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Integrating in a Complex Networked Local Fresh Fish Supply System

Per Engelseth* and Marius Sandvik

Molde University College
**corresponding author: peen@himolde.no*

ABSTRACT

The contemporary food market is experiencing an increased popularity of quality locally produced foods. These types of foods are produced and distributed in a different manner than foods subject to large-scale modernistic forms of production. The research question is posed as how to integrate this particular form of networked food production. The paper discusses what differentiates this form of food production focusing in its logistics and relationship features; features of interdependencies, information technology, traceability, complexity and local foods networks as complex ecosystems are applied to evoke these logistics and relationship particularities. This implies expand the supply chain view to accommodate for ecosystems thinking on local foods. The study provides accordingly, based on a single case study, a detailed description of the local foods network of a small Norwegian fresh seafood retailer and wholesaler. Based on this empirical evidence, a conceptual model that describes how food supply may be considered as an ecosystem. This model, which basically is a set of systemically interrelated propositions, represents basis for further investigation to better empirically ground the views presented in this paper on how to integrate in this form of local foods supply understood as complex systems encompassing ecosystems thinking.

Keywords: *Local foods network; Logistics; Integration; Interdependencies; Complexity; Ecosystems; Fresh seafood*

1. Introduction

In a study of short supply chains, Engelseth (2016) pointed out, based on empirical findings of a network of local foods suppliers to a common supermarket in Norway that developing short supply chains involved in local foods supply is associated with improving the exchange economy found in these short supply chains. Since exchange-dependent interactions involving pooled or reciprocal interdependencies are typical of the service industry (Stabell and Fjeldstad 1998), the logistics of local foods networks therefore can be said to resemble that of such service supplies. This also implies that the development of local foods supply chains is associated with two paths which may be complementary. According a view proposed by Engelseth (2016), rooted in contingency theory (Thompson 1967), local foods networks are associated with reciprocal interdependency and therefore improved intensive technology assists developing efficiencies in the bi-directional and complex interactions found in these networks. Alternatively local foods suppliers may seek to reduce reciprocal interdependency thereby increasing the impact of pooled interdependencies and enabling using mediating technology involving standardising interaction such as through increased standardised products and packaging as well as cost-efficient automating information connectivity (Engelseth et al. 2014).

This study concerns how to integrate local foods production focusing in its empirically grounded particularities. Investigation concerns here one of the companies studied in a previous case study by Engelseth and Hogseth (2016) presented at the Igls Forum in 2016. Instead of taking the supermarket as point of departure for

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investigation, this study, based on a new and dedicated case study, focuses on a local supplier of fresh seafood to the same region. The choice of fresh foods as focal product implies considering particularities of the distribution of such products. Building on the conceptual framework concerning local foods supplies developed by Engelseth (2016), this investigation also seeks at a fundamental level to reveal to what degree short supply chains may be considered similar to service supply chains This level of analysis implies directing focus to interdependencies, considered by Engelseth (2016), to empirically assess to what degree value in local foods supply is created in manner similar to value creation in services supply chains through use of intensive and mediating technologies. Furthermore, the framework is widened to encompass notions of complexity and ecosystems not covered thoroughly in the preceding paper (Engelseth 2016). These considerations take into account use of information technology (IT) in short supply chains (Engelseth 2017) to support logistics operations. Analysis thus encompasses the notion of emergence in production processes and this is linked with considerations regarding using IT as a supporting resource to facilitate developing connectivity in the supply chain of local foods characterised by limited economic resources at hand. This also directs investigation to finding empirical evidence of different forms of uncertainty in the networked context. On these grounds it is considered how to mitigate risk in local foods supply through IT use. This includes the use of traceability as an enabler of risk mitigation (Parenreng et al. 2016). The use of information technology is accordingly considered in the provided empirical context form a complex systems perspective. This paper provides accordingly conceptual modelling of IT use in the local foods network implies also conceptually founded on then economic terms posed by the agents in this network. These considerations are combined to assess how integration is to be viewed in cases of local foods supply.

2. Frame of reference

The frame of reference considers four issues associated with integrating local foods operations from a complexity perspective and is encompassed in the following subsections of this paper:

2.1. Interdependencies and short supply chains
2.2. IT enabled development in short food supply chains
2.3. Traceability systems and risk mitigation
2.4. Complexity and efficiency concerns in local foods ecosystems

2.1 Interdependencies and short supply chains

Engelseth (2016) points out that local foods supply is fundamentally different from modernistic industrialized food production and distribution. The local foods producers are described as small and weak network actors. They need focus on network navigation. Using the navigation metaphor implies that complexity is a core feature of local foods production. Processes are emergent. While the interdependencies in modernistic food supply are predominately sequential involving long-linked technology, local foods production in short supply chains are characterized as involving predominately reciprocal interdependencies, and to a limited degree pooled interdependencies. This means that the state of interaction in the local foods networks predominately involves interaction as *mutual adjustments*. Not only is interaction highly manual, the production is also characterised by a high degree of manual labour, here mainly concerning on administration as labour. In local foods supply, therefore, "….networking is the all-important supply chain activity to sustain local foods production"(ibid. p. 240). Efficiency is therefore in local foods networks tightly coupled with the effectiveness of dialogue with customers.

Reciprocal interdependencies, since this was the dominant form of interdependency in the study by Engelseth (2016) represents the form of interaction that should be addressed when considering short-term development. Changing interdependencies is possible, but requires strategic planning; a long-term endeavour. This also

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indicates that local foods production has much in common with many forms of reciprocally interdependent service supplies, what Stabell and Fjeldstad (1998) term as "value shops". These local foods supplies are as most services, short in geographical structure due to the logistical proximity of the supply chain actors. In such reciprocally interdependent relationships efficiency is associated with developing how agents manually interact; how do they do their "problem-solving"? Alternatively the local foods producers may seek to reduce the reciprocal interdependency, to become a "value network" (Stabell and Fjeldstad 1998). This development is founded on increased standardization of resources associated with interaction, information, goods, facilities and tools. This development involves both vertical and horizontal integration. This involves integration through increased standardization of interactions with suppliers, customers, service suppliers such as transporters, and other local foods suppliers (that also may be considered competitors). To the degree that reciprocal interdependencies still abide, the quality of manual interaction needs to be addressed. This implies rather than focusing on standardisation, the mediating technology (Thompson 1967), rather using intensive technology (Thompson 1967), to improve how people communicate, including support by IT. Two modes of developing interaction are pointed out. First development of mutual adjustment processes through the use of intensive technology, and second, using mediating technology to better pool resources in the local foods network. Interdependencies reveals how integration should be carried out, through developing either pooled or reciprocal interdependencies.

2.2 IT enabled development in short food supply chains

Engelseth (2017) points out that the reasons for adapting information systems used in local food supply chains are divided into three lines of argumentation: (1) Interactions in local food supply chains resemble service supply chains; (2) initially developing customer and supplier relationships through improving the use of intensive technology; and (3) economizing local food supply through developing the use of mediating technology. This line of argumentation is founded on the presupposition that local food suppliers do not pursue growth and instead aim to remain local food suppliers and thus aim to develop the quality of their information systems and information use in this given short supply chain structure context.

