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# **Managing supply chains successfully: an empirical testing of success of supply chain networks in the German fish sector**

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# Managing supply chains successfully: an empirical testing of success of supply chain networks in the German fish sector

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**Abstract.** Increasing consumer requirements for quality, safety and environmental sustainability of seafood products are recognized as the driving forces of vertical cooperation in the fish sector. Cooperation among the participants of the fish chain becomes apparent in formation of so-called supply chain networks that embody multilateral coordination and address more than just the goals of individual organizations. This requires that supply chain networks are successfully managed. Yet, it is not clear up to now what the success of supply chain networks is and how it can be measured. Therefore, this study aims to develop and test the model of the supply chain network success. We test the model empirically using Partial Least Squares Structural Equation Modeling based on the survey of 90 leading specialized fish retailers in Germany. We discuss our results and derive implications for fish chain management.

**Keywords:** Supply Chain Networks, Fish Sector, Success, Germany.

## 1. Introduction

Fish and fish products are the most traded food products in the world today (FAO 2006). Capture fisheries and aquaculture supplied the world with about 110 million tons of food fish in 2006, providing an apparent per capita supply of 16.6 kg (live weight equivalent). Despite such “popularity”, the confluence of growing demand, improved harvesting technologies, limited regenerative capacity of fish populations and the lack of property rights have led to failure in achieving sustainable fish supply (Botsford et al. 1997). In addressing the issue of sustainability, fish production in aquaculture is discussed as a possibility to bridge the gap between supply and demand. Aquaculture has been the fastest growing food production sector in the world over the past 30 years (FAO 2006). Yet, the majority of the food fish supply (83.3%) is still provided by capture fisheries (FAO 2006). In this context, there are several factors in the fish supply chain that are crucial for its sustainable development.

First of all, fisheries rely on a renewable resource that is under escalating pressure as population growth and technology development have progressed. The catch of wild fish is characterized by variations in the supply of raw materials caused by stock variation, weather conditions, fishing effort, and governmental regulations. These phenomena produce uncertainty and unstable market conditions, especially for fresh seafood products (Hanssen 1996, p. 28).

Second, the fish sector faces a number of challenges on the demand side. The demand for fish and fish products has been steadily growing due to enhanced distribution processes that encouraged global trade and emergence of new products entering the market (Hameri and Pálsson 2003). Except for the demand for quantity, quality requirements towards fish products increase. As a raw product, fish is a fresh and perishable food product, and must be delivered to the processor in the shortest time spans. Given the latent perishability and increased public concerns about quality, quality assurance mechanisms become increasingly important in the sector (Várdi 2001; Roheim Wessels 2002). When discussing quality concerns, it is important to remember that not all of the quality aspects are of equal concern. There are different interests in quality due to the final product market for fish. Thus, concern about quality is higher for fresh consumer products than for highly processed products. However, one must consider that quality issues reflect not only freshness, taste, color or smell but also the method of harvest, how the fish is handled after landing, and timeliness of delivery (Thorpe and Bennett 2004). Additionally, quality control is conducive to reducing the cost of recall goods. To lower the risk of uncertainty, high quality, large volume and predictability in both quality and volume have to be taken into account (Pinkerton 1994).

Given all these factors, Anderson and Valderrama (2009) argue that the companies that can address these problems will be the leaders in international seafood business.

Summarizing, the challenges of increasing consumer requirements for quality, safety, and environmental sustainability of seafood products and the demand for continuous supply are recognized as the driving forces of vertical cooperation in the sector (Hameri and Pálsson 2003). Vertical cooperation becomes apparent in the formation of so-called supply chain networks in the fish sector. Supply chain networks encompass long-term and recurrent relationships among more than two supply chain actors (Omta et al. 2001). They also embody multilateral coordination and address more than just the goals of individual organizations (O'Toole 1997). Thus, supply chain networks are strategic, goal-oriented networks that have strategic importance for organizations constituting them (Gulati et al. 2000; Provan and Kenis 2007). Notably, a sustainable supply chain network will only be established when tangible benefits occur for the actors in the network (Kaiser and Edwards-Jones 2006). The above issues of quality, safety and sustainability together with goals of the individual network actors require that supply chain networks are appropriately managed. In this context, we argue that understanding of how to manage a supply chain network successfully can be achieved only if one understands what the success of supply chain network is.

Therefore, our aim in this paper is to develop and test the model of supply chain network success. Specifically, in the view of strategic nature of supply chain networks, we recruit the constructs that are widely addressed in the strategic chain management literature and that may play substantial role in achieving and sustaining competitive advantage for those firms participating in the fish supply chain networks.

The paper is structured as follows. We first provide the description of the fish supply chain with the detailed look at the recent tendencies. Subsequently, we describe the theoretical underpinnings of supply chain networks and strategic chain management. Based on these foundations, we further present the model of network success. Adjacent, we describe the methodology and data, and test the model. Finally, we discuss our results and derive some implications for chain management in the fish sector.

