HORIZONTAL SUPPLY CHAIN COLLABORATION IN SWEDISH AND NORWEGIAN SME NETWORKS

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ABSTRACT

An SME is often managed in an informal way with focus on sales and production. Many SME are also financially vulnerable as they are strongly dependent on a few key customers and key products. As variation will always exist, SME should learn to deal with variation instead of try eliminating it. This paper hypothesises that structural flexibility in SME supply chains through horizontal collaboration leads to a regional environment of economical growth from which all active SME will benefit

The hypothesis is examined through two case studies; a Swedish supplier network that has worked together six year and a freshly started Norwegian supplier network. The Swedish suppliers are cooperating; e.g. in case of low capacity, they are sharing production resources. Another benefit of cooperation, supported by Norwegian findings, is the sharing of knowledge amongst each other that lessens the economical strain of keeping up with the "latest".

Cooperation within supplier tier networks marks the emergence of a "collective strength" improving individual suppliers bargaining position towards their customers, e.g. when obtaining new orders, when lobbying for changes in regulations, or when developing and verifying new products. This evolution indicates the emergence of a "Lean Enterprise" within the house building sector.

KEYWORDS

Horizontal supply chain management, Construction suppliers, Collaboration, SME

INTRODUCTION

As an enterprise's economy grows its focus changes from regional interests, to industry and later sector interests. This can be exemplified from construction where large contractors generally collaborate across supply chains (Figure 1) in strategic questions that involve the construction sector at large, i.e. political questions such as new construction regulations, raised transportation taxes, etc. These questions are critical for the growth of the construction sector, and hence, required for economic growth of individual enterprises. Industrialised house builders represents a relatively young niche in the housing industry where enterprises instead collaborate (Figure 1)

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to increased the market shares of industrialised housing by joint development of, for example, new and improved service systems (Lennartsson and Björnfot, 2010).

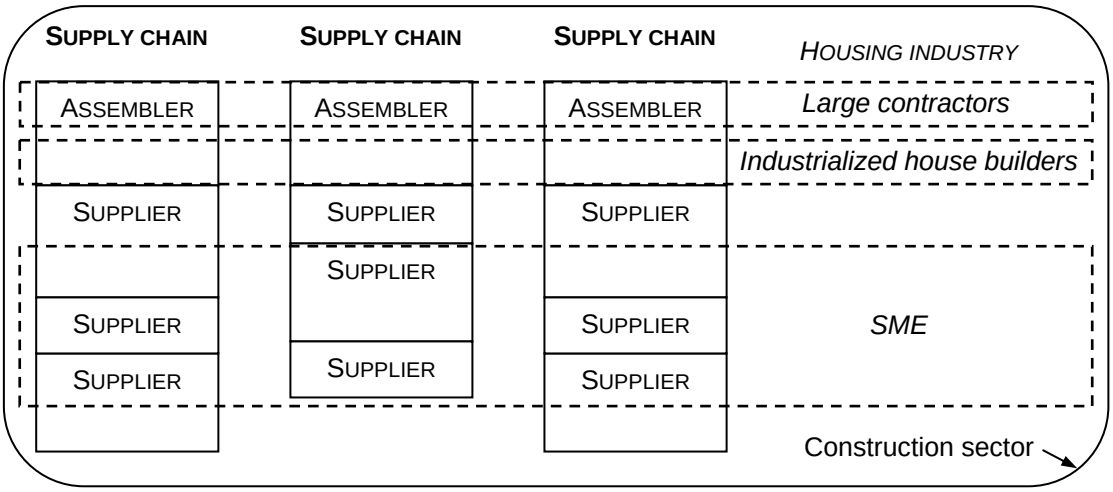

Figure 1: Illustration of collaboration efforts in the housing industry.

The plights of small- to medium-sized enterprises (SME) are many. Many SME are financially vulnerable as they are strongly dependent on a few key customers and key products (Radas and Božić, 2009). An SME is often managed in an informal way, often with a focus on sales and production. SME with growth ambitions often end up in financial problems (Cressy and Olofsson, 1997) and they often have problems recruiting required competences. Also, development of organizational and economic management systems rarely accompanies growth in sales (Greenhalgh, 2000). Sacks (2004) identify similar plights for subcontractors as they struggle to share their resources among many simultaneous projects.