Following Stabell and Fjeldstad (1998) on the strategical differentiation of service offerings, local foods may initially be as already mentioned, considered as either value networks (predominately reciprocally interdependent applying mediating technology, standardized resources to integrate) or value shops (predominately pooled interdependent using intensive technology to integrate). However, in actual business scenarios, the conceptual borderline between these service forms is rather pictured as a continuum. Engelseth (2017) suggests therefore that, like services, local foods networks may be viewed as hybrids between these forms. Variation regarding interdependencies (Thompson 1967) regards the degree to which local foods are considered either as "value shops" or as "value networks". This is dependent on the degree to which customer value is dependent on tailoring food supply.

Short supply chains are inherently transparent (Engelseth 2016); the customer is close at hand. Since local food production is highly market contingent, the market context provides a visible to the local foods supplier, reason for either developing or not developing the quality of personal interaction. IT may facilitate such mutual adjustments through negotiations applying what Thompson (1967) terms as "intensive technology". Such forms of manual processes are expensive, especially when applied in large scale. Local foods networks are, however, small and involve therefore a more limited amount of personal interaction than modernistic large-scale industrial forms of food production. Therefore coping with reciprocal interdependencies is as long as they are small, no large challenge; it is handled manually by enthusiastic local foods producers. Furthermore, to the degree the quality of the foods offering is associated with personal interaction with customers, with the retailer intermediary or direct with consumers, information technology should be developed to support this interaction. This involves developing information connectivity to support the role of the local food supply as a value shop.

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Local food suppliers that to a limited degree tailor their food offering to individual consumer preferences should rather develop pooled interdependencies. This is also the case as the networks, including an increasing number of customers, grow. There is a limit to how many agents in a supply network a local foods producer can economically speaking seek mutual adjustments with. Increasing the pooled interdependencies strategically is a more efficient in economic terms since it facilitates, based on increased standardisation of processes, operations supported through IT-use. They need to, strategically–driven, operationally move from a value shop configuration to a value network configuration. This implies developing information connectivity to support the role of the local food producer as a value network through reducing the personal factor in the supply chain by increasingly automating it. Thus involves applying, what Thompson (1967) refers to as "mediating technology". Such connectivity must be inexpensive or easy to use (Engelseth et al. 2014).

Advancing IT competence is not prioritized by the local foods producers (Engelseth 2017). Therefore cheap and simple IT-enabled connectivity solutions are advocated, such as programmes provided by third-party suppliers to enhance traceability, tracking and trading procedures. A study by Engelseth et al. (2014) showed how this is possible in a developing country setting using off-the-shelf IT solutions. These systems should accordingly be easy to use, cheap and preferably usable on smartphones that that actors already possess. These technologies should enhance pooled interdependencies, simplifying how goods are traded and informed about, but still providing a channel for mutual adjustment through intense interaction when this is called for. According to Engelseth (2017): "Local foods may, through improved information connectivity in their supply chains that support increasingly economical food supply, be moved from being a post-modernistic curiosity to become a functionally viable mode of geographically constrained mass food supply. If the practitioners and supporting forces understand their particular needs, in association with developing information connectivity, local foods may become the norm rather than the exception in the food industry". This implies that integration in local foods network involves a combination of developing both intense and mediating technologies, and this development need to be cost efficient.

2.3 Traceability systems and risk mitigation

Food product traceability is now demanded in most developed economies in the world. It includes the local foods producers. Food product traceability represents a form of inter-organizational competence in the food industry that inherently demands an integrated network to function (Engelseth, 2009). It is associated with "…the ability to trace the history, application, or location of an entity by means of recorded information" (ISO 8402:1994). According to Stock and Lambert (2001) product tracing and tracking goods are activities that are combined in order to "…avoid litigation, firms must be able to recall potentially dangerous products from the marketplace as soon as problems are identified" (ibid. p. 101). Product traceability helps avoid repeating discrepancies in production. Tracing products similarly provides information so that faulty products may be located and handled according to quality aims.

Quality traceability is dependent on quality information about the food products. This implies information technicality associated with registrations of food production associated product transformations through the entity of an entire supply chain. A tracing system in use helps to inform about production qualities and this information about the history of foods in the supply chain may then be communicated from wherever it originally was registered to the person demanding this information about food production qualities. Food product information regards technical registrations of product transformation in form, environments, location, movement, transactions, actors involved in product handling and timing. Traceability is concerned with retrieving this type of information upon actual demand. This demand is more intermittent than continuous in nature (Engelseth 2009). Continuity is represented by the traceability system in place in the network. Competence in food product traceability is ultimately measured regarding how accurate and timely information regarding product history is provided to actors in the supply chain that have made an explicit demand for this information (Engelseth 2009).

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While the technology to develop traceability systems is in place, the organizational willingness to follow up on IT based potentials is not whole-heartedly followed up in food supply chains (Senneset, et al. 2007). It is accordingly the organising of food product traceability in a complete supply chain rather than understanding technical solutions that are most challenging. In local foods networks, given their small size and scope, developing and using traceability system is an expression of *local collaboration*. Food product traceability is therefore clearly an issue pertinent to supply chain management (SCM). This form of development involves several actors and how they interrelate to integrate technically how foods are traced and how this foods' tracing functionality is developed. Product traceability may be considered one such overall reason for supply chain integration as well as representing supply-related activities that cross inter-firm borderlines (Engelseth, 2009). In local foods supply chains, traceability involves competence associated with informing not only the present and future state of the foods supplied, but also their history. This is way to create quality assurance that differentiates local foods form modernistic food supply. This also implies that a well running traceability system mitigates risk. The risk is associated with the quality of the output, while traceability is associated with the quality of the information flow supporting this production flow.

Risk management involves perceiving the future uncertainties of a business and dealing with these uncertainties today. According to Zsidin (2003) risk is the probability of an incident associated with inbound supply from individual supply failures or the supply market occurring, in which its outcomes result in the inability of the purchasing firm to meet customer demand or cause threats to consumer life and safety. Risk assessment consists of identification, assessment and evaluation. Risk can be measured. Different applied metrics and approaches account for risk management as phenomenon. This takes into consideration the human perception and observable outcomes. “Risk” is never straightforward since: “People’s perceptions and attitudes are determined not only by the sort of unidimensional statistics used in tables, but also by the variety of quantitative and qualitative characteristics ...” (Slovic 2000: 231).

Developing food product traceability is a common practice that needs to be strategically organized (Vanany et al. 2015). Traceability encompasses risk mitigation and this creates organizational motivation to improve traceability in e.g. a local foods network. "While risk is associated with features of transformation in the supply chain, traceability concerns the potential for providing information about goods’ transformation in the supply chain, that is, whether production is carried out in accordance with the food safety and quality requirements" (Parenreng et al. 2016, p. 2). Gonzales-Barron and Butler (2011), for instance, consider the use of meta-analytical tools in risk assessment of food safety, and it has become generally accepted that it is possible to apply the principles and methodologies developed for the risk assessment of toxicological substances to food allergens as contaminants (Crevel et al. 2014). Other publications assess risk by focusing on just one component of the food chain, such as production, postharvest processing, distribution or consumption (Yeung and Yee 2003, Lagerkvist et al. 2013).

