

TECHNICAL EQUIPMENT ALLOWING FLEXIBILITY IN SERVING CUSTOMERS AS A PREREQUISITE FOR STRENGTHENING CUSTOMER RELATIONSHIPS IN THE B2B MARKET

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Abstract

Speed and flexibility of suppliers in meeting the changing demands and preferences of customers definitely contributes to strengthening relationships between suppliers and buyers in B2B markets. Therefore, it is necessary to constantly modernize production, distribution and service equipment and have a flexible manufacturing facility capable of producing high quality products according to specific customer requirements, sufficient capacity of storage space close to customers for the response to special customers' demands, or JIT deliveries, suitable transport means for transporting the products to the customer and modern service facilities. The paper describes the role of the individual elements of technical equipment in strengthening customer relationships and summarizes the results of a quantitative survey among managers of selected chemical industry businesses in the Czech Republic focused on mapping of the perception of the benefits and the actual level of technical equipment for strengthening customer relationships and increasing customer loyalty.

Keywords: value network, relationships strengthening with customers, flexibility, technical equipment of supplier

1. INTRODUCTION

Fast and dramatic changes in customer expectations, competition, and technology are creating an increasingly uncertain environment [1]. From the perspective of the production company, this can be countered by the company by building together with other appropriate entities a value network that may have a different form of the network embeddedness. Thus not only the individual companies, but the entire supply chains compete and encompassment of supply chain management is becoming an important competitive advantage [2]. Network embeddedness captures the extent to which a firm is connected to other firms and in turn, how interconnected those firms are to each other [3]. To increase the success of the value network and its various entities, it is important to strengthen relationships within the value network. To strengthen the relations the company can use various instruments, one of the most important undoubtedly being fast and flexible deliveries by which the supplier (as a production company) secures material needs and requirements of the customer. Flexibility is the organization's ability to meet an increasing variety of customer expectations without excessive costs, time, organizational disruptions, or performance losses [1]. However, this requires adapting technical facilities in the supply company. The company has to build a logistics system, and within it a production system that is capable of speed and flexibility in relation not only to direct customers, but that will also increase the flexibility of the entire value chain (network). According to Zhang [1] manufacturing flexibility, a critical dimension of value chain flexibility, is the ability to produce a variety of products in the quantities that customers demand while maintaining high performance. It is strategically important for enhancing competitive position and winning customer orders.

It is often the development of cooperation, especially in the field of material flow management and application of JIT principles and methods based thereon, such as Quick Response (QR), Collaborative Planning, Forecasting and Replenishment (CPFR) and others, that becomes a very important means of increasing the speed and flexibility of individual links and the entire value chain, or the value network, as the case may be. Direct involvement of several (or even all) subjects of the value chain, or the network, can radically affect the

success of individual links and that of the entire group. Frolich and Westbrook [4] and Chen [5] and Fung [6] also found that manufacturers with the most extensive integration with suppliers and customers showed the best performance improvement. But to effectively manage the network, firms have to mobilize and coordinate the resources and activities of other actors in the network [5], [6]. Then it means to customize own (i.e. the company's) technical facilities not only in relation to the direct customer. The technical means used for fast and flexible operation must become an integral part of the entire technical system within the value network. With regard to the unquestionable importance of the company's technical support in strengthening relations in the value network, this article discusses the role of individual elements of the technical support facilities in strengthening customer relationships and summarizes the results of a quantitative survey among managers of selected chemical industry businesses in the Czech Republic focused on mapping the perception of benefits of technical support for strengthening relationships with customers and increasing their loyalty.

2. THEORETICAL BACKGROUND

The flexibility of each entity in the value chain (network), as well as value chain flexibility includes product development, manufacturing, logistics, and spanning flexibilities [6], [7]. It enables firms to introduce new products quickly, support rapid product customization, shorten manufacturing lead times and costs for customized products, improve supplier performance, reduce inventory levels, and deliver products in a timely manner [7]. Value chain flexibility supports delivery flexibility as the ability to change the product mix and to reallocate the firm capacity to accommodate customer rush or special orders [8]. Ketokivi [9] defined delivery flexibility, "as the ability to accommodate last-minute changes to order quantities, small-batch deliveries, fast deliveries, and higher on-time delivery rates."

