



ATTITUDES OF SMALL AND MEDIUM-SIZED CHEMICAL COMPANIES TOWARDS INFORMATION SHARING WITHIN SUPPLY CHAINS

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Abstract

Information sharing within a supply chain has a number of positive impacts on its performance. However, to achieve highly effective communication, it is necessary that there are trust-based business partnerships and willingness to share correct and for the partner important information in the supply chain. Based on a quantitative research conducted at 69 small and medium-sized companies, the paper discusses attitudes of Czech chemical companies towards importance of information and willingness to share it with a key business partner for the purpose of effective management of business operations. While purchase managers marked information concerning extraordinary fluctuations in deliveries and order status information as most important, sales managers saw the highest significance in information about future customer demand and market development. The highest rate of willingness to share information was identified just in the information that was considered by the business partners as most important. For this reason, it is not possible to consider a lack of willingness as a barrier to effective communication among small and medium-sized companies in chemical industry supply chains.

Keywords: Information sharing, small and medium-sized enterprises, chemical industry, supply chain

1. INTRODUCTION

The key factor for effective supply chain management is common activity management in all the chain entities based on the systems approach. If an organization manages its activities in isolation, it is not able to evaluate adequately how its decisions will affect activities of the other supply chain entities. A copybook consequence of such an unsystematic management is the bullwhip effect, where small fluctuations in the demand of the end customer result in increasing demand fluctuations in the subsequent supply chain entities [1]. Information sharing thus represents an essential condition for application of a systems approach within supply chain management.

Information sharing in a supply chain has a number of positive impacts on its efficiency [2-5]. This is also a reason why there is a massive spread of advanced information and communication technologies (ICT) in corporate management [6], and also among small and medium-sized enterprises (SMEs) [7,8]. However, it is not only availability of suitable ICT what is the main condition of effective information flow management as it is the people who decide what will be shared and how. That is why the main barrier to effective information sharing within a supply chain is most often seen in insufficient confidence between a company and its business partners [9].

Obviously, the basis of successful supply chain management is willingness to share relevant data, information and knowledge with all the supply chain entities. However, there is still a question what information it is important to share and how companies are willing to provide their business partners with such information. Therefore, the paper aims to identify the importance of selected information for effective purchase and sales management and the willingness of companies to provide their key business partners in the supply chain with this information in Czech chemical industry SMEs. To achieve these targets, the structure of the paper was arranged as follows. Chapter 2 summarizes the theoretical background of the research focussing on the

contents of information shared within a supply chain. Chapter 3 specifies the applied research methods. Chapter 4 presents and discusses the achieved research outcomes, and the last chapter, Chapter 5, summarizes the main conclusions of the research, including specification of the limitations and recommendations for future research.

2. CONTENTS OF INFORMATION SHARED WITHIN A SUPPLY CHAIN

A lot of professional literature authors have tried to identify the contents of information that is shared or that should be shared within a supply chain. Ovalle and Marquez [10] categorize this information into three basic groups, namely product information, information about the demand, information about payments and the stock level. Fiala [11] divides this information by the supply chain entity it is shared with, i.e. into supplier information, manufacturer information, distributor and seller information, and information about the demand. Lotfi et al. [13] identify seven categories of shared information, specifically stock information, sales data, sales forecasting, order information, product ability information, new products information, and other information. In addition to that, Ramanathan [12] defines information that is relevant to share within the supply chain to improve forecast accuracy. It includes daily/weekly sales, order, local forecast, competitor information, inventory, sales promotion, seasonal sales, historical sales, government policy on export and production, and discount sales. The opinions of the above authors basically do not differ in the type of shared information, but rather in the rate of detail according to which the given information is classified. Information that is shared most often is that directly related to preparation and implementation of the material flow in the supply chain, but also information connected with financial management of the supply chain (information concerning payments, profit margins, etc.).

Some information is not of the same weight, or it is not necessarily of the same benefit for all the supply chain entities. The research shows that the type of shared information differs in relation to the position of the company in the supply chain [12], but also in relation to the industry [14]. Ramanathan [12] identifies five factors affecting managers when choosing information to be shared with the supply chain partners - cost, usability, reliability, action-ability, and capability. Combination of the rate of effects of the mentioned factors, which might depend not only on the company type, but also on the personality type of the manager, creates uncertainty in the fact which information is considered as important for sharing and which is actually shared.