Consequently, SME are generally too small for their voices to be heard at the construction sector or housing industry levels. Therefore, SME companies in the construction industry should opt for alternative routes for profitability and survival. Christopher and Holweg (2011) argue that enterprises should build in structural flexibility into their supply chains, i.e. to accept and learn to deal with variation instead of try to eliminate it as variation will always exist in one form or another.

This paper hypothesises that structural flexibility in SME supply chains through horizontal collaboration (Prakash and Deshmukh, 2010) will lead to a regional environment of economical growth from which all active SME will benefit (Figure 1). This environment is what in this paper is referred to as a Lean Enterprise, a horizontal Lean enterprise where SME will thrive. Benefits of horizontal supply chain collaboration among SME in the housing industry are examined through two case studies; a Swedish supplier network that has worked together six year and a freshly started Norwegian supplier network.

HORIZONTAL SUPPLY CHAIN COLLABORATION (HSCC)

In the current competitive industrial context, enterprises must react quickly to market changes. In order to face this problem, enterprises must collaborate. According to Cao et al. (2010), supply chain collaboration is two or more autonomous firms that form long-term relationships and work closely to plan and execute supply chain operations.

Prakash and Deshmukh (2010) conclude that supply chain collaboration plays a crucial role in improving overall performance that benefits all the chain members.

Supply chain collaboration is most commonly realised horizontally or vertically in a supply chain (Carpinetti et al. 2007). Horizontal supply chain collaboration is not as frequently approached in literature as vertical or horizontal collaboration or even networks. A general definition of horizontal collaboration is the pooling of logistics activities and consolidation of supply chains between two manufacturers (can be non-competitors or semi/direct competitors) for mutual benefits. Horizontal supply chain management thus means to cooperate across, rather than along, supply chains and can take place amongst both competing and non-competing companies (Figure 2).

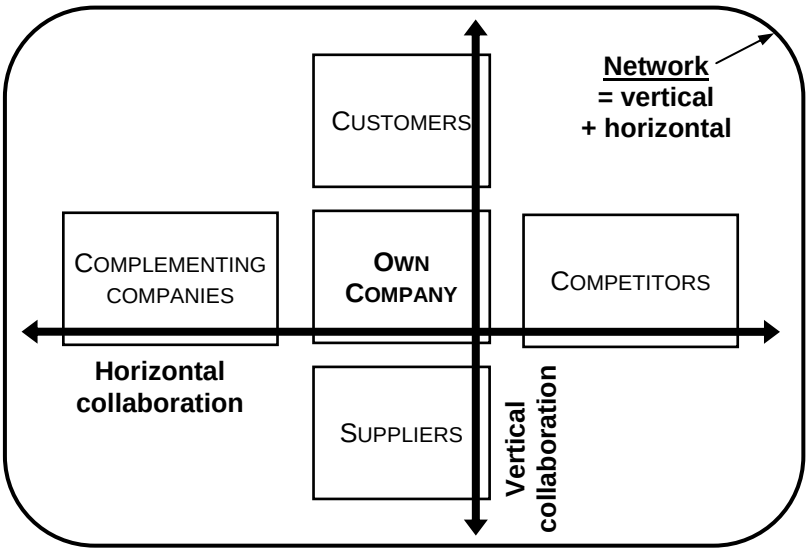

Figure 2: Illustration of vertical vs. horizontal collaboration.

Horizontal collaboration can, according to Prakash and Deshmukh (2010), reduce the overall cost of the supply chains and the enterprises can improve the real time decision making process by adopting a suitable inventory policy. Other objectives and possible outcomes of horizontal supply chain collaboration are:

- **Lower logistics cost** results in improved use of transport/storage facilities and economies of scale in deliveries to customers.
- **Higher service levels** leads to shorter throughput times to customers as well as more frequent deliveries to customers.
- **Higher turnover/market share** provides collaborative distribution channels to customers and shared offers for new/potential customers.
- **Reduced investments** leads to shared investments in distribution centres and handling as well as shared investments in transports.
- **Sustainable logistics** results in reduced CO_2 footprint and improved use of fuel and energy.
- **Knowledge exchange** provides an exchange of best practices and the sharing of innovation.