## **2. Fish supply chain**

The food chain does not just concern the supply of products but is a series of interconnected flows of goods, services, incentives and information between the different participants in the market chain (Martinez et al. 2006). The fish supply chain can be defined as „a set of interdependent agents (fishers, processors, distributors and retailers/fishmongers) that work together, consciously or unconsciously, to convey fish derived products to the eventual consumer.“ (Thorpe and Bennett 2004, p. 42) The complexity of fish chains has evolved over time since the international fish trade grew due to the integration of the markets and establishment of the extended fishery zones in the 1980s (Thorpe and Bennett 2004).

Suppliers of seafood products to the retail trade are mainly small, individual or exporting companies. They face the same challenges as other food manufacturers confronted by a food retailing sector increasingly dominated by giant retailers operating in several countries and with strict quality, timing and labeling requirements. However, unlike other agri-food industries, the fish sector has the added complication of supply variation and product perishability (Hanssen 1996, p. 27). Larger suppliers are better equipped to import fish and benefit from less volatile international markets. Therefore, some supermarkets have bypassed distributors completely, sourcing their fish directly from processors. The effect of these changes is a coordinated supply chain with fewer but more highly integrated agents.

The retail food system has experienced deep and rapid structural changes over the last 2 decades in all European countries. Increased centralization in the retail sector implies that suppliers have to redefine their structures and strategies to match those of powerful retailers. Consequently, the fishmongers in Germany have lost their market share of total fish consumption from 10 % in 2000 to 5 % in 2007, whereas, in the category of fresh fish, fishmongers recorded a market share of 26% (Fisch-Informationszentrum). Fishmongers are considered to be the ones that offer the highest quality to consumers. Another important fact for consumers buying their fresh fish products at fishmongers is the trustful relationship (de Felipe and Briz 2004) which is higher among consumers and fishmongers than consumers and other retailers. In order to maintain the consumers' confidence, the need for consistent standard and vertical cooperation in the chain will grow in the future. For this reason, retailers have to

build long-term relationships with their fish suppliers in terms of strategic partnering. In broader sense, this means that all companies in the fish supply chain are actively working together, i.e. collaborating.

Collaboration is characterized by information, knowledge, risk and profit sharing (Mentzer et al. 2000, p. 53). One of the main issues that require collaboration among participants of fish supply chain is sustainability. The sustainable seafood movement is taking place in only a few of the world's major seafood markets, mainly the EU and USA (Roheim 2009). Generally, these movements are initiated and run by environmental non-governmental organizations (NGOs) like Greenpeace, or at least private non-profit organizations. These initiatives aim to tap into growing consumer demand for environmentally preferable products, channeling purchasing power towards seafood products from sustainably managed fisheries and aquaculture activities. This caused the German fish processors to sign a negotiated agreement "Initiative to promote sustainable fisheries" already in 1996 with the aim to include sustainable supply in their purchasing agreement and to specify origin. However this initiative was not widely shared by retailers. Only since Greenpeace in Germany has first published its supermarket-ranking for fish products in 2007, many retailers have decided to reconsider how they purchase fish and fish products and have begun to institute ecological measures. The results of Greenpeace's ranking in 2008 showed that 8 out of 11 retailers started to implement better purchasing policy (Greenpeace). Norma, Kaufland, Aldi süd, Rewe and Lidl were under the retailers with the most positive development in improving their responsibility. One criterion for the ranking was the public policy of fish purchasing which was satisfyingly provided by all retailers except Lidl. By that time Lidl had good purchase principals but did not publicize anything of it. The reaction of Lidl to Greenpeace's supermarket-ranking was a change in the strategy of information policy. Lidl now presents on its webpage in detail its purchasing policy and also the criterion behind its labels like the label of Marine Stewardship Council (MSC). Lidl brought out its first MSC fish products in October 2006 and has continually expanded its range of MSC products since then.

One of the most popular instruments of guaranteeing certain standards are labels. Whereas in aquaculture each traceable unit can be labeled from the very beginning, capture fishing experiences some practical problems. It is obviously impossible to tag wild fish at birth. Furthermore, the surveillance of the marine capture fishery activities is very demanding. The only major international eco-label program for capture fisheries is the Marine Stewardship Council (MSC). The MSC was established in 1997 by the World Wildlife Fund and Unilever. Its purpose is to increase the long-term supply of fish through promoting better management of fisheries. The eco-label signifies those fisheries that manage their fisheries successfully for a maximum long-term yield (Ward 2008). Although not without criticism from some parts of the conservation movement, there can be little doubt that the MSC is able to yield benefits both from an environmental and economic perspective (Kaiser and Edwards-Jones 2005). Processed fish products can be easily labeled so that credence attributes can be transformed to search attributes that allow the consumer to judge quality of the good before purchase (Roheim Wessels 2002). The UK, Switzerland, and Germany are the leading markets in terms of numbers and volumes of MSC-labeled products sold. MSC products can be purchased in 41 countries but no other country sells as much MSC-labelled good as Germany. There are more than 300 products that carry the MSC-label in Germany. First attempts have been made to label also fresh sold fillets or whole fish at the retail counter. However, based on the market research, it is not clear that the consumers themselves are driving the demand for eco-labeled products. Rather it seems, in particular in Europe, where most of the action is happening with respect to eco-labeled products that retailers and processors are creating the market (Roheim 2009 p. 87).