The fact that people make decisions about which information is shared with the business partners may represent an obstacle to effective communication. Fliedner [15] identifies the main behavioural problems of effective communication, which are fear of information misuse and lack of confidence. That is decisive in the area of communication when building long-term partnerships is accuracy, timeliness, and reliability of shared information. A partnership can only be successful if all the three aspects are fulfilled [16]. In addition to that, Ofek and Sarvary [6] hold the opinion that the relationship between the rate of information sharing and firmness of business relationships is reciprocal. If supply chain partners are willing and able to share confidential, but decisive information, this could result in a very firm relationship between them.

The decision about what information is to be shared within the supply chain itself still does not necessarily lead to its effective management. What is of the same importance is the way of sharing information and the business partner's ability to use the shared information properly. However, it is identification of information that is important for individual supply chain entities and which the business partners are willing to share at the same time what is the first step when setting successful communication between supply chain partners.

3. RESEARCH BACKGROUND

A primary research was conducted to verify the rate of willingness to share relevant information between chemical industry SMEs. The research tried to identify the importance of information (in purchase and sales departments of the companies) and willingness to share such information with their key business partners (a

supplier or a customer). As the addressed managers were both from purchase and sales departments of the companies, comparative analysis of the respondents' attitudes on top of that made it possible to assess whether the companies are willing to share just the information the business partners consider as important.

The targets were to be achieved using the method of a quantitative research conducted in the form of online questioning through a structured questionnaire. The survey involved 433 companies (the database of Czech tax entities ARES) with less than 250 employees, whose registered main sphere of economic activity is manufacturing of chemical substances and chemical preparations (CZ-NACE 20+). The data were collected in April and May 2018 in two stages because both the purchase and the sales departments of all the companies were addressed. To increase the return rate of the questionnaires, the selected respondents (purchase/sales managers) were addressed twice in each stage. Nevertheless, 40 completely filled-in questionnaires were obtained from the purchase departments, and 29 completely filled-in questionnaires were obtained from the sales departments of the 433 addressed companies.

The research tried to identify the importance of and willingness to share information about future customer demand (hereinafter referred to as Forecasts), information about extraordinary fluctuations in supplies/purchases (Extraordinary Supplies), information about the demand, competitors and market development (Market), information about the business partner's stock level (Stock), information about the business partner's free manufacturing, transport or warehousing capacities (Capacities), information about the business partner's product and technology innovations (Innovations), information about the business partner's manufacturing costs or profit margin (Costs), and information about the order settlement status (Order Status). Only the sellers were inquired about the importance of information about the future customer demand, while only the purchasers were asked about the importance of information about the order settlement status (and the other way around when asking about the willingness to share this information).

The importance of information was assessed using a 7 point scale (where 1 = totally unimportant, 7 = extraordinarily important). The willingness to share information was assessed through a dichotomous scale (yes/no). Providing a respondent was not able to evaluate their company's willingness, they could mark the questionnaire option "I cannot assess" (the data analysis assessed these cases as missing values, and they were not included in calculation of the frequency of willing respondents). Within the assessment of the willingness to share information, the respondents were asked to specify their key business partner through several classifying variables. The subject matter of the identification was the fact whether the business partner is an industrial processor or a reseller (e.g. a wholesaler, a retailer, a distributor), which territory the business partner comes from, how long they have been in the relationship with the business partner, whether there is any property interconnection between the company and the business partner, and what is the company's bargaining power within the relationship with the business partner.

The data were analyzed using the descriptive and inferential statistical methods in the environment of the IBM software of SPSS Statistics. The importance of information was assessed through the arithmetic mean. The statistical significance of differences in the average importance of information between the purchasers and the sellers was verified by the ANOVA test at the level of significance of 5 %. The willingness to provide information was assessed through the relative frequency of respondents who declared to be providing the given information or to be willing to provide their key business partner with it providing they are interested in it. The statistical significance of the differences in frequencies between suppliers and customers was verified through the Fisher's exact test at the level of significance of 5 %. The attitudes of suppliers and customers were cross compared using attitude maps (scatter diagrams), where the coordinates of each point corresponds to the average importance of the given information (the horizontal axis) and the frequency of respondents willing to provide the information (the vertical axis). The values on both axes were standardized to normal distribution (so-called z-scores).