EVALUATING HORIZONTAL SUPPLY CHAIN COLLABORATION

In current supply chain practices, enterprises seek to create dynamic flexibility, which allows firms to cope with shifts in demand and technology within their existing supply chains. However, Christopher and Holweg (2011) argue that turbulence such as increasingly demanding customers and increasing uncertainty in global markets are features of times to come. Therefore, Supply chains need to adopt structural flexibility that builds flexible options into the design of supply chains.

Increased control efforts in supply chains in volatile environments results in rigidity which may result in amplification of variability rather than dampening. According to Christopher and Holweg (2011), this is because the supply chains have been designed with efficiency rather than flexibility in mind. Supply chains that achieve structural flexibility do so through a number of actions:

- **Dual sourcing**, by having alternative sources for key raw materials and major components.
- **Asset sharing**, i.e. being prepared to share physical assets such as factories, distribution centres or trucks with other companies.
- **Separating demand**, by recognizing that most products will have a base level of predictable demand that can be planned for. Demand over the base level ("surge") can be managed through the use of postponement techniques.
- **Postponement**, by holding the base materials, sub-assemblies, and modules as strategic inventory and assembling or configuring the products against actual orders.
- **Flexible labour**, by utilizing "annual hours" agreements or by making use of agency personnel, so that the labour force can be adjusted – with little or no cost penalty – to meet seasonal demand swings through the years, as well as shift is demand over the product life cycle.
- **Rapid manufacture**, by using new technology to enable the economic manufacture of products in small batches in relatively small facilities, thus permitting dispersed manufacturing.
- **Outsourcing**, to external providers, such as contract manufacturers and third-party logistics firms, to gain access to capacity when required and convert fixed costs into variable costs.

In order for SME in the housing industry to become more competitive on volatile markets they should adopt one or more of the actions for structural flexibility (Figure 3). Collaboration should be established with both competitors and complementing companies. Case studies of Swedish and Norwegian SME networks are used to examine the extent, and the effects, of horizontal collaboration.

Dual sourcing	Asset sharing	Separating demand	Postponement	Flexible labour	Rapid manufacture	Outsourcing
✓	✓	✓	✓	✓	✓	✓

Figure 3: Characterization of a fully structural flexible supply chain.

HORIZONTAL SUPPLY CHAIN COLLABORATION IN TIMBER HOUSING

Both the Swedish and Norwegian supplier networks were studied over a three year period through active participation by the authors who all worked as "academic project leaders" (representatives from the local universities). Active participation included involvement at multiple project meetings, seminars, workshops, study visits, continuous communication with project leaders (consultants) responsible for direct development of companies, as well as individual communication with SME both involved in the network and outside. From collected data, three cases are highlighted that demonstrates the effects of horizontal supply chain collaboration.

CATEGORIZATION OF INDIVIDUAL SME AND THEIR COLLABORATION

To evaluate and analyse collaboration it is important to clarify whether the involved SME compete or complement each other and whether there is a state of power that dictates the collaboration. The nature of collaboration is analysed by judging the SME product offer (Figure 4), i.e. the individual enterprises position in the value chain. The power relation between the individual enterprises involved is analysed by a combined evaluation of their annual turnover and number of employees.

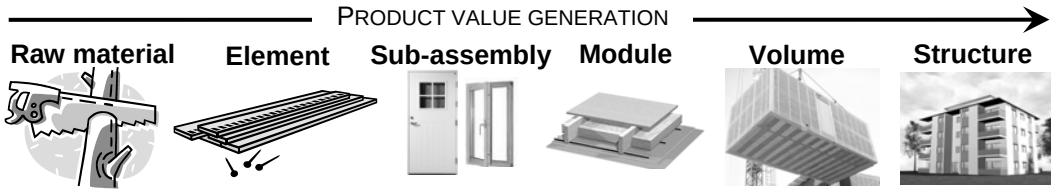

Figure 4: Characterization of product offer (from Björnfot and Stehn, 2005).