To achieve delivery flexibility as well as value chain flexibility, the company needs a suitable production system comprising manufacturing flexibility, a storage system with sufficient capacity, appropriate internal equipment and favorable allocation allowing formation of stocks, which creates barriers especially to the supply management system failure on the basis of JIT and other methods (QR, CPRF, etc.), a suitable transport system for the physical transfer of products to customers and appropriate service equipment to ensure high quality, safe and efficient use of the products.

For the production system to be deemed appropriate, it must be capable of all these types of flexibility [10]:

- Machine flexibility "refers to the various types of operations that the machine can perform without requiring prohibitive effort in switching from one operation to another" [11].
- Process flexibility is the ability to change between the production of different products with minimal delay.
- Product flexibility is the ability to change the mix of products in current production, also known as mix change flexibility.
- Routing flexibility is the ability to vary the path a part may take through the manufacturing system.
- Volume flexibility is the ability to operate profitably at different production volumes.
- Expansion flexibility is the ability to expand the capacity of the system as needed, easily and modularly.
- Operation flexibility is the ability to interchange the sequence of manufacturing operations for a given part.
- Production flexibility is the universe of part types that the manufacturing system is able to make. This flexibility type requires the attainment of the previous seven flexibility types.

If a manufacturing system should be capable of flexibility, it is necessary that the requirement for speed and flexibility be incorporated in the very design of the production system. This means in particular to choose such technologies that can be implemented in multi-purpose manufacturing facilities, if possible spatially arranged

according to the technological conformity of the machinery. The spatial arrangement must support the intent of high speed and flexibility, i.e. it must allow for an optimal material flow. That should ensure maximum continuity of movement of material within the production process, the maximum limit of material handling on the entry to and exit from the manufacturing facility and the exclusion or limitation of delays in material transfer between the two operations [12, adapted].

Directness and, if possible, the shortest path of material flow and its simple course are the basis in determining the spatial arrangement of individual machines, equipment and workplaces not only inside the facility, but also inside individual production facilities in the company [13].

A difficult problem is connected with the determination of the size and distribution of the production capacity. The size of the production capacity must by all means be adapted to the intended purchases, but in general it is recommended to increase it with the reasonable capacity reserve. Consequently, it is necessary to solve its arrangement. To increase flexibility in meeting the requirements of customers, it appears to be a suitable solution to acquire several production facilities with a smaller capacity than one large facility. The distribution of the total capacity into several constituent capacities means greater flexibility while maintaining the production economy, as there are fixed cost savings with partial capacity utilization and enormous costs associated with changes in the range of products that occur in serial productions [13].

A flexible manufacturing system is a critical factor for achieving flexibility of the producer (as a supplier) and flexibility of the entire value chain, or the network, as the case may be. The more flexible and reliable the manufacturing system is, the fewer inventories we need to create. However, it is usually impossible to completely dispense with the storage capacity as it allows excluding various fluctuations in the process of replenishment (due to fluctuations in demand and sales as well as in the process of physical delivery of materials and raw materials). In addition, storage helps improve customer service and it can also bring economic benefits representing direct cost savings [14]. If there is a possibility of hiring a suitable storage capacity (in terms of capacity, equipment and location) from specialized entities, this possibility seems to be more convenient in terms of flexibility.

Also, the transport system has a significant impact on the speed and flexibility of the supplier. To ensure its flexibility (as a necessary condition for fast, flexible and reliable deliveries), businesses often resort to outsourcing transport. According to Solakivi et al. [15] transport activities are outsourced to a large extent. Cost savings together with flexibility and customer service were found to be the major motives for outsourcing. If businesses do not decide to outsource transport services, they often team up with various types of autonomous transport middlemen and intermediaries that organize and/or provide a part or even all of the physical transportation to customers. However, if the company intends to make use of independent entities while implementing transport operations, it needs to choose the best partner or partners and develop relationships with them based on partnership and mutual benefit similarly as with suppliers and customers [13].

3. PRACTICAL RESEARCH

3.1 Methodological bases

The aim of practical part is to summarize the results of quantitative marketing research among managers of selected chemical industry businesses (industrial explosives, organic semi-finished products and specialties, organic dyes and pigments and nitrocellulose) in the Czech Republic focused on mapping of what is their perception of the usefulness of various aspects of technical equipment for strengthening relationships with customers. This quantitative research was carried out using the method of personal interviews using a semi-structured questionnaire at the April of 2013 among 47 managers of selected SBUs working in the top, middle and first line management. The respondents were those managers of the chemical business units that are part of the internal value network of SBUs, are in direct contact with customers and directly participate in creating

and increasing the value to them and the value of relationships. With the exception of the open-ended questions, evaluation of the research was carried out using the statistical program IBM SPSS Statistics, version 21 and by synthesis of the obtained findings.