These examples present risk management from a single-firm perspective. It is necessary, however, to develop food product traceability through an integrated and coordinated multi-organizational effort and to organize traceability systems from an end-to-end chain perspective. Parenreng et al. (2016) propose the development of food product traceability with the mitigation of risk involving that these two types of developmental efforts are carried out at the same time. Vanany et al. (2015) describe a case study of the mango supply for exporting how the case company intentionally integrated the monitoring of product quality with the development of the traceability function from a multi-tier supply chain perspective. Traceability is associated with mitigating the risk of low quality food product supply; the operational supply failures in local foods networks, the development of traceability to mitigate risk involves taking into considerations that production is embedded in predominately reciprocal and pooled interdependencies. This implies that, different from modernistic mass produced foods, traceability follows a more flexible mode of production in cases of local foods production. Therefore the information flow that covers these flows of foods needs to be equally flexible; an adapted for of

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local foods traceability scheme needs to be developed that is both inexpensive and flexible in use. Integrating to trace foods is different than in mass produced food chains.

2.4 Complexity and efficiency concerns in local foods ecosystems

Complexity is primarily associated with emergence through processes. This implies that production is inherently associated with uncertainty, at least to some degree. This uncertainty may draw our understanding conceptually in different ways. Following Alderson's (1965) functionalistic view of distribution, the purpose of production is associated in inter-organizational structures where goods are sequentially transformed providing time, place and form utility through a series of intermittently directed transformations. This logic is typical for physical distribution, such as is the case in food supply. This form of physical supply (not services) involves, according to Thompson (1967), "long-linked technology". This technology is found especially in manufacturing industries, including modernistic food production. Following Alderson's (1965) transvection model of end-to-end marketing channels, production is described as piecemeal adjustments of pooled resources founded on stepwise management of sequentially interdependent transformations of goods.

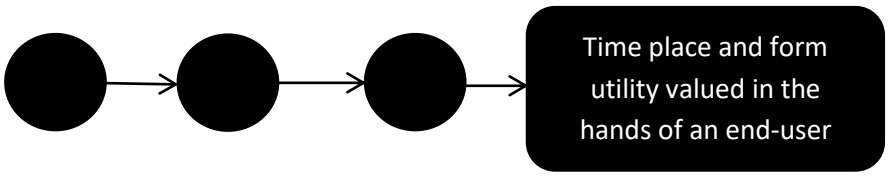

Figure 1: The transvection model. (Engelseth 2017b)

The circles in the model indicate "sorts", decision-making events. This model may be described as a complex understanding of production since the outcome flows of material are in accordance with this view multiple and sequentially interdependent, and may be understood as emergent. Thus evokes a notion of complex food production. The question emerges to what degree this model, designed to explain how value is facilitated through production may be adapted to smaller local foods supply chains. These have already been discussed as more resembling service supply chains. Management following the transvection model is, however, local and information-based, located as it as at "sorts"; sensemaking events that create decisions on how to produce. According to Engelseth (2013), the managerial locus in the network when applying a transvection understanding of food suppløy is located at the "sorts", short-term events that decide based in information on the past, present and future state of goods, how to send the goods effectively onwards to the consumer. Interactions between supply chain agents dot the line of the product flow as these agents collaborate operationally through exchanges to co-create value. Since local foods chains simply are shorter they are also expectedly more transparent than the long-linked ones; the horizon is smaller, and there are less people at this network outlook. Although production is emergent to the degree the flow is locally managed by a coalition of complementary environmentally contingent agents, this emergence is more visible in local foods networks simply because these networks have a simpler configuration. This implies, in relation to complexity as an organizational challenge, that local foods chains have an organizational advantage in their geographical and organizational smallness since their simplicity makes it easier to detect quality discrepancies. This also includes adjusting production to customer demands. It is fair to state that local foods supply is therefore inherently quality-aware. The efficiency of local foods networks, can using the transvection model, be described as reaping efficiencies of local decision-making in a context that is transparent because it is small and simple. Thus implies that integration is associated with sensemaking at sorts, and these sors are fewer in local foods production than in modernistic food production.

This understanding of local decision-making in a smaller context is now in this text expanded to encompass an ecosystems understanding of supply chains. Supply chains are in Supply Chain Management considered as systems, an inter-organizational business setting. Ecology is, however, concerned with nature and was termed

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by Haeckel (1866) as the science of relations between organism and the surrounding outer world. The concept of "Ecosystems" indicates considering ecology from a systems perspective. When considering local foods production, this implies widening the conceptual horizon to encompass in addition to business-economic concerns, also societal and nature concerns. "Systems thinking" suggests research sensitivity to the connectedness, relationships, patterns and context of phenomena, in this case systemic local foods supply chains. Parts are not viewed in isolation and the whole is never equal to the sum of the parts in a system. Complexity is an approach within systems thinking that implies a view where processes within the system are given emergent properties; following Broad (1925), the features of the system at a higher level of complexity will not be found at a lower level of complexity. Capra and Luisi (2014, p. 68) describe that "...nature does not show us any isolated building blocks, but appears rather as a complex web of relationships between the various parts of a unified whole". According to ecosystems thinking, nature not only envelopes production, it is a part of it.

Developing local foods production as an ecosystem, faces a range of challenges that are expanded from that of simply considering the business challenges. According to Engelseth (2015) there are three competing issues that explain why consumers shop locally produced foods: 1) food security and self-sufficiency, 2) protection of local markets, and 3) socio-cultural self-identification. This indicates a market awareness of the social and nature-related embeddedness of local foods production. Local foods production may easily be considered as a form of production in harmony with nature and the parts of society that adhere to this as a societal value. This is also a source of market differentiation and competitive advantage. Taking a ecosystems view expands network integration to encompass ethics, concerns regarding nature and society, and how this impacts on the core economic concerns the local foods producers strive with to survive as a business.

3 Method

This single case study involved a series of interviews and observations of Horsgaard & Co AS, a small fresh seafood retailer and wholesaler located in the Norwegian coastal city of Norway. This study followed abductive reasoning (Kováks and Spens, 2005) between ideas and empirical findings, using an iterative trial-and-error process to reach new understanding of how ICT supports developing business processes in the context of a corporate merger in the food industry. Following Miles and Huberman (1994) and Yin (2013) the case study research strategy is used when: (1) they make it possible to answer “how” and “why” research questions, (2) researchers cannot manipulate the behaviour involved during the research process and (3) researchers can seek a picture of the context the phenomenon is embedded in. Taylor and Fearne (2003), Fernie and Thorpe (2007) and Holweg and Pil (2008) state that the case method is appropriate for describing actors, network structure and agency relations taking place through social interaction. A single case approach was applied, following Voss et al (2002), to evoke micro-level details of the local foods chain. This involved designing the research process that led to “observations [that] generated new questions on which further interviews could be based” and eventually “added new dimensions to the subject, which eventually resulted in a new view of the phenomenon itself” (Dubois and Gadde 2002). The case study was conducted in line with Yin (2008) to create focus and order as grounds for analysis in a complex, local foods network considered as a system. Case studies involve triangulation of methods (Thomas, 2011). In this case, the main strategy of data gathering was associated with carrying out semi-structured interviews, meaning interviews were sequentially interdependent and adapted to each new informant building on knowledge derived from the preceding interview. In addition, research was facilitated by observations through visits to the focal local foods producer, a combined fresh seafood retailer and wholesaler and its network of suppliers and some customers. We seek, however, in line with Meredith (1998), theoretical generalizability through discussing concepts at a higher level of abstraction. The single case study involved a mix of company visits followed by facility observations and telephone

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interviews of the local seafood supplier, its suppliers, logistics service providers and two of its customers. This provided grounds for the following provided description of the local fresh seafood supply network.