Proposed explanations show that the establishment of sustainable supply chains requires profound levels of organization and strong links between fishers, producers and retailers. To meet consumer demands as well as governmental and non-governmental requests, effective governance mechanisms are evermore important. As a result, strictly coordinated chain organizations named also supply chain networks have emerged. In the next section, we present the theoretical background of supply chain networks and their management.

### **3. Theoretical background**

#### **3.1. Supply chain networks**

The above developments indicate the need for optimization of vertical interfirm relationships in the fish sector. Optimization of resource and information flows in the fish supply chain leads to tightening of

vertical relationships between chain actors and formation of vertically cooperating interfirm networks. Embeddedness of firms in networks allows rapid sharing of sensitive information with suppliers and buyers, develops appropriate level of interfirm trust, and provides an enduring competitive advantage which becomes apparent in gaining higher sales, reducing lead times and logistics costs (van der Vorst et al., 1998). In the food sector, such networks are defined as “supply chain networks” (SCN) (Lazzarini et al., 2001). Under a supply chain network we understand the joint and cooperative behavior of companies that are related by vertical product and information flows in the supply chain in order to provide a product or service to the end consumer. The objective of most of the supply chain networks is to produce higher quality and/or higher efficiency by cooperation rather than by full integration of the supply chain or by market transactions (Lazzarini et al. 2001; Neves 2003; Zylbersztajn and Farina 1999). SCN can be characterized as pyramidal-hierarchical interfirm collaborations (Jarillo, 1988), which possess a focal firm that coordinates them. The focal firm is recognized by the consumers as “responsible” for the specific food product. In the case of the processor-owned brand, the focal firm is the processor, and in the case of the distributor-owned brand, it is the retailer acting as the focal company. Within such pyramidal-hierarchical strategic networks, the focal company (or chain captain) is liable with its reputation for each product being produced by its SCN. The increasing importance of reputation or brand image can be observed for example by the retailer’s efforts to create a brand for its own company (Hanf and Hanf 2007). Since the chain captain is liable without limitation for the correctness of the production, i.e., for all credence characteristics, it must be familiar with the network’s structure to avoid any type of defect within the entire network.

Hence, the focal company has to set incentives to create a situation, in which every actor has self-interest to secure the sustainable stability of the whole network (Picot et al. 2003). On one hand, these incentives must be of monetary nature to create a short-term win-win situation (i.e. higher profits). On the other hand, the incentives have to be of non-pecuniary nature to create a long-lasting “unique relationship proposition”, which cannot be imitated easily by competitors. Exclusive benefits can include higher profits or joint growth in the future. Nevertheless, for some participants of the network this might be just to stay in business. The cooperation in SCN relies on confidence and understanding. These characteristics have to grow over a long time and create the space to achieve a superior joint solution of a problem (Hanf and Kühl 2005).

Especially in the food business, where numerous small- and medium-size enterprises (SME) are active, cooperative networks give those enterprises the chance to concentrate on their core competencies. By cooperating, SME can better exploit their core competencies and reduce at the same time the inherent risk by focusing on single activities. In turn, the focal company has to consider that such companies do not dispose of a sophisticated IT-infrastructure and high manpower. Additionally, single SME do not dispose of a sufficient quantity of commodities in order to supply the whole demand of the network. Particularly, for agricultural and seafood goods, the total amount of supply needed has to be delivered by various suppliers. For this reason, cooperation has to be installed being managed by the focal company itself or by a system supplier.

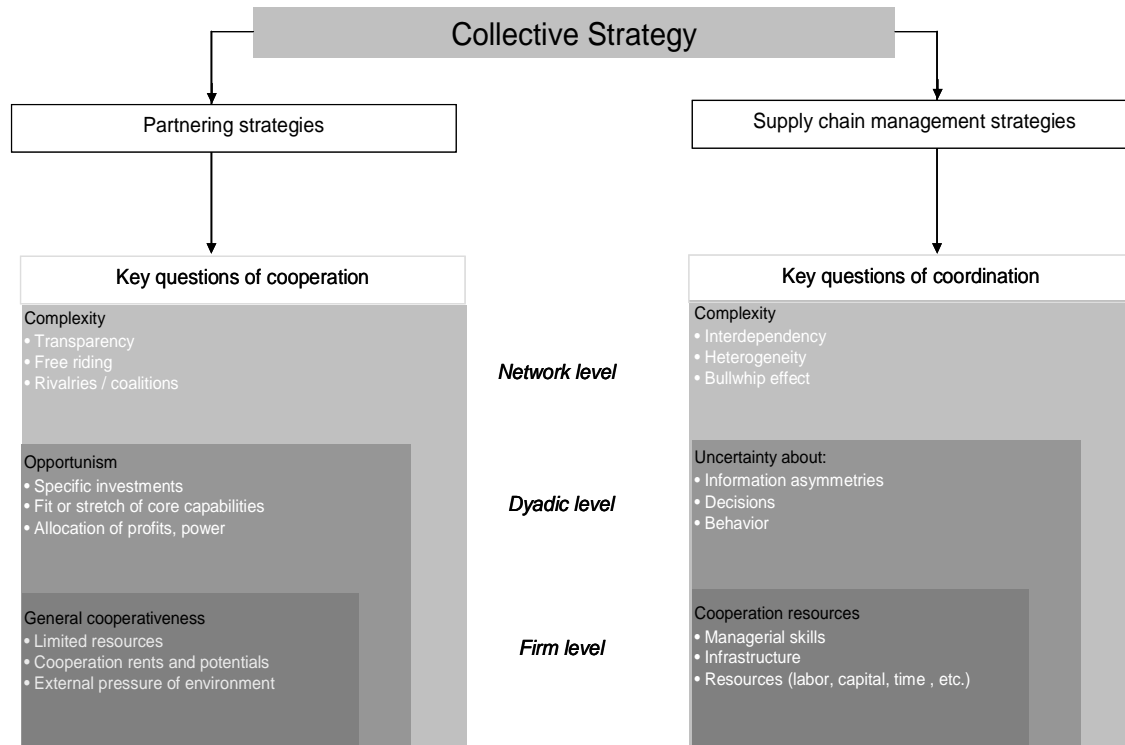
### **3.2. Supply chain network’s management**