4. OUTCOMES AND DISCUSSION

The first part of the analysis identifies the importance of information from the point of view of SME purchasers and sellers. Information of the highest importance from the point of view of purchasers was that concerning extraordinary fluctuations in supplies and the course of settling orders. On the other hand, what was most important for sellers was information about future customer needs and about the demand and market development. The importance of information about markets and innovations was significantly higher for sellers, which is probably caused by the fact that analysis of the market, competitors, customers, and also the need to be able to adapt to changes in their requirements, is a common part of work of employees of corporate sales departments. **Table 1** summarizes the outcomes of the importance analysis, including the outcomes of the tests verifying the differences between the sellers' and the purchasers' attitudes.

Table 1 Importance of information for effective purchase/sales management [own study]

Information	Average Importance			ANOVA test	
	Total	Purchase	Sales	F	Sig.
Forecasts	6.3	x	6.3	x	x
Extraordinary Supplies	6.0	6.3	5.7	2.859	0.096
Order Status	5.9	5.9	x	x	x
Market	5.3	5.0	5.9	7.484	0.008
Stock	5.0	4.9	5.1	0.330	0.567
Capacities	4.7	4.9	4.5	1.097	0.299
Innovations	4.6	4.1	5.3	8.303	0.005
Costs	3.8	3.7	3.9	0.137	0.712

Generally, the most important information for SMEs is that about the volume of future sales to customers and supplies from suppliers as this information enters directly almost all the decision-making steps relating to preparation and implementation of the material flow. By contrast, information about manufacturing costs and profit margins belongs to information with the lowest perceived importance, which points to a low tendency of SMEs to integration with their business partners in the area of financial management. What is a surprising outcome of the research is relatively low importance of information about the stock level, even though according to Lotfi et al. [13] it is information that is most frequently shared in the supply chain.

A follow-up analysis aimed to identify the willingness of SMEs to provide their key business partner in the supply chain with information. Purchasers were most willing to provide the suppliers with information about their future needs and extraordinary fluctuations in purchases. On the other hand, sellers were most willing to provide their customers with information about extraordinary fluctuations in supplies, the order settlement status, and innovations. Almost none of the addressed SMEs were willing to provide their business partners with information about their manufacturing costs and profit margins. With the exception of information about innovations, which SMEs are significantly more willing to provide to their customers than to their suppliers, the purchasers' and sellers' attitudes to willingness are comparable (i.e. the willingness to provide the suppliers and the customers with the given information is comparable). **Table 2** shows the overall outcomes of the willingness analysis, including the outcomes of the tests verifying the differences between the sellers' and the purchasers' attitudes.

The analysis outcomes will probably not be significantly distorted by the type of key business partner (who was chosen by the respondent within the questioning). The thing is that the researched sample comprised even representation of manufacturers (58 %) and sellers (42 %), partners from the Czech Republic (54 %) and from abroad (46 %), companies with differently powerful negotiation positions (61 % of the companies declared a comparable negotiation position) and with different duration of the partnership (45 % of the companies

indicated duration up to 10 years, 55 % of the companies longer than 10 years). In almost all of the cases, there were no capital ties between the companies (97 %). It was not possible to consider any differences in the attitudes to willingness to share information depending on the type of business partner as significant in view of the small range of the analysed set.

Table 2 Willingness to provide information to the key business partner [own study]

Information	Willingness (% of Cases)			Fisher's Exact Sig.
	Total	Purchase	Sales	
Forecasts	100	100	x	x
Order Status	97	x	97	x
Extraordinary Supplies	96	92	100	0.255
Stock	71	75	66	0.430
Innovations	69	50	93	<0.0005
Market	65	68	59	0.599
Capacities	60	59	61	1.000
Costs	6	5	7	1.000

The last part of the analysis compares the purchasers' attitudes to the importance of information with the sellers' attitudes to willingness to share it, and vice versa. The outcomes of both comparative analyses are part of the attitude maps in **Figure 1**.