4 Case narrative

4.1 Overview

Our case firm, Horsgaard & Co AS, is situated in Molde city on the North-Western coast of Norway close to abundant fishery resources. This local foods case is about the distribution of local seafood, from sources close to consumers, all located in a limited geographical area that may be conceptualized as a local foods network. Some years ago Horsgaard needed to make a tough decision regarding the company's future. They had to decide either to compete with the larger food stores or to cooperate with them. The company decided to collaborate with the food stores and to become their supplier instead of struggling against them for market shares. This is the main reason way the company today has fewer employees than in its earlier more independent years. Today there are only 8 employees working at Horsgaard & Co AS. Most of these employees are located in the single fish shop in downtown Molde. Although the company previously, during a brief period, was selling fish all the way to England the company now sells mainly to supermarkets and food stores that are located fairly close. They also provide catering for hotels and different events. Most of the income for the company comes from their supplier business with their larger customers, the supermarkets, but Horsgaard has also continued in their tradition of operating with a fresh fish counter and selling fresh fish directly to customer that comes and visits their store. However, this type of sales currently contributes only to about 15% of Horsgaards revenue. Although most of their customers are located fairly close to Molde, Horsgaard & Co. AS has also in recent years also received more and more offers to deliver fish north in the area around Trondheim and Oppdal. These places lie about 4 hours driving time away.

Kjell Rune Kirkeland, the director of Horsgaard & Co AS, manages on his own the company purchasing, sales and distribution operations. His father, who normally transports the fish to customers in their van, can step in when needed. Production and most distribution take place within an era that is equal to maximum three hours from where their store is located. This means that the delimited area for this case study defines local food to be produced inside a three hour radius. Fish that the company receives from places such as Tustna, Kristiansund, Aukra, Åtterøya, Averøya and so on are determined by Horsgaard to be local food. Most of the products that the company buys from their suppliers are products that are produced at suppliers that are close to Horsgaard. & Co. 50% of the products that Horsgaard sell are fresh fish, 5 % are processed fish food (creates the possibility to get rid of wastage), 10 % shellfish and the remaining percentages are processing products like smoked fish, salted fish and so on.

The company sells some niche products that people would not find in normal supermarkets and food stores. These types of niche products could be "Lutefisk", pollockbeef, fresh halibut and different types of fish food for barbeque in the summer. Retaining quality in their product assortment is very important for Horsgaard & Co and they only sell products that meet their set strict quality measures. Kjell Rune Kirkeland states that he emphasizes the quality of his employees, stating that *"If you find a product in the fresh fish counter that you would not buy yourselves, it should be removed and not put on for sale".* This strict concern about quality that Horsgaard operates as a quality aim is something that their suppliers are quite aware of, and in fact, they seldom receive from them products with poor quality. Their reputation of having excellent quality measures is also one of the reasons that Horsgaard & Co the last couple of years have managed to expand their business to places outside Molde and Romsdal to places like Oppdal and Trondheim.

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Horsgaard & Co's CEO Kjell Rune Kirkeland at the shop's fresh fish counter

Especially wild caught fish is embedded in supply uncertainty. Therefore when ordering, past sales, seasons and "gut feelings" based on many years of experience determines the volumes that are ordered each day. Horsgaard & Co AS follows a procedure of sending out frequent small purchase orders to its suppliers. The orders are sent to their suppliers early each day, at times when there is little fish to be obtained the same set of list of orders on products are sent to several suppliers, and the products are then picked up and delivered at night / early morning the next day. This means that Horsgaard & Co AS receives fresh merchandise each day. A couple of years ago Horsgaard & Co AS tried to save up some transportation costs by only ordering products every other day, but this created too much wastage and loss in profit. When Horsgaard & Co orders more than they can sell, they use the excess purchased fish to create processed fish food, such as fish cakes, that they then can sell. This helps Horsgaard & Co AS to get rid of the waste from the fresh seafood sales in an economical fashion. This is quite important for a company of the scale of Horsgaard & Co AS. They produce several products at a small scale, instead of just putting the product away as the larger companies would, so that they can offer it to their consumers and customers. Most of the distribution of their products to their customers is also in small-scale volume.

The major problem that the company experiences in their day-to-day operations is stated by Kjell Rune Kirkeland to be the availability and durability of the product. Fish as a product cannot always be obtained in the desired volume due to mainly weather causes. Because of the high frequency and small volumes in orders, Horsgaard & Co AS gets a very quick responsiveness to uncertainties and changes that can occur in the demand of their products and therefore the company does not face too big concerns and problems regarding this element. Regarding durability, the speed in handling of the product before it is delivered to their customer is important to the company. As Horsgaard & Co AS competes to some degree against the large retail food chains (the ones they do not deliver products to) for the market share, they put a lot of their attention in quality of their products. Since their main product sis fish or seafood, freshness in the product is very vital. Therefore they have to be able to handle and deliver the products to their customer quickly and more effectively than some of their competitors. In this regards good supplier relations is a main competitive advantage.

4.2. Customer relations

Horsgaard & Co AS has four major customers. These customers are Coop Mega Molde, Coop Mega Oppdal, Eurest AS and Eurospar Hjelseth. Coop Mega Molde is a grocery shop located in Molde City centre and is one of Horsgaard & Cos oldest customers. The relationship between the two companies stretches back for more than 30 years, to 1985. Coop Mega Molde started using Horsgaard & Co As because of their close proximity but has continued the relationship because of the high quality in their product and the great service that they can provide. Coop Mega Molde order their entire fresh fish assortment from Horsgaard & Co AS. They send their orders by mail to Horsgaard & Co AS every single day although, especially in the summer, some of the products

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get sold out. In such circumstances it has happened that Coop Mega has sent out as much as three orders the same day using their own van. The orders are normally sent at the evenings and the products arrive the same night.

Eurospar Skjevik Hjelseth is a grocery shop located at Hjelseth, approximately a 20-minute drive east from Molde city center. They have been doing business with Horsgaard & Co AS since early in 2007 when they were looking for a new main supplier for their fresh fish assortment and choose to use Horsgaard & Co AS because of their quality in the products they deliver, the level of service and due to close proximity. Eurospar Skjevik Hjelseth orders their entire fresh fish assortment from Horsgaard & Co AS including shellfish and fish food. They send out orders by mail in the morning one to two times a week and receive the products early the next morning by transportation provided by Horsgaard & Co. When the products arrive the product are handled by Eurospar's employees according to set regulations and routines and put in the shops fresh fish counter.

