Adoption of supply chain management in German agrifood networks

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Abstract: Supply chain management has emerged as cross functional, cross company concept to improve coordination of entire value chains through coordinated actions of all companies. It has received a major push from the availability of Internet-based information and communication technologies. The conditions in certain sectors are favorable for a realization of chain wide supply chain management. In other sectors such as the food sector, however, conditions are more complex and companies and value chains still struggle to exploit the potentials from supply chain management, in particular when it comes to cross enterprise coordination. This paper analyses the case of complex food supply networks and follows the research question why complex networks do not exploit the potentials from cross enterprise supply chain management. It provides empirical results on reasons for and barriers to the adoption of electronic tools for supply chain management.

1 Introduction

Agrifood production is realized in complex network comprising large multinationals and small and medium sized enterprises producing and processing inputs for food production as well as food products. Production and processing in this network involves complex supply chain and logistics processes with complex material and information flows. These processes are often inefficient due to the special infrastructure and conditions in the agrifood production network. Internet-based supply chain management (SCM) offers support potentials for the coordination of supply chain and logistics processes. The potentials provide particular opportunities for supply networks rather than single firms. Information and communication technology (ICT) support potentials regard coordination and efficiency improvements and excellence in a broad sense, not only speedy operations. However, the use of these technologies is low in food networks. This paper has the objective to explore the reasons behind the low adoption rate. The paper is organized as follows: It first gives an overview of the complexity of supply chain and logistics processes in food networks with particular focus on the crop production network (paragraph 2). It then deduces potentials from the use of IT-based SCM technologies (paragraph 3) and provides reasons for the low adoption rate (paragraph 4).

2 Food networks: the crop production network

The supply network for crop production (FH07) is embedded in a complex multi echelon network spanning from process industry and agrochemical producers to crop production in agriculture to be then further processed in the food industry and marketed through retailers. The supply network for crop production uses seeds and agrochemicals, a.o., to produce crop. The output of the crop production network is food, which in general has a high impact on human health and therefore the quality of life. The logistic processes for the distribution of agrochemicals to agricultural producers across wholesalers and traders are influenced by the structure of the supply network and the product and demand characteristics of agrochemicals. The largely increasing number of companies in the distribution part of the network and at the ag-production level and increasing number of process interfaces between companies creates complexity and high coordination efforts. Due to the increasing number of interfaces between suppliers and buyers with farmers are at the end of the lot disaggregation process, the number of orders coordinating the material flow increases while the size of the orders decreases.

The agrifood production network ranging from the input production, the distribution of these inputs, the agricultural production, and the distribution of the agricultural products to the food industry pictures a complex value creation network with a large variety of differently sized companies. Differences in size and owner structure lead to different company cultures. Companies in the network have a wide variety of different IT systems ranging from ERP systems to simple spreadsheet based programs and relating breaks in the information flow. Both traders and wholesale traders distribute many product categories. An important success factor for the traders and wholesale traders is logistic flexibility. Stocks therefore play an important role. On the value chain levels, different degrees of fragmentation are prevalent. As a consequence, suppliers have a large number of customers and vice versa. The different fragmentation degrees require a high level of coordination. Logistic interfaces increase from input suppliers to agricultural production. The network in general is characterized by either one-tier or two-tier distribution. The large number of interfaces creates high complexity and makes coordination of the information and material flows difficult and inefficient.

Relationships in the agrifood production network vary from spot market relationships to long term contracting. The number of small scale orders increases. Agricultural producers often have only one or two regular suppliers on a regional basis. Larger buyers in the network often show a higher price sensibility. Wholesale traders and traders act as both sellers and buyers in the network. Two opposed flows of material and information regarding input and output of the ag production are the consequence. Especially on the distributing levels of the network, the logistic complexity is very high. As a consequence, the chain levels between wholesale traders, traders and ag production and vice versa have a bottleneck character in the agrifood supply and production network. Due to this bottleneck character, efficiency improvements on these levels are a prerequisite and starting point for improvements in order to reach a global optimum in the network.

3 Potentials from supply chain management

Supply chain management across companies is supported by advances in IT-based tools such as advanced planning and scheduling (APS) systems, or concepts such as collaborative planning, forecasting, and replenishment (CPFR), efficient consumer response (ECR) or vendor managed inventories (VMI) and improvements in mathematical optimization of supply chains (DNP04). For the logistic inefficiencies in the bottleneck of the agrifood network, ICT-based improvement potentials regarding logistic performance and cost objectives need to be identified. For the main inefficiencies resulting from the as-is analysis, the potentials stated in table 1 exist to improve the situation (see FH06).

Table 1: Inefficiencies and potentials (see also FH04)

Inefficiencies in processes and organization	Potentials from SCM
Inefficiency of order processing, particularly in reception and order placement processes	Process automation to reduce inefficiency, process cycle time and errors, reduce logistic interfaces, realize efficient administration
High number of customer interfaces with high order frequency in demand peaks	Reduction of interfaces through bundling of information flows
Need for high safety stocks due to seasonal demand on input side often leading to large remaining stocks	Targeted offers for remainder of stock and provision of stock information (virtual stock)
Varying qualities and perishability with the need for aggregation and fast turnover, weak information exchange between levels of network/chain	Targeted offers for remainder of stock and provision of stock information (virtual stock)

4 SCM adoption barriers

20 expert interviews were conducted in Germany to explore the barriers to adoption of cross-company supply chain management tools in food networks. The interviews were guided by guideline, which first focuses on the market situation including the type of business relationship with suppliers and buyers, media involved in the information exchange processes between the companies, and the current use of IT-based systems for supply chain management. The second part of the interview guideline asks for barriers for the adoption of other improvement options from supply chain management. The results of the interviews show that in general a positive perception of the Internet. However, Internet-based SCM tools are not considered as suitable for the part of the food network dealing with plant protection and fertilizer. Three major barriers against adoption of SCM tools have emerged, which are considered as much more important than potential advantages (see also table 2): (a) high importance of social contacts in business relations, (b) avoidance of transparency, (c) embedment in traditional company culture.

Table 2: Barriers to SCM adoption in food networks

Improvement potentials from SCM	Stages of the food network value chain			
	Agro-chemical producers	**Wholesalers**	**Traders**	**Farmers**
Process automation	• social relations • resulting trans-parency	• social relations • resulting trans-parency	• social relations • resulting trans-parency • embeddedness	• social relations • embeddedness
Bundeling	• social relations	• social relations	• social relations	-
Virtual warehouse	• resulting trans-parency	• resulting trans-parency • embeddedness	• resulting trans-parency • embeddedness	-
SCM-platform, e-marketplace	• resulting trans-parency	• social relations • resulting trans-parency • embeddedness	• social relations • resulting trans-parency • embeddedness	• social relations • resulting trans-parency • embeddedness

4 Conclusions

The exploring interviews have shown that the personal contact and the personal relationship is a value-adding element of the exchange relationship. To foster the adoption of Internet-based SCM-tools in food networks, multimedia technologies supporting the personal contact are important and available and, e.g., when it comes to the use of videophones or similar technologies, enhanced options for the creations of personal contacts are available as opposed to the traditional telephone. When it comes to the prerequisite for SMC, the increased collaboration on horizontal chain levels or across vertical chain levels, however, the barrier of the unwillingness to cooperate is more principal and more difficult to overcome.

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