Structuring of exchange relationships with the supply chain partners requires that the supply chain network’s management, i.e., primarily the focal company, properly deals with the problems of two domains – cooperation and coordination (Gulati et al. 2005, Hanf and Dautzenberg 2006, Xu and Beamon 2006). Because problems of cooperation arise due to the conflicts of interests, the cooperation task is to align the interests of the participating actors or, in other words, motivate them to work together (Gulati et al. 2005). The accomplishment of this task is typically addressed by the implementation of partnering strategies that generally aim to design the relationships within the supply chain (Mentzer et al. 2000). More specifically, partnering strategies involve the use of formal and informal mechanisms of cooperation. Formal mechanisms include contracting, common ownership of assets, monitoring, sanctions, rewards and the prospect of future interactions (Williamson 1985, Gulati et al. 2005). Identification and embeddedness serve as informal mechanisms (Granovetter 1985, Kogut and Zander 1996).

The problems of coordination appear as a consequence of uncertainty about the actions of interdependent actors. Therefore, coordination is related to joint actions and can be generally referred to as the alignment of actions (Gulati et al. 2005, Payan 2007). The fulfillment of this task consists in gaining or transferring knowledge about the behavior of interdependent actors and the character of existing interdependences.

The alignment of actions in supply chain networks is addressed by implementation of the supply chain management strategies (Simatupang et al. 2002). Generally, supply chain management strategies involve mechanisms named in the coordination literature. Formal coordination mechanisms include programming, hierarchy and feedback (Thompson 1967) while informal mechanisms incorporate shared experience, leadership, culture, norms and values (Kogut and Zander 1996).

In the process of structuring of long-term exchange relationships within an SCN, the focal company has to take into account that problems of cooperation and coordination appear at the three different levels, i.e., the firm, dyadic and network levels of collaboration (Duysters et al. 2004). In order to preclude or solve problems arising at the three levels, it is necessary to address the partnering and supply chain management strategies simultaneously as components of the overall collective strategy (Figure 1).



**Figure 1.** The framework of strategic chain management (Hanf and Dautzenberg 2006)

A number of studies (Astley and Fombrun, 1983; Bresser and Harl, 1986; Sjurts, 2000) have addressed collective strategies as the type of strategies that are implemented by collaborating organizations to deal with variation in interorganizational environment. In the network context, collective strategies aim not only to shape network processes and relationships but also to ensure the achievement of the specified network outcomes (Sydow and Windeler, 1998). Therefore, we suggest that a collective strategy can be subsumed as a framework of activities to achieve network goals.

Thus, to guide an SCN towards the achievement of its goals, the focal company has to be aware of goals set in the network. Furthermore, simultaneous implementation of partnering and supply chain management strategies does not mean that those strategies have to be addressed equally in a specific SCN. Hence, the focal company has to be aware of the indicators of alignment of interests and of alignment of actions to be achieved. Overall, we posit that 1) goals, 2) the alignment of interests and 3) the alignment of actions are the main components of the SCN success because they encompass the network's specific structural and relational indicators that have to be achieved to sustain competitive advantage for the network members.