Located in Oppdal city center about 3 hours driving time from Modle, Coop Mega Oppdal has been using Horsgaard & Co AS as their main supplier for fresh fish since 2013. When Coop Mega Oppdal became aware of Horsgaard & Co AS and the quality in their products they were therefore attracted to using Horsgaard & Co as their fresh seafood supplier. Oppdal is a major Norwegian winter resort town, and many of the customers there come from the large city of Trondheim, bringing with them food consumption preferences that include demand for quality fresh seafood. There was one major obstacle though since the big chains normally follow a strict rules of purchasing in which the retailers are forced to use centralized purchasing agreements even though small companies like Horsgaard & Co AS can provide substantially better quality at a lower price. After some discussion Coop Mega Oppdal was allowed break out of these centralized agreements that were set by their franchise owner company. Coop Mega Oppdal normally orders all sorts of filet, cod, smoked cod, salmon, smoked salmon, trout, monkfish and clip fish. They send orders by mail to Horsgaard & Co AS in the mornings, around 10:00 o clock, three times a week and receive the products at the same evening/night. When the products arrive with transportation from Shenker Molde they are carefully handled by Coop Mega Oppdal's employees and put in the shops cooling room where they are inspected and counted. Early the next morning the products are being put out for sale in the shops fresh fish counter.

Eurest AS is a part of the Compas Group and provides catering to different business and arrangements. When Eurest AS was selected, it was to carry out the catering for Shell Nyhamna Ormen Lange located at Aukra they decided to use Horsgaard as their fresh fish supplier. They started doing business with Horsgaard & Co in 2012 because of their quality and the level of service that Horsgaard & Co AS provides and have since only had good experiences regarding the company and Horsgaard & Co's AS products have become very popular by the workers and employees at Ormen Lange. Eurest AS orders fresh filet products, shrimps and crab, and a normal order is around 100-200 kilogram. Eurest AS orders three deliveries each week (Monday, Wednesday and Friday), and the order is sent by mail on Monday the week before. The products arrive at Ormen Lange around 10:00 to 12:00 and after they are loaded of Horsgaard & Co.'s AS truck they are taken out of the packaging and put into Eurest AS own packaging and put out for cooling.

With the exception of Coop Mega Oppdal, Horsgaards & Co AS main customers are located in the proximity of their local store location. They also sporadically experience that they receive orders from customers in Bergen and Tromsø. To customers that are located outside their normal area of sales, Horsgaard & Co AS normally delivers shellfish products. In regards of the logistical aspect of dealing with their customer, Horsgaard & Co AS receives the orders by mail, and then send a mail to check with their suppliers of the availability of the product and then always call back of the customers to confirm what they can or in some cases cannot deliver (in these cases Horsgaard & Co AS offers replacement products instead). Kjell Rune Kirkeland, the general manger, is the responsible for the management of customer orders. He explains that he is always trying to formulate some sort of marketing questions that he can ask his customers, for example concerning how they require the products to be packed. This enables them in getting to know the customer and their customary demand of

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products. This also simplifies the work that Horsgaard & Co AS does to enable a customer responsive supply. Customer relationships are expressed as vital resources in this effort.

Horsgaard & Co previously used channels like the local newspaper to inform their customer about their products, with about 12-15 ads a year. The last couple of years they have switched away from this type of advertising and now only advertise by using Facebook, which also creates a dialog with their customer. Dialogue with their customers, not only via Facebook and the Internet but also face-to-face or via the telephone and e-mail is very important to Horsgaard & Co in ways of always trying to achieve customer satisfaction and getting in touch with their customers, but also for the company in terms of pushing themselves more.

4.3. Supplier relations

The four main suppliers for Horsgaard are Vikenco AS, Strømsholm, O.Skarsbø and Kongshaug Krabbe. O. Skarsbø AS is located at Harøysundet, Fræna and was established in 1919. Today the company is involved in fish and shellfish export. The company started their relationship with Horsgaard & Co AS when the Kirkeland family got involved in the late 1970s and there has been a close and fruitful relationship ever since. The company delivers whole fish, filet variants like pollock, haddock, monkfish, halibut and plaice together with clipfish. The size of the orders that Horsgaard & Co put in can very a lot, from 100-600kg. The orders are received at the morning, one to two times a week. After the O.Skarsbø AS receives the orders from Horsgaard & Co the orders are put into the Maritech information system used by the company, where O.Sarsbø create an order and check if they have what Horsgaard & Co wants available and then they send an confirmation back to Horsgaard & Co AS before the products are sent for packing. If O. Skarsbø doesn't have the wanted products, or if they don't have it in the wanted volume, they try to send it as soon as they have obtained it. Schenker Molde picks up the products between 16:00 and 18:00 each day and does the transportation of the products from Fræna to Molde.

Strømshold Fiskeindustri is located at Tustna, an island about three hours driving time from Molde. It was established in 1906. The company carries out fish farming and has been doing business with Horsgaard & Co AS since 1990. The company delivers many types of products to Horsgaard & Co AS. Some are fresh fish including almost all types of fish filet, salted fish and smoked fish. They normally deliver within the range of 100 to 700 kg, but normal standard order is around 250-300 kg. Strømsholm receives orders from Horsgaard & Co AS every day, and these orders can vary from one to ten orders each day. There is also considerable variation in terms of when the orders arrive, as this can vary from 08:00 in the morning to 02:00 at night. The orders are communicated via phone calls. This helps create a continuous quality dialogue between Horsgaard & Co AS and Strømsholm. After Strømsholm receives the order from Horsgaard & Co, the order is processed and registered in their system, and sent for packing. If Strømsholm in unable to deliver the product types that Horsgaard & Co AS specifically requires, they negotiate with Horsgaard & Co As via the telephone about the possibility to send different products instead. The products are picked up at Tustna by the transportation company Bring and delivered in Molde at the Shenker terminal around 16:00 and 17:00 the same day.

Vikenco AS is an aquaculture and seafood processing company located at Aukra, an island about 1 hour driving time from Molde, and was established in 1973. It has been doing business with Horsgaard & Co since the start of the company, although there was a small stop in the relationship between the years 1989 and 1990. Vikenco AS provides seafood supplies and they are involved in fish farming, The company delivers different types of redfish: trout, salmon, trout filet and salmon filet to Horsgaard & Co AS. The size of the orders they receive from Horsgaard & Co can vary from 50-500kg and they normally receive the orders in the morning, four to five times a week. After Vikenco AS receives the order from Horsgaard & Co AS they use their Maritech information system to create an order in this information system which is then checked up against what they have available. This is fresh seafood, but the fish needs to be deprived feeding, or "starved", about a week before slaughter to attain the best taste. This implies that orders need to be forecasted a week in advance by this

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supplier. Then the products are after slaughter then sent for packing. If Vikenco AS doesn't have the wanted product or volume they call Horsgaard & Co AS and they explain this. Normally these products can then be delivered the following day. The products are picked up by Shenker and transported to Molde where they arrive at the afternoon or evening the same day.

Kongshaug Krabbe is located at Smøla, an island about 3 hours driving time from Molde, and was established back in 1994 and they have been doing business with Horsgaard & Co since 2004. Kongshaug Krabbe is engaged in production and distribution of crab. Horsgaard & Co As, Kongahaug Krabbe delivers such products as crab shell, crab claws and cocked whole crab. They receive orders from Horsgaard & Co AS three times a week during season and one to two times a week during the winter and the orders are normally received in the morning. When Kongshaug Krabbe receives an order from Horsgaard & Co AS they write the order up on a blackboard and after production ends around midday the products are sent to packing. The products are then pick up by Bring and transported to Molde and the Shenker terminal where they arrive around 16:00 and 17:00 the same day.