THE SWEDISH NETWORK

The network has been active for at least six years in northern Sweden. The network contains about sixty SME where about twenty of these are active in network activities on approximately weekly basis. The SME are saw milling enterprises, furniture and interior manufacturers, construction component manufacturers (door, windows, etc), construction element manufacturers (wall and floor elements) and detached housing manufacturers, i.e. the whole value chain as illustrated in Figure 4.

A privately owned organization dedicated to SME development supports development. In the network there is close cooperation with universities and other research institutes as well as other organizations focused on, for example, export. The network is externally funded from the government, involved municipalities and the European Union. Common network activities include participation at fairs and exhibitions, arrangement of workshops and seminars, aid in product development, etc.

THE NORWEGIAN NETWORK

The Norwegian network is active in south-eastern Norway. The network has been active about two years and involves abut 15 enterprises ranging from saw mills to construction component manufacturers (trusses, wall elements, roof element, etc), detached housing producers and producers of housing in multiple floors, i.e. the whole value chain is involved (Figure 4), similar to the Swedish network.

The network involves collaboration with academia and other research and development organizations. Network activities include collaboration activities aimed at improving individual SME competitiveness. Other focused activities are to increase industrialisation by, for example, joint study visits to other SME and the development of a new local education, specially catered to the needs of the regional SME.

COLLABORATION EXAMPLE 1 – COORDINATED PRODUCTION OF INTERIORS

SME 1 (Figure 5) competence is production of interior solutions and furniture. They supply libraries, hotels, offices and other projects with special requirements for furnishing and storage furniture, desks and other special carpentry, but where size of the order requires a cost-effective production and management

SME 2 (Figure 5) manufactures and delivers complete interiors for public spaces. They produce everything from reception desks to complete interior solutions for restaurant and hotel rooms. In recent years they have invested in modern machinery and specialize in furnishings for public spaces.

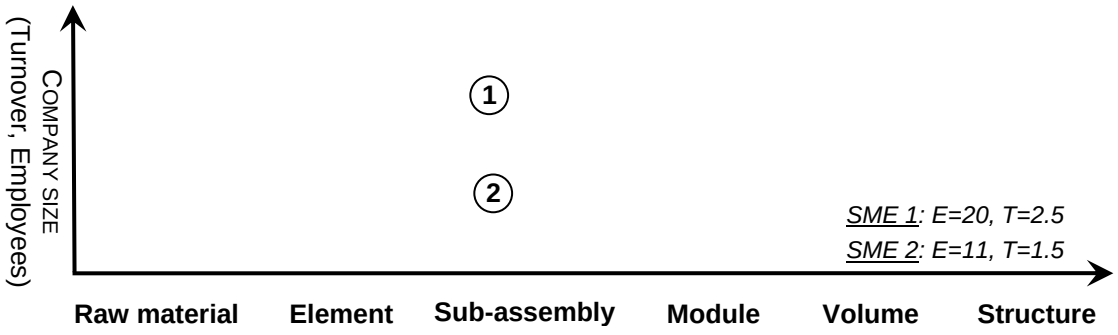

Figure 5: Characterization of involved SME in example 1 (E= number of employees and T= Annual turnover in M€).

Collaboration (summarized in Figure 6) between the two competing SME has been active in different forms about seven years. Examples of collaboration activities are:

- Both SME made individual bids for a hospital reception interior. *SME 1* won the tender. At the same time *SME 1* won a bid on library interiors. To fulfil both contracts, *SME 2* was allowed to produce the library interiors.
- During the delivery of interiors to a large cultural building, of which both *SME 1* and *SME 2* had contracts for different parts, purchasing of materials was coordinated in order to reduce the costs.
- As *SME 2* has invested in modern CNC machinery, *SME 1* frequently outsource parts of their production to *SME 2*, e.g. drilling of dense holes in large massive timber plates requires special machinery for cost-efficiency.

Dual sourcing	Asset sharing	Separating demand	Postponement	Flexible labour	Rapid manufacture	Outsourcing
✓					✓	✓

Figure 6: Characterization of actions for structural flexibility in example 1.