#### 4. Model of supply chain network's success

Approaches to defining success of interorganizational systems and collaborations widely vary. A common underlying principle in most interpretations is the achievement of goals (Anderson 1990, Ariño 2003). Yet, to consider SCN goals, a multiple-constituencies approach is needed because there are multiple

parties to an SCN, including each participating firm as an independent organization, the network's management – primarily the focal company in an SCN, and the community – particularly end consumers and the government (Ariño 2003). Similarly to Ariño (2003), we concentrate only on the goals of network members and network management by assuming that they are constrained by the goals of other constituencies and, therefore, reflect them insofar as they are constrained by them. Furthermore, specific network goals considered depend on the particular constituency assessing the achievement of those goals (Provan and Kenis 2007), i.e., the focal company and (partly) other firms in an SCN. Therefore, goals we take into consideration have first been subject to definition based on a review of the literature on food supply chains as well as strategic management and marketing literature. Based on that review, we also implicitly assume that goals of SCN include goals set at the two levels, i.e., network level and firm level. Network-level goals are the goals which can be achieved only if all the network actors work together to achieve them. Given that a SCN is in most cases deliberately arranged by the focal actor, we suggest that such a focal actor is responsible for setting the network-level goals<sup>1</sup>. Firm-level goals are the goals single network members pursue in an SCN, i.e., goals that do not require all the actors to work together, e.g., profits, access to market, etc.

Additionally, based on the literature review, we posit that the constructs of cooperation (alignment of interests) and coordination (alignment of actions) have to be included into the model of SCN success. The alignment of interests and the alignment of actions can be assumed as SCN goals because they are set by the network's management and without their achievement the other network goals cannot be intentionally achieved (Figure 2).

We mentioned before that NGOs like Greenpeace are pushing the issue of responsible fish practices of international retail companies. To take over responsibility in fish purchase retailers act as focal companies and guarantee, for example, the high quality or sustainability of the fish products. The responsible treatment of the goods can be seen as one of the SCN goals that the focal companies want to achieve.

Since 2006 Kaufland - one of the winners of the Greenpeace list - is working on its supply chain to carry only sustainable fish products but they haven't reached their goals yet (Lebensmittelzeitung 2009). Other German retailers have announced to reach similar goals by 2011. To reach those goals, the retail management has to make sure that all involved actors follow the same strategy. In our model we find this strategy divided into the two managerial parts: the alignment of interests and the alignment of actions. As practice shows, focal companies have to allow for both parts in order to reach the network goals.

There are retailers that carry more than 1000 different fish products or products that contain fish. Therefore, it is nearly impossible to keep an eye on every product. It is, thus, necessary that the focal companies target their suppliers to implement purchasing, quality and environmental standards and use sanctions, e.g. discontinuing of articles in the case that suppliers are not willing to accept the standards.

On behalf of those duties, Kaufland opened a new position of a fish coordinator in 2007. The person in responsibility stays in regular contact with suppliers, NGOs and academics. So far this has been a very practical advance for Kaufland also in terms of knowledge transfers.

Another important fact is that the whole management has to incorporate the new strategy and, what is equally important, has to put it not only across all business units but also across all chain partners. One of the strategic goals is to train the staff in order to make sure that everyone in the network understands the network goals and the common strategy to reach those goals. Therefore, some retailers employ field workers, for example in Asia, to have someone who trains the workers on farms, supervises the implementation of the practical guidelines of the retail company and gives feedback to the central office in Germany.

The focal retailers have recognized that they will benefit from the growing demand of fish and fish products only if they ensure their fish supply with high quality and sustainable products and also with competent staff in the long run.

## 5. Methodology

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<sup>1</sup> For example, in the UK, Tesco has formed its own meat supply chain network, setting the network-level goals of food safety and animal welfare and promoting long-term vertical and horizontal cooperation among the network actors to achieve those goals (Lindgreen and Hingley, 2003).



This section explains the survey design, the operationalization of variables, and the statistical procedure used to analyze the data.

## 5.1. Survey design

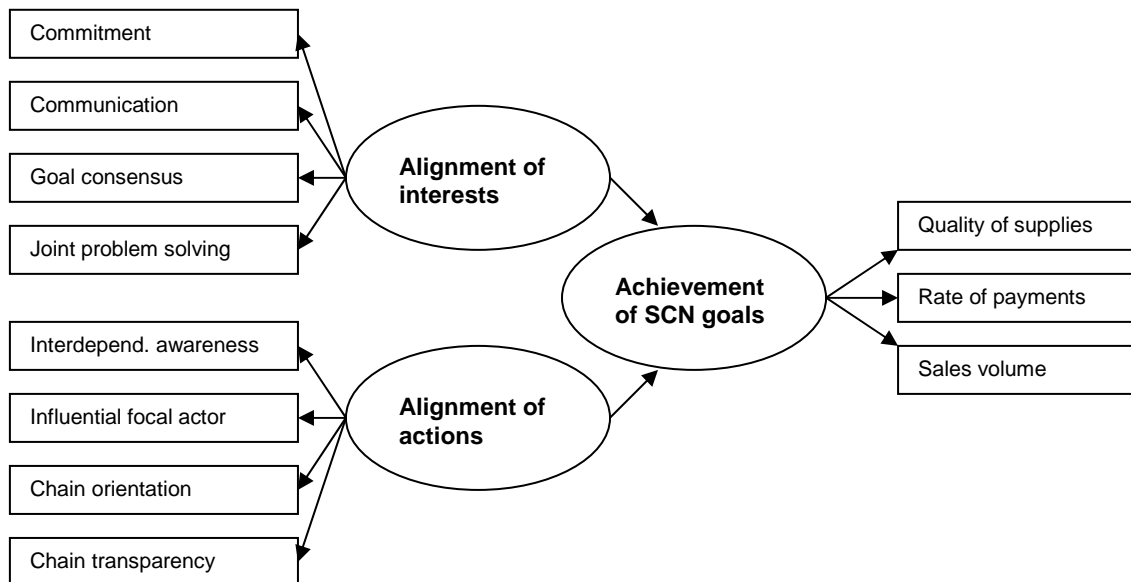
To test the model, data was collected from specialized fish retail firms in Germany from May 2008 to July 2008. We assume a specialized fish retailer to be the focal company in its fish supply chain network, i.e., the company which is most often responsible for the setting and fulfillment of SCN goals and, therefore, is knowledgeable about the network. The database of the firms was obtained from the international gourmet-journal *Der Feinschmecker*, No. 7 “Fisch & Meeresfrüchte” (1<sup>st</sup> quarter 2007). Totally, 90 firms involved in specialized fish retail comprised the database.