3.2 Experimental part

The research objective was to find out the beneficial effect and the actual level of individual components of flexibility of the contractor and conditions for ensuring it thanks to the technical equipment from the point of view of managers in chemical production enterprises who come into contact with the customers and who participate in making offers and increasing the value for them.

In a subsequent quantitative research, the managers of the companies surveyed rated the benefits and the actual level of the individual aspects of the flexibility of the contractor in serving customers and conditions for ensuring it thanks to a sufficient standard of the technical equipment for strengthening relations with customers on multi item scales. All scales were in 7-points from 1 - extremely low to 7 - extremely high.

Given the number of researched SBUs and their managers, we cannot generalize the results of the research on the whole chemical industry. The results have confirmed some hypotheses, while not confirming others, and led to the selection of the factors leading to stronger relationships with customers.

3.3 Results and its discussion

First, we investigated the benefits of aspects of flexibility, as identified in the pilot study [16]. The research hypothesis that all aspects of flexibility in serving customers are very beneficial for strengthening relationships with customers buying the selected chemical products for intermediate consumption was confirmed (see **Table 1**).

Table 1 Benefits of aspects of supplier flexibility in strengthening relationships with customers

Characteristics of supplier flexibility	Statistics				
	Mean	Mode	Percentiles		
			25	50	75
Ability to comprehensively adapt to the requirements of customers	5.5	6	5	6	6
Flexibility in changing customer requirements	5.9	6	6	6	6
Speed of response to extraordinary customer requirements	6.0	6	6	6	7
Speed of processing business transaction	5.8	6	5	6	6
Speed of response and handling of customer complaints	5.8	6	5	6	6

Notes: The scale used from 1 - extremely low to 7 - extremely high

The variability of these views is small, since already a 25% quartile has a value of 5 or 6 with individual aspects of flexibility (rather or very useful), and a 75% quartile of benefit is mostly at the level of 6 (very useful) and up to 7 (extremely beneficial) - with the speed of response to extraordinary requirements of customers. 1-sample Kolmogorov-Smirnov test of conformity of empirical and theoretical distribution did not confirm the normality of the empirical distribution, as there is an obvious slant of this distribution to the right to higher benefits (see average values and mode in **Table 1**). Friedman K-related samples test confirmed statistically significant differences in the experimental distribution of the different aspects of flexibility and subsequent Wilcoxon 2-related samples tests showed that the flexibility in changing customer requirements and speed of response to extraordinary requirements of customers is statistically significantly more useful than the ability to comprehensively adapt to the requirements of customers as well as the speed of response to the extraordinary demands of customers is significantly more beneficial than the speed of processing the business transaction.

To what extent it is possible to further increase the flexibility and speed in serving customers in the B2B market for products intended for further manufacturing depends mainly on the technical equipment of the supplier.

Therefore, the research addressed the possibility of further strengthening customer relationships. The research results confirmed the research hypothesis that the technical equipment of the supplier enabling fast and flexible responses in meeting changing demands and wishes of the customers is very beneficial in most aspects of the technical equipment, but the variability of these views was somewhat higher than in the aspects of flexibility (see **Table 2**).

Table 2 Benefits of aspects of supplier's technical equipment in strengthening relationships with customers

Aspects of supplier's technical equipment	Statistics				
	Mean	Mode	Percentiles		
			25	50	75
Flexible production facility capable of producing products according to specific customer requirements	5.4	6	5	6	6
Technical standard of production equipment to ensure the required quality parameters of products	5.5	6	5	6	6
Adequacy of storage capacity to respond to extraordinary requirements of customers, or JIT deliveries	5.2	5 ^a	5	5	6
Warehouses strategically located near customers	4.6	6	4	5	6
Equipment of storage areas in accordance with legislative and safety criteria	5.3	6	4	6	7
Availability of suitable means of transport for the carriage of goods according to the ADR road regulations	5.2	6	4	6	6
Availability of suitable means of transport for the carriage of goods according to the RID rail regulations	4.2	5	3	5	5
Cooperation in equipping customers with machinery and equipment, enabling better use of the product at the customer	4.6	5	4	5	6
Technical quality of service facilities to ensure the required quality parameters of products and use thereof	5.0	5 ^a	4	5	6

Notes: a. Multiple modes exist. The smallest value is shown
The scale used from 1 - extremely low to 7 - extremely high.