COLLABORATION EXAMPLE 2 – COORDINATED SALES OF FURNITURE'S

The network, composed of six furniture manufacturers (Figure 7), was created to improve sales of furniture. The network includes **SME 1** and **SME 2** from example 1. **SME 3-6** are smaller enterprises with fewer then eight employees, one enterprise is a carpenter who produce furniture by hand in a traditional manner. The network product range is furniture for dining rooms, bed rooms, and cupboards and bookshelves. To aid in marketing and sales, a sales enterprise (**SME 7**) was contracted.

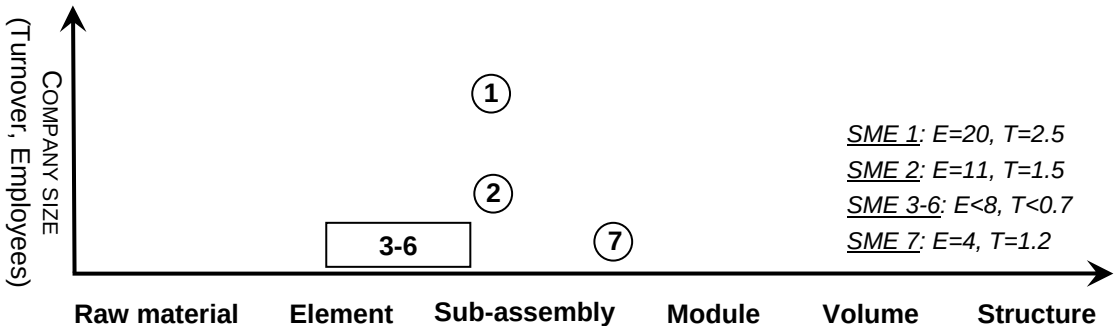

Figure 7: Characterization of involved SME in example 2 (E= number of employees and T= Annual turnover in M€).

Collaboration between the involved companies is active in many areas (summarized in Figure 8). Examples of collaboration activities are:

- All orders are received by *SME 7* who distribute production of furniture's or components to the different manufacturers based on quality, costs and availability of production capacity.
- Development of a common enterprise resource planning system for efficient coordination of sales, production and logistics. The ambition is to make sure that all involved SME receive work and become profitable.
- Jointly established distribution centre (DC) to coordinate deliveries to furniture traders (mostly in southern Sweden) allowing more optimal finished goods batches that can be managed based on inventory level, i.e. as customers pulls finished goods from the DC, a signal is sent back to the producers.

Dual sourcing	Asset sharing	Separating demand	Postponement	Flexible labour	Rapid manufacture	Outsourcing
✓	✓	✓				✓

Figure 8: Characterization of actions for structural flexibility in example 2.

COLLABORATION EXAMPLE 3 – COORDINATED PRODUCT DEVELOPMENT

Three SME has joined together with a large saw milling enterprise to develop and produce a new kind of heat-treated wood for new construction applications.

SME 1 calls themselves one of Sweden's most innovative producers of wood products, primarily intended for outdoor use. Their capabilities include round lathed and pressure-treated wood products, designed according to customer demands.

The product range of **SME 2** consists of interior and exterior panels, laths and other timber, and a large assortment of rails and pressure treated wood. They also perform priming and painting of exterior panels.

SME 3 is a family owned smaller saw milling company that grades timber in 26 compartments for maximum customer choice. They also offer planing of timber.

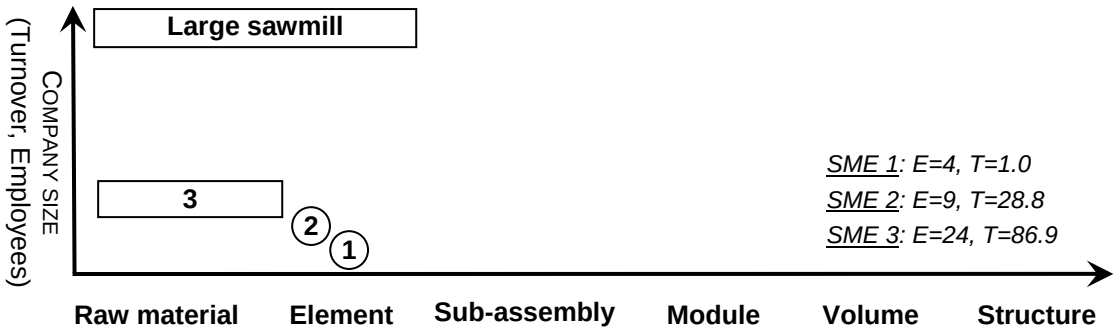

Figure 9: Characterization of involved SME in example 3 (E= number of employees and T= Annual turnover in M€).