Afterwards, a questionnaire was designed based on a review of literature on such variables as embeddedness, power, conflict, communication, and supply chain and strategic alliance performance. To avoid the possibility of consistency artefacts and common method bias (Ariño 2003), we arranged the questionnaire items so that the subjective items appeared prior to the more objective ones<sup>2</sup>. Then, the questionnaire was pretested with five food chain specialists. Those specialists included buying and quality managers of the international food retailers, CEOs of the international standardization bodies and a CEO of non-governmental organization being active in the food business. The respondents were asked to make their comments on the order of questions, wording and format of the questionnaire. Their feedback was considered to modify the questionnaire.

Telephone interviews were used for the data collection. Prior to contacting the potential respondents by phone, they were informed about the interviews by mail. Of the 90 specialized fish retail firms, 31 interviews were conducted. This resulted in a 34 % response rate. Each interview lasted about 20 minutes on average.

## 5.2. Operationalization of variables

We turn now to operationalize the variables used in the model. Corresponding measures were obtained from the literature on supply chain performance, strategic alliance performance, interfirm relationships, marketing and management.



**Figure 2.** Model of supply chain network's success

### Measures of achievement of SCN goals

<sup>2</sup> The questionnaire can be provided by authors upon request.

These measures assess the degree of fulfillment of several goals from the perspective of the focal company. We considered not only the degree to which the network-level goals, i.e., the goals set by the focal company, were achieved but also we asked the focal company to assess the degree of fulfillment of firm-level goals, i.e., those of the other network actors. In each case, a five point-scale measuring the informants' assessment from "very dissatisfied" to "very satisfied" was employed.

In our analysis, the focal company's satisfaction with quality of supplies serves as a measure of the network-level goal achievement. A number of studies indicate that quality is the main driver of vertical cooperation in the food chain (Hanf and Kühl 2005, Ponte 2009). Taking into account that quality of supplies is a multifaceted issue, it requires that the whole SCN works together (Hanf and Hanf 2007). The degree of satisfaction with supplies' quality indicates, thus, how successful an SCN is at the network level. At the same time, suppliers' satisfaction with the rate of payments and the sales volume serves as an indicator of the SCN success at the firm level (Gellynck and Molnár 2008). Thus, within the construct "Achievement of SCN goals" we encompass the goals of all the constituencies of the network, i.e., firm-level goals of suppliers as well as network-level goals set by the focal firm and achieved through collaboration of all the SCN members.

#### Measures of alignment of interests

The construct "Alignment of interests" involves the following measures: goal consensus, communication, joint problem solving, and commitment. Dealing with cooperation problems in procurement relationships requires that the conflicts of interests are resolved or precluded because conflict between the parties can substantially harm those relationships (Mohr and Spekman 1994, Gulati et al. 2005). Therefore, the level of goal consensus among SCN members depicts to what extent the interests within the network are aligned (Provan and Kenis 2007). Additionally, the level of communication among network actors is an important indicator of the alignment of interests because ineffective communication causes conflicts resulting in improperly functioning relationships (Mohr and Nevin 1990). Another measure of interest alignment is the network actors' commitment, i.e., the degree to which actors are willing to stay in the network and invest resources into the network relationships showing that they are reliable to the exchange partners (Gulati et al 1994, Sarkar et al. 2001).

#### Measures of alignment of actions

We measure the alignment of actions by the indicators of chain transparency, presence of influential focal actor, chain orientation (by the focal actor), and awareness of existing interdependencies. The level of chain transparency can be considered as a measure for the extent of actions' alignment because of the inherent complexity of the structure of SCN that often leads to a feeling of anonymity among network members (Theuvsen 2004, Choi and Kim 2008). Such missing transparency increases the probability of free-riding and, thus, demonstrates misalignment of actions (Hanf and Dautzenberg 2006). Presence of an influential focal actor coordinating the chain is also crucial for canalizing the actions of the SCN actors in a necessary direction (Lindgreen and Hingley 2003). The more possibilities a focal actor has to influence the decisions of the network members, the higher the probability that the actions in the network will be aligned (Hingley 2005). However, to ensure the alignment of actions, the focal actor has to be aware of its coordinating role (Min and Mentzer 2004) and knowledgeable enough about the whole network, i.e., about interdependencies that exist among the network actors (Mohr and Spekman 1994). Therefore, we use the level of chain orientation and the level of awareness of existing interdependencies by the focal actor as the measures of alignment of actions.