1-sample Kolmogorov-Smirnov test of conformity of the empirical and theoretical statistical distribution did not confirm the normality of the empirical distribution with neither of the aspects of technical equipment, on the contrary, there is again an apparent slant of this distribution to the right towards higher benefits thereof (see the values of averages and modes in **Table 4**). Friedman K-related samples test confirmed statistically significant differences in the distribution of individual experimental aspects, as evidenced by subsequent Wilcoxon 2-related samples distribution tests. Statistically significant differences were only present in the perception of the benefits of sufficient storage space capacity to respond to extraordinary requirements of customers, or JIT deliveries, availability of suitable means of transport for the carriage of goods according to the ADR road regulations and RID rail regulations, strategic deployment of warehouse spaces close to customers and equipment of storage areas in accordance with legislative and safety criteria.

The research showed that there is a very strong dependence between the elements of flexibility and aspects of the technical equipment (see **Table 3**).

Table 3 Spearman's Correlation Coefficients between the aspects of flexibility and supplier's technical equipment

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1.000	.439	.624	.445	.513	.518	.400	.383	.381	.290	.296	.283	.399
2	.439	1.000	.716	.713	.377	.580	.567	.322	.518	.477	.179	.323	.365
3	.624	.716	1.000	.650	.530	.450	.420	.374	.379	.306	.260	.350	.317
4	.445	.713	.650	1.000	.544	.452	.472	.308	.375	.505	.451	.487	.445
5	.513	.377	.530	.544	1.000	.212	.230	.211	.143	.047	.314	.077	.430
6	.518	.580	.450	.452	.212	1.000	.844	.701	.715	.685	.524	.389	.583
7	.400	.567	.420	.472	.230	.844	1.000	.709	.641	.669	.556	.421	.511
8	.383	.322	.374	.308	.211	.701	.709	1.000	.651	.438	.473	.314	.441
9	.381	.518	.379	.375	.143	.715	.641	.651	1.000	.833	.497	.420	.552
10	.290	.477	.306	.505	.047	.685	.669	.438	.833	1.000	.621	.510	.564
11	.296	.179	.260	.451	.314	.524	.556	.473	.497	.621	1.000	.435	.543
12	.283	.323	.350	.487	.077	.389	.421	.314	.420	.510	.435	1.00	.345
13	.399	.365	.317	.445	.430	.583	.511	.441	.552	.564	.543	.345	1.000
14	.235	.295	.209	.304	.166	.653	.519	.526	.664	.680	.589	.381	.774

Legend: 1 to 5 aspects of flexibility - their order is indicated as in **Table 1**

6 to 14 - aspects of technical equipment - their order is indicated as in **Table 2**

CONCLUSION

The primary quantitative research in selected lines of business in the chemical industry confirmed that the speed and flexibility in meeting customer requirements and needs in the B2B market is becoming an increasingly important aspect of servicing the target B2B markets for products intended for intermediate consumption, such as products of the metallurgical industry, or chemical industry, as the case may be. It is very important not only for customers choosing their suppliers, but also when deciding on repeat purchases from a particular supplier. It significantly strengthens relationships between suppliers and customers and increases the loyalty of business partners of the suppliers.

The research confirmed that the flexibility and speed in satisfying customers in B2B markets depends in particular on the technical equipment, as companies need to be equipped with production facilities capable of producing products according to specific customer requirements. The production equipment should be of such a technical quality as to be able to produce products of the required quality parameters of products as desired by customers. The supplier should have a sufficient storage space capacity to be able to respond to extraordinary customer requirements, or JIT deliveries, preferably of strategically located warehouses close to customers and equipped in accordance with legislative and safety criteria for the product category stored. This requires sufficient availability of suitable means of transport for the carriage of goods according to the ADR road regulations and RID rail regulations. Also, cooperation in equipping customers with machinery and equipment enabling better use of the product at the customer or even the availability of service facilities at the supplier that the supplier itself provides to the customer when using or processing the products supplied to the customer. The research showed that in this context there are certain, yet insignificant weaknesses in the supply companies surveyed.

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