Horsgaard expresses that the quality of the product that they receive from their suppliers is "*alfa and omega*" and that they base most of their selection of suppliers on this fundamental criteria. The company operates with four main suppliers that are located fairly close to Molde. There are close relations between Horsgaard & Co AS and their main suppliers, and all of the suppliers that they use today have been with the company for many years. A good and strong relationship with their suppliers is important for Horsgaard & Co AS because of the frequently interactions that they have with them. Kjell Rune Kirkeland is also the person that is responsible for the interactions and handling of ordering merchandise from their suppliers and the states that he always strives to create a dialog via telephone instead of just using e-mail with his suppliers, much in the same way as he does with his customers, so that the relationship becomes stronger and that the two parties can get to know each other better in terms of what products that the supplier can deliver and what types of products and quantities that Horsgaard & Co AS requires.

Since Horsgaard & Co AS receives products each day from their main suppliers, each of their suppliers will normally deliver to the same time and day each week. A routine is established. Horsgaard & Co AS has managed to create long-term relationships with their four major suppliers that gives them the opportunity to receive an adapted packaging of the products that they order in such a small volume and quantity that Horsgaard & Co AS themselves feel comfortable with. These adapted and predefined packaging gives them a better opportunity juggle their products more flexible and efficient since e.g. when dealing with a 100 cases that only consists of 3kg fish is much easier than dealing with 30 cases with 10kg fish.

4.4. The logistics

Horsgaard & Co AS has centralized the product arrivals by having all of these products sent daily to only on terminal, Shenker Molde. For the products that are going to supermarkets and food stores that are located close to Molde, Horsgaard & Co themselves perform the transportation of the products. In those cases products are received from their logistics service provider Shenker early in the morning and then take over handling and delivering of the products, which normally is done at 07:00, 10:00 and 14:00. For products that are being dispateched to customers in the proximate region, like Kristiansund, Sunndal, the packed goods are delivered at the Shenker terminal and Shenker and Bring carry out the transportation out to the customers. In the case of Oppdal and Trondheim, where transportation of products are done every second day, Horsgaard performs the handling and packaging of the product at the Shenker terminal and then Shenker takes over the transportation of the products.

Horsgaard & Co AS performs much of the transport of their products to their customers themselves. Shenker performs that transportation of the products from the Shenker terminal to Horsgaard & Cos location in Molde city center. After the products arrive, Horsgaard & Co AS takes over the responsibility and handling of the

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products and loads them on their own van. Horsgaard & Co AS. operates one refrigerated van as their main transportation vehicle for the transportation and delivering of the products. Kjell Inge Kirkeland (father of today's CEO Kjell Rune Kirkeland) is the person at Horsgaard & Co AS that is responsible for this van transportation. There are several reasons to why Horsgaard & Co AS chooses to perform much of the transportation themselves instead of using an external transportation company. One of the reasons for this is the high cost that a third party solution would force upon the company. As they are a small company Horsgaard & Co does not have the luxury of using an external transportation company that would have taken a lot of money to perform transportation to locations that Horsgaard & Co AS themselves can perform without too much difficulties.

Kjell Inge Kirkeland delivering products for Eurest AS at Ormen Lange

Horsgaard & Co AS states that there a main reason why they choose to perform much of their own transportation of products is to save costs and to personally interact with their customers. Having the same person showing up to their customers and deliver the products each day is something that Horsgaard & Co sees as an asset that the bigger chains don't bother to employ. Where the bigger chains uses external transportation companies to do much of the transportation and delivering in such a way which Kjell Inge Kirkeland describes to be very "detached", where the driver normally just unloads the products and then quickly leaves. Kjell Inge Kirkeland prefers to use a different approach when he delivers the products to Horsgaard & Co.`s customers. He uses an approach in which he unloads the products and then takes the time, not more than a couple of minutes, to talk to the kitchen chiefs to see if they received what they wanted. He is interested to see if they received their order in the wanted volume and so on, and to explain why they didn't receive what they ordered or why Horsgaard & Co AS had to do some modifications to the order. This, Kjell Inge Kirkeland states, helps to develop stronger relations with their customers. In some cases it has happened that the kitchen chiefs of one of their customers changed workplace, and then has remembered Horsgaard & Co AS both for the service that they provided and also for the human relations that they have developed with them. This has led to a desire to continue the working relationship with the company.

Since Horsgaard & Co AS has chosen to perform most of the local transportation themselves they also have the possibility to obtain a much greater degree of flexibility in terms of responsiveness to their customers, and this is a vital part in order to be able to create and obtain the level of service that Horsgaard & Co AS does its utmost to deliver. Instead of having to go through an external party, an operation that would have taken much longer time, and to a much higher cost, Horsgaard & Co AS has the ability to respond much quicker to unexpected changes in the demand from their customers. Kjell Inge Kirkeland explains that it has happened more than once that he has received a phone call from a customer that has been in dire need of products and in need of quick service. In these types of situations Kjell Inge Kirkeland states that he always does his best to

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deliver and to help the customer, no matter the time of day. The transportation of the products that Horsgaard & Co AS performs themselves is normally done three times a day at 07:00, 10:00 and 14:00 with transportation routes to customers that are located fairly close to Molde, like Coop Mega Molde, Eurest AS at Ormen Lange and Eurospar Hjelseth.

Horsgaard & Co AS uses Shenker Molde as their main transportation partner to transport goods to customers that are not located close to Molde; in places such as Oppdal and Trondheim. They also use Bring, a competitor of Schenker, to perform the transportation of products to some of their smaller customers that are located in places like Åndalsnes, Finnøya and Kristiansund. Shenker Molde is located just outside Molde city centre and has been used as the main transportation partner and 3PL (third-party logistical provider) for Horsgaard & Co AS since 2013. The relationship has been productive for both parties, but in the scale of things Horsgaard & Co AS is a quite small customer for Shenker. Since Horsgaard & Co AS uses Shenker in Molde as their main terminal, products from Horsgaard & Co.'s AS suppliers arrive each day, and on arrival the products are handled and stored by the personnel on the terminal.

Shenker has contracts on two routes of transportation for Horsgaard & Co AS. The first of these routes is from the Shenker Molde terminal to Horsgaard & Co, where Shenker delivers the products that Horsgaard & Co AS themselves can perform the transportation of. This transportation is done at 05:45 in the morning every day. The second route where Shenker Molde provides the transportation for Horsgaard & Co AS is to Horsgaard & Co.'s AS customers in Oppdal and Trondheim. This transportation route is done three times each week and Shenkers trucks normally departure from their terminal in Molde around 19:00. Since the products that are transported are fresh fish products, all the transportation that Shenker performs are done by the usage of refrigerated trucks. The volume of the products that Shenker provide the transport for can vary considerably from day to day, but normally the products that Shenker transport to Horsgaard & Co AS has an average around 300kg and for the transport to Oppdal and Trondheim averages around 100kg. Although the volume of the transport can very, Horsgaard & Co AS has an agreement of a fixed price for each transport done by Shenker. The logistics network of Horsgaard & Co AS is illustrated in figure 1 indicating the main flows of goods:

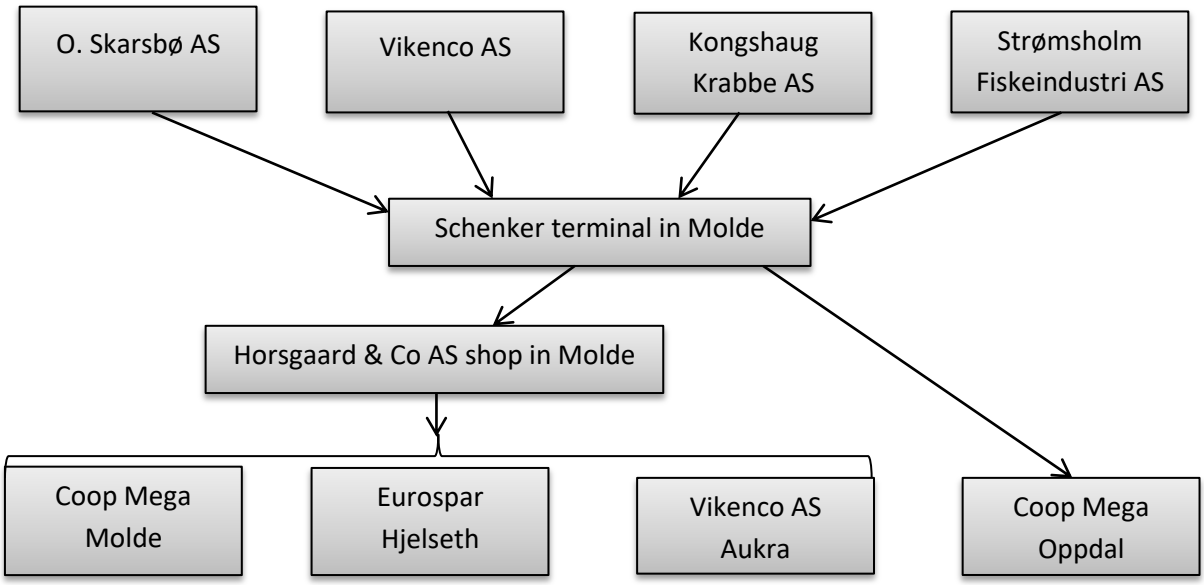

Figure 1. The logistics network of Horsgaard & Co AS

5 Discussion

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The following discussion is structured in accordance with the analytical frame of reference provided in section 2. This provides insights in to both the "as-is" state of Horsgaard & Co. AS's local foods network, as well as considerations associated with its development.

5.1. Interdependencies and short supply chains

The case describes in detail the logistics flows of fresh fish from suppliers, through Horsgaard & Co AS, onwards to its customers. These are fresh products meaning the time is limited. Therefore quality is importantly associated with time. In addition, volumes and types of products need to be adjusted. Within its business concept Horsgaard & Co AS purchases a range of fresh seafood products demanding different specialized suppliers. These suppliers are all relatively small firms. They, have however, quite different types of seafood production involving differences in technology. The wild catch seafood is most vulnerable to variations. However, aquaculture-based supplier also has limited flexibility since their product cannot immediately be taken out of production for slaughter. A fundamental sequential interdependency can be described where consumption is dependent on preceding phases of production. The quality of this supply is, however strongly embedded in various networked business relationships. These relationships are complementary. The supermarket customers are only to limited degree in competition since they are located at different places. Horsgaard & Co AS is clearly dependent on how well they network. While sequential interdependencies entail a neat linear configuration, this configuration does not fir well with this case. It is the complexity of a *network* rather than a more linear chain, as metaphorical mental model, that needs to be managed.

Manging different business relationships, including those with transport firms, means that interdependencies are to a high degree reciprocal in the present state of the local foods network. A hierarchy of the two main interdependencies may be described where the quality of mutual adjustments involving reciprocal interdependencies supports a quality flow of goods. Therefore, in line with Engelseth (2016), this local foods supply chain is not described as predominately sequentially interdependent, but that it is the reciprocal interdependencies that have the greatest impact on supply quality. It therefore does resemble a service industry supply chain. Its shortness is possibly the reason why these reciprocal interdependencies are predominant. This is a transparent network where manual administration is possible simply because the supply chains involved are short, simple and small. Using intensive technology is the predominate form of integration in this network.

5.2. IT enabled development in short food supply chains

Horsgaard & Co AS can be seen, through their logistics operations, to be are every day juggling supplies for different suppliers to supplies to different customers. This entails an inherent form of complexity in this local foods network. The abundant use of manual forms of mutual adjusted, orders are negotiated by e-mail or on the phone, reflects a very limited use of IT. Automation of the information flow is in this case limited to the various information systems of the different companies involved in this local foods network. These information systems are not interconnected. Interconnectivity is accordingly facilitated through personal communication. This use of intensive technology supports quality in business relationships characterized by reciprocal interdependencies.

A question emerges if there is reason to increase the degree of automation, in line with findings by Engelseth et al 2014) regarding the implementation of a traceability system in rural Thailand. If it is possibly on small scale in a developing country this may also be possible in rural Norway. The main lessons learnt for the case in Thailand is that success is dependent on two main factors: (1) low-process easy to use IT, and coupling this potential with (2) organizing this use from an inter-organizational perspective. When designing this increased use of IT in the supply chain, a fundamental quest is to reduce the reciprocal interdependencies and increase the pooled interdependencies. As previously discussed, while reciprocal interdependencies rely on intensive technology (such as personal negotiations), pooled interdependencies are reliant on mediating technology.

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Pooling relies on automating connectivity by enabling process to be more coordinated through increasing standardization of resources and the use of these resources through activities. This is clearly an organizational challenge. It is simply not enough to lower a purchased off-the shelf information system onto the studied local foods network of Horsgaard & Co AS. Physical and informational elements need to be standardised. How one communicates needs to be standardised. This may be a lengthy, possibly a continuous, development effort. The question remains whether such a standardising effort really is called for in a small local foods network. Clearly, if the cost of IT is low enough, this will increase the attractiveness of increasing the automation in such network. Cheap IT involves off-the-shelf flexible software that can e.g. be used by smart phones or computers the companies in the network already have. But cheap technology isn't sufficient. It does also really need to be organised, and this demands efforts and related manual costs, at least in the development and start-up phase. IT provides accordingly opportunity to increasing pool interdependencies to integrate through mediating technology development.

5.3. Traceability systems and risk mitigation

The case does not reveal any explicit traceability system in use. Traceability is not formally organised in the network with the exception of registrations of the normal flow of goods. This still provides the necessary rudimentary traceability required by government. This system also reflects the current status of the local foods network, that reciprocal interdependencies are abundant. If there is a demand for traceability, package markings coupled with order documents, reveal where the goods came from. The tracing inquiry is then handled much the same way as the order was, by phone or e-mail. Given the limited use of traceability, including its importance in marketing, there is little reason to automate this function. However, given implementation of a more automated information system binding the actors in the local food network better, could lead to integrating traceability as function within this system. This would enhance the quality of this system and could also be marketed to increasingly differentiate Horsgaard & Co AS as a quality seafood supplier. In relation to risk mitigation, such a traceability system would counter threats both in relation to the continuous ongoing production operations as well as market risks. Traceability, while n important driver in modernistic food chains (Engelseth 2009), does nniot play the same decisive role in driving integration in local foods networks.