### **5.3. Path analysis**

To test the model, we employ the Partial Least Squares (PLS) technique for Structural Equation Modeling (SEM) using the SmartPLS software 2.0.1 (Henseler et al. 2009). Our decision to use PLS was based on its advantages compared to other techniques, i.e., the possibility to analyze small size samples in the absence of distribution assumptions. PLS involves analysis of two forms of variables, i.e., the latent and manifest variables. Manifest variables that make no significant contributions to the respective latent variables are progressively removed and the analysis is repeated until all the manifest variables are significant (Gyau and Spiller 2009).

## **6. Results**

In this section, we test the model and represent the estimated results.

## 6.1. Testing the measurement model

The fit of the measurement model in PLS is evaluated with regard to the inner and the outer models. Individual item reliabilities and convergent validity of the model provide information about the fit of the outer model. The individual item reliabilities are evaluated via the factor loadings of the items on their constructs. According to Hair et al. (1998), an item is considered insignificant and removed from the model if its factor loading is less than 0.4 (see table 1 for the results). We also calculated the composite reliability (Werts et al. 1974) of the measurements and Cronbach's Alpha (Cronbach 1970) to evaluate internal consistency of the measurements. All the composite reliability indices for the constructs exceed the recommended 0.7 homogeneity criterion. Except for the construct "Alignment of interests", our Cronbach's Alpha measures also exceed the recommended criterion of 0.7 for the other two constructs<sup>3</sup>. The convergent validity was estimated by calculating the Average Variance Extracted (AVE). The recommended threshold of 0.5 (Bagozzi and Yi 1988) was exceeded for all the constructs indicating that the chosen indicators are explained by their respective constructs.

**Table 1.** Factor loadings of the items on respective constructs

Variables and indicators	Factor loading <sup>a</sup>	Composite reliability	Cronbach's Alpha	AVE
<u>Alignment of interests</u>		0.785	0.540	0.537
commitment <sup>b</sup>	-			
communication	0.416			
goal consensus	0.822			
joint problem solving	0.679			
<u>Alignment of actions</u>		0.850	0.742	0.653
awareness of interdependencies	0.835			
influential focal actor	0.812			
chain orientation <sup>b</sup>	-			
chain transparency	0.777			
<u>Achievement of SCN goals</u>		0.874	0.799	0.700
quality of supplies	0.763			
rate of payments	0.863			
sales volume	0.879			

a. Scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*)

b. Items that were deleted after initial tests

The fit of the inner model was evaluated by the discriminant validity criterion which means that every construct is significantly different from the others. The first way to analyze discriminant validity is a comparison of item loadings and cross loadings. If all loadings are higher than cross loadings, then the construct significantly differs from the others. The second way is to compare the square root of the AVE with the correlation between the construct and the other constructs. The square root of the AVE should be higher than the correlation between the constructs (Gyau and Spiller 2009). In both cases, our results support the fit of the inner model (see tables 2 and 3).

<sup>3</sup> It is argued that the composite reliability index is more reliable in assessing convergent validity because it takes into account the relative weights of the various indicators in a latent construct while Cronbach's Alpha assumes equal weights (Gyau and Spiller 2009). Thus, because all the composite reliability indices are above 0.7, we made a decision based on the composite reliability and retained the construct "Alignment of interests".

**Table 2.** Loadings and cross loadings of indicators and constructs<sup>a</sup>

	<b>Alignment of interests</b>	<b>Alignment of actions</b>	<b>Achievement of SCN goals</b>
awareness of interdependencies	0.099	<b>0.835</b>	0.205
chain transparency	0.062	<b>0.777</b>	0.221
Communication	<b>0.416</b>	0.196	0.205
goal consensus	<b>0.822</b>	-0.099	0.299
influential focal actor	-0.099	<b>0.812</b>	0.129
joint problem solving	<b>0.679</b>	0.105	0.294
quality of supplies	0.403	0.224	<b>0.763</b>
rate of payments	0.396	0.169	<b>0.863</b>
sales volume	0.472	0.208	<b>0.879</b>

a. Loadings are shown bold

**Table 3.** Correlations of the latent variables and the AVE square roots

	<b>Alignment of interests</b>	<b>Alignment of actions</b>	<b>Achievement of SCN goals</b>
<b>Alignment of interests</b>	0.733 <sup>a</sup>		
<b>Alignment of actions</b>	0.047	0.808 <sup>a</sup>	
<b>Achievement of SCN goals</b>	0.684	0.240	1

a. AVE square roots

## 6.2. The structural model

The structural model was evaluated based on the  $R^2$  and the significance of the path coefficients. The  $R^2$  for the achievement of SCN goals is 0.511, indicating that the model provides good fit for the latent constructs. The results of bootstrapping with 200 re-sampling show that the calculated path coefficients are significant at the  $p < 0.05$  level. The alignment of interests with a weight of 0.674 results in the larger explanatory share for the latent variable of the achievement of SCN goals. The alignment of actions makes considerably lower contribution (0.208) to explain the achievement of SCN goals.

