table 7 P-values for the related-samples Wilcoxon signed-rank tests (Source: authors' compilation)

	Supplier rating	EDI	Customer rating	Computer aided ordering (automatic)	Joint planning
Supplier rating	-				
EDI	0.790	-			
Customer rating	0.006	0.034	-		
Computer aided ordering (automatic)	0.038	0.036	0.983	-	
Joint planning	0.001	0.001	0.453	0.467	-

Based on these values in Table 7, the following conclusions can be drawn (at the 5% level of significance): supplier rating and EDI have the same importance, but both of them are ranked significantly higher than the others. Investigating each pair of customer rating, computer-aided ordering and joint planning, the Wilcoxon tests do not show significant differences. So, the order consists of a shared first place (supplier rating and EDI) and a shared second place (customer rating, computer-aided ordering, joint planning).

The use of EDI solutions is independent of the number of people employed (Pearson Chi-Square = 22.372, $p = 0.034$).

Seventy-seven percent of the enterprises require the service of an external provider in the field of freight forwarding, 18% in the field of storage and 8% in the field of inventory management. Forty-three percent of enterprises provide services in the sample, the highest proportion regarding the functional field, and arrange forwarding on their own. These companies are typically those that provide forwarding as a service.

Conclusions

Although some strange and possibly questionable conclusions can be drawn based on the data collected, and that is why the results have to be handled with reservations, some of them can meet the previous expectations. There are a number of reasons for assuming their reality, like without electronic data interchange, there is no success in the business. Very few of the enterprises can afford not to have any kind of IT systems but these are micro enterprises, which more or less explains it.

Three different attributions were used to examine whether the companies are aware of the importance of the field of logistics: strategy, organisational unit and ERP systems with a special module, in broader sense IT systems. The main findings were the following: Among the companies involved in the survey, there is a separate strategy for logistics itself in 55% and almost all of them (91% of the 55%) do have a department for executing it and 77% of them use ERP systems. But the reverse is not true: there is a separate organisational unit for logistics in 79% but only 67% of this 79% have such a strategy. ERP system with a special module for logistics is used in 72%. We might conclude that the existence of strategy is the key factor because if there is a strategy, it entails the other factors, but this is not true: where there is no logistics strategy, the probability is almost two times higher to have a separate organisational unit for logistics. Although there is no strategy in 45% of the surveyed companies, even those companies have separate organisational unit for logistics and/or ERP system with a special module in 78%. To summarise, we can point out that the awareness is of high importance, but special strategy does not seem to be needed for operating successfully in business.

What are the most important methods/tools that make a company successful? Based on the responses the top five ones are the following: first supplier ratings and EDI with equal importance, and second customer rating, computer-aided ordering and joint planning. The customers and the suppliers evaluate each other and these evaluations play a very important role and can be key performance indicators when it is about the decision of maintaining the (long) term cooperation in an unchanged form. The importance of joint planning underlines the results of previous (secondary) research, such as trust is one of the most important factors in the cooperation of the supply chain for example.

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