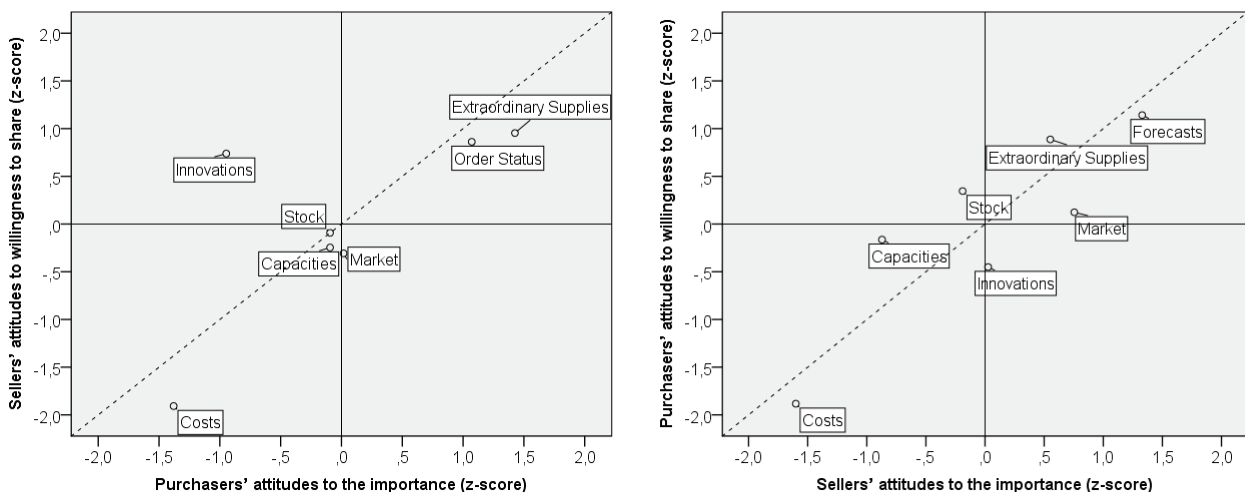


Figure 1 Attitude maps of the importance of information and willingness to provide it to the key business partners in the supply chain [own study]

The z-scores are situated close to the diagram diagonal on both attitude maps, i.e. the area of the diagram where the identified importance and willingness are in harmony (positive correlation). This implies that SMEs are willing to provide their key business partners just with the information their partners consider important. For this reason, it is not possible to consider lack of willingness as a barrier to effective communication between SMEs in chemical industry supply chains.

5. CONCLUSION

The primary research implies that the most important information for effective purchase and sales management in SMEs is that about the future customer demand, information about extraordinary fluctuations in supplies/purchases, and information about the order status. It is information SMEs already share with their key business partners or they would be willing to share. The identified high rate of willingness to share relevant information is in direct contradiction to the opinion of professional literature, which considers lack of confidence as the main barrier to effective information sharing within a supply chain. This might be caused by specifically selected respondents (SMEs in the chemical industry), but also by the territorial specifics of the Czech Republic. At the same time, these are the basic limitations of the research outcomes making further generalization of the outcomes impossible. Nevertheless, the identified attitudes of SMEs (particularly the perceived importance of information) can be, in our opinion, generalized to some other related industries.

The relatively high rate of willingness of SMEs to share information may also be caused by the inquired type of information, and particularly the chosen rate of its detail. While providing information of the type of “approximate volumes of future purchases” can be fully acceptable for most companies, provision of manufacturing plans, demand forecasts, and other sales data can be considered as sharing sensitive data. For this reason, we propose focussing follow-up research on identification of the importance of and willingness to share particular data and information from the category of “information about the future customer demand”, which was identified by the research as the most important type of shared information. At the same time, it would be interesting to verify whether the perceived importance of information and willingness to share it depend on the business partner type (the position of the business partner in the supply chain, the partner’s size and negotiation power, duration of the business partnership, property or another interconnection between the partner and the company, etc.).

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