## 7. Discussion and implications

Our results generally indicate that the issues related to chain management become strategically important in the German fish sector. The alignment of interests and the alignment of actions of the SCN members have significant positive effects on the achievement of SCN goals. Those companies which gain understanding of this importance and use appropriate cooperation and coordination mechanisms will ensure not only their own success but the success of the whole fish supply chain.

Specifically, we posit that differentiation between firm-level goals and network-level goals has to be made by the chain management. In relation to those goals, our results demonstrate that their achievement is mainly explained by the construct of alignment of interests. We explain this result by arguing that most goals which constituted the latent dependent variable were the firm-level goals of suppliers. Satisfaction of single suppliers with the achievement of their own goals, i.e., getting good payments or supplying high fish volumes, requires that the focal company puts much emphasis on establishing of good working relationships with its suppliers, i.e. alignment of interests. In our sample, the alignment of interests is achieved due to high level of communication among the partners about their goals and the problems to be solved. If such problems arise, they are most often solved jointly by provision of assistance from the focal

actor. As shown by Mohr and Spekman (1994), joint problem solving serves as an effective mechanism of conflict resolution.

Nevertheless, we suggest that the alignment of actions is also relevant in the fish SCN. Based on our results, we suppose that the importance of the alignment of actions could have been evaluated higher if we had included more network-level goals into analysis. The alignment of actions has to be paid much attention in the process of achievement of such network-level goals as quality of supplies. This multifaceted goal involves issues like timeliness of supplies, fulfillment of logistics requirements, etc., which require synchronized work of all the links in the supply chain. In particular, these issues are relevant in the fish supply chain due to high quality requirements stipulated by activities of several NGOs on behalf of the end consumers. Besides, product quality and its complements, e.g., freshness, are important in those fish SCN which involve small specialized retailers that have to ensure high quality of their products just to stay at the market. Therefore, such specialized fish retailers have to be skilled enough to coordinate their SCN. They have to be aware of the network structure and the interdependences that exist between the network members, i.e., if one requirement is not fulfilled, this can lead to failure in fulfilling the other requirements. Even if a mistake occurs, the focal actor has to detect its location as soon as possible and, therefore, chain transparency gains in importance. Furthermore, missing chain transparency increases the probability of free-riding among the network actors. To solve this problem, networks must take measures to reduce anonymity. An influential focal company must be allowed and be able to apply sanctions and fiats such as excluding network firms from the network. For example, of the 31 specialized fish retailers interviewed, 27 have suggested that they would initiate a relationship break off with a supplier if a supplier failed to meet their requirements repeatedly. Additionally, because networks consist of more than two enterprises (for example, in our sample, more than 40 per cent of specialized fish retailers work with more than 5 suppliers), they can contain member firms which are also rivals. To ensure that potential rivalry between them will not lead to inefficiency, tasks must be clearly distributed so that every network participant knows what it has to do and why the other firms are needed.

However, not always acting in a hierarchical way will have positive effect on partners' compliance. As shown by a number of studies on interfirm relationships in marketing channels (e.g., Payan and McFarland 2005, Leonidou et al. 2008), influence strategies can be more effective if they involve non-coercive mechanisms like recommendations, advices and persuasion. Thus, although in our model communication between actors appears on the interest alignment side, we posit that communication plays an important role in alignment of actions too. Furthermore, problems evolving from free-riding occur in reciprocal interdependencies (Mohr and Nevin 1990) implying that the partners' knowledge about each other and the experience of working together are crucial to build routines which can also be regarded as a coordination mechanism. As a proof, 30 of the 31 specialized fish retailers in our sample work with the same suppliers for more than 3 years and based on verbal agreements.

Moreover, the networks' ability to establish learning routines can be viewed as a further mechanism to build up unique and network-specific knowledge, creating a further inimitable and non-substitutable collaboration advantage (Dyer and Hatch 2006). Because today competition takes place between supply chains and networks rather than between individual firms (van der Vorst et al. 1998), we perceive the ability of chain management to achieve network-level goals simultaneously with firm-level goals as the main prerequisite of the SCN strategic success.

This notion is particularly important for the fish chain management because nowadays the fish sector faces increasing challenges which encompass the entire supply chain. Considering complexity of issues arising in the sector (i.e. demand for increased fish harvesting, quality assurance, sustainability, etc.), successful cooperation among supply chain actors has to be ensured. Although there is evidence that retailers act as focal companies in the fish supply chains and that formal chain management mechanisms (e.g. MSC eco-labeling) are installed, investigation of their effectiveness has to be undertaken alongside with analyses of informal mechanisms. Furthermore, both, the cooperation and coordination sides of chain management have to be simultaneously addressed. In this context, our empirical investigation can be regarded as the first step towards simultaneous analysis of the alignment of interests and actions and their role for the SCN success as the most important construct of strategic chain management.

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