5.4 Complexity and efficiency concerns in local foods ecosystems

This section takes analysis a step further so to explicitly consider two features: (1) the emergent nature of processes in the local foods network, and (2) its embeddedness in nature and society. This is clearly an initial-stage consideration that provides a few thoughts on these two interdependent issues. Regarding process emergence, the case reveals a high degree of process complexity in an overall simple network structure. The structure represents the organizational pattern, which companies trade and supply each other, and how to the do this. This represents a Pattern that in the long run changes only slightly. In principle, contracts and relationships may be severed or established overnight. In this case, however, relationships are clearly long term. Therefore at an overall level complexity is limited. It is in the daily operations complexity is an organizational challenge.

This challenge is, as discussed in the preceding section 5.1. handled through the use of intensive technology enabling mutual adjustments. One of the prime facilitators of solutions to this complexity is networking. This means that the network is not a problem, even though the more agents in the network, does make it difficult for a sole person as Kjell Inge Kirkeland to comprehend it. The given small size and its rather long history means that the network is experienced by him as fairly transparent. Stability in the network is in this case the grounds of a management knowledge resource; knowing how to do business in the local foods network of Horsgaard & Co AS. This resource is used to tame the chaos of daily operations.

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Over time, the uncertainties in relation to operations, features of supplies and features of customer orders, also repeat themselves. There is some degree of self-similarity here. This logic of complex systems may be applied to manage the local foods network, where navigation is associated with managing operations in a relatively stable network context is the rule. The notion that this context is an ecosystem creates an increased challenge to this view. By bringing in features of society and nature into this system, and not only considering the economic business processes, this seemingly increases complexity. This also expands the real as what is to be integrated in the local foods network. It also highlights the importance of ethics, the focus on human long-term well-being.

Regarding nature, the impact of this is already accounted for in supply, such weather, or production discrepancies in aquaculture production. Society also poses constraints regarding quality and safety regulations. On the consumer side, society and nature are already prevalent since customers are increasingly concerned with the sustainability of production as well as that society impacts on market trends. This includes the awareness of the sustainability of local foods production. This entails that applying an ecosystems framework is predominantly a research approach that formalizes, makes clearly explicit, the impact of nature and society, in addition to business economic concerns. This role is not to be underestimated. By making nature and society more important in investigation, research aims regarding balancing production with a combined societal and natural context, sets network sustainability on both the business and research agenda. In the current global society with its increasing environmental and societal challenges, ecosystems thinking is clearly called for. It is closely interrelated with moving towards more sustainable food production, something that is inherently the nature of local foods production due to its small scale production that involves close interaction with both society and nature. What makes local foods networks different form modernistic forms of food supply is that these networks are more transparent and as small scale production, closer to nature and food traditions. It is therefore easier to grasp in practice and conceptually the interaction between business, nature and society constraints in these local foods production processes.

6 Conceptual modelling of connectivity in the local foods ecosystem

Local food production is fundamentally an economic activity. If local foods producers cannot turn up some form of profit from their production they necessarily will close down unless subsidized by society. This section provides a conceptual model of the studied local foods network as an ecosystem. This implies that the roles of business, nature and society constraints are made explicit, something not done in the more pure logistical model in figure 1. These two models should be compared for the reader to comprehend the contribution of an ecosystems understanding of food supply in general.

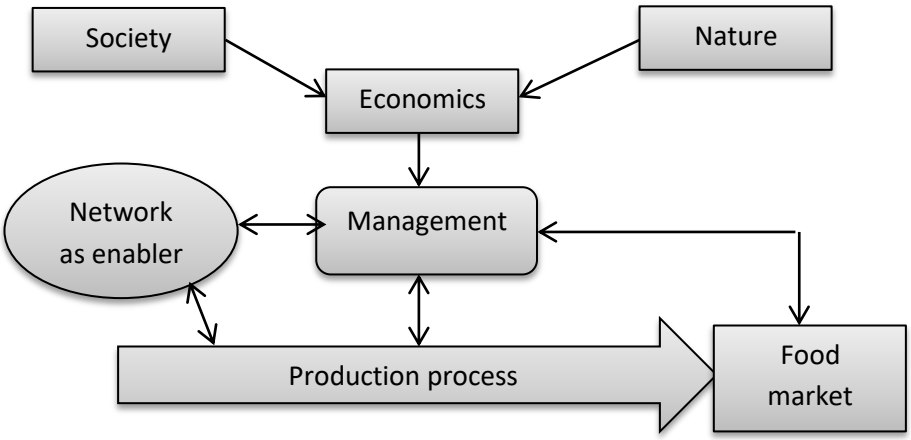

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Figure 2: Food production conceptually modelled as an ecosystem

Figure 2 is a systemic proposition regarding how to view food supply as an ecosystem. The view is founded in interdependency theory encompassing conceptually how networks work as systemic interaction. The model is hardly self-explanatory, so some guidance is provided here. First economics is viewed as a mediator between nature and society and management. This implies the business is driven by a fundamental aim of securing its economic existence. However, this economic realm is intertwined with societal and nature constraints. Management is therefore mainly concerned with reaching economic goals. This represents therefore the principles that influence management. Nature and society therefore are modelled mainly as principles. The degree to which economics as principle alone is modelled as directly linked with management, whether this is ethically desirable, can be discussed. A political view may be to create direct linkages between management and society. This implies radical rethinking of the purpose of production compared with common views in industry today. The model also depicts the network as an enabler through manipulating and using relationships as resources. The network includes all types of agents, with varying roles, customers and suppliers, even competitors may be part of this network concept. The local foods network is mainly characterised as a coalition of complementary interdependence. Integration is understood as predominately reaping network complementarities.

The main process feature of the network is interaction and potential for developing complementarities. This means that the different agents need each other in different ways. This is because they may as agents they also be described also as bundles of resources. They not only decide and manage, that also represent potential for solutions. In a manner the network is a buffer against uncertainty. Management directs production. Production, also since it is carried out in the network, impacts on management as information regarding the state of goods transformation. Production implies purpose and production also reflects quality levels. Management is also influenced by the market. In the case of local foods production this market is clearly less faceless than in the case of modernistic food supply. This is an advantage for local foods producers compared to modernistic food supply; they can easily understand how to be customer responsive. The market is embedded in society and nature, so this is a more direct impact on management than as the principles already discussed. These impacts are measured as customer behaviours.

An ecosystems view implies a new perspective of integration in local foods network. This represents an approach that makes explicitly that economic constraints need to be balanced with societal and nature's constraints. Supply chain management encompasses from an ecosystems view, more than integrating business process form an economic perspective.

7 Concluding remarks

The model in figure 2 represents a proposition and not a statement of reality in food supply. This implies that this model describes a set of interdependent propositions. These should be empirically grounded in future investigation. This may involve seeking to refine this model with increased conceptual detail. Furthermore, this model represents a specific view of what constitutes a food network as an ecosystem. Future investigation should elaborate on how and why the systemic propositions are beneficial both from an academic and business practice viewpoint. Further investigation should also reveal, empirically founded, why possible the model is wrong. The challenge is not to discuss views in relation to each other at a pure conceptual level, but to ground an ecosystems understand of the food industry empirically. Finally, what characterizes explicitly "local foods supply" from an ecosystems viewpoint can also be elaborated on.

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