The involved companies are not direct competitors. Instead they collaborate in product development of a new heat-treated wood. The underlying goal is to find new applications their individual products. However, the collaboration has also led to:

- Extensive research and development of the heat-treated material and also the design of an optimal production process.
- The development and construction of a new plant for production of the new heat-treated wood.
- Joint development of innovative application of the new material, for example a new window was developed to severely reduce heat conduction.

Dual sourcing	Asset sharing	Separating demand	Postponement	Flexible labour	Rapid manufacture	Outsourcing
✓	✓					

Figure 10: Characterization of actions for structural flexibility in example 3.

OTHER EXAMPLES OF COLLABORATION

There are plenty of other ongoing collaboration efforts within the Swedish and Norwegian network. Some examples of these are:

- Seven detached housing SME is working together with Sweden's largest detached housing producer and a large multi-storey timber housing producer in a combined effort to better market the regional housing industry: Joint activities are, for example, workshops with local municipalities and landlords.
- In northern Sweden there has been a long-time on-going effort to coordinate competences and education in the timber industry. Activities performed have included companies from all parts of the value chain and the

work has led to development of an internet based competence platform for coordination of competence requirements for SME.

- Participation at fairs is a key activity leading to increased business for the individual companies but cross-wise orders are not uncommon, i.e. where competitors also receive orders. Therefore, competing SME share stands with the argument that *'two are seen more easily than one'*.

- There exists a similar network to the one presented in example 2 above composed of two competing SME and three design SME that jointly market their products through a joint web-page and coordinate orders.

- In both the Swedish and Norwegian networks described above, competing SME sit together and discuss how to improve that regional industry, arguing that "*my own competitiveness and business will improve if the business climate surrounding my enterprise grows*".

OPPORTUNITIES FOR IMPROVED SME COLLABORATION

From the case studies it becomes evident that collaboration among the SME occurs mainly as dual sourcing, asset sharing, and outsourcing. Consequently, there are opportunities to further improve the structural flexibility of the individual enterprises through improved horizontal collaboration. The occurring collaboration can be further improved by separating demand, postponement strategies, use of flexible labour and rapid manufacture. A possible activity to further improve structural flexibility is to jointly employ one or more resources that can help coordinate:

- **Marketing and sales** is crucial for any company but maybe more so for SME who have a limited product portfolio. Pooling together products from different SME that are marketed and sold jointly can potentially lead to additional businesses that will further promote the collective products.

- **Research & development** is a major hindrance for SME that wants to grow as they rarely have a margin to use to develop their current businesses. However, it is imperative that the SME are inclined to grow as standing could mean being outpaced by competitors leading to economic decline.

- **Logistics** through the development of additional distribution centrals that should be linked to postponements strategies to further increase the structural flexibility. This implies the need of additional assemblers, either through new formed enterprises or that current SME integrate downstream.

- **Supply of competences** should occur through a joint development of a competence platform that acts as a hub that brings together suppliers of competences and education as well as companies seeking the same. Such an initiative is under development in the Swedish network.

The study was performed from an SME perspective; the customer perspectives or legal issues of so called, "alliancing" were not considered in this work. However, it is relevant to include these issues in future work. Even so it is believed that horizontal supply chain collaboration can be linked to other Lean initiatives. For example, agility as used in Lean (Lu et al., 2011) means that market knowledge and virtual

corporations are used to exploit profitable opportunities in volatile environments, i.e. the goal of structural flexibility; a foundation of horizontal supply chain management. Consequently, horizontal supply chain management represent a Lean enterprise where *'the companies joined in a Lean enterprise must target the best opportunities for exploiting their collective competitive advantage'* - Womack and Jones (1994).

CONCLUSION

An analysis of economic data from the development of the national Swedish timber industry during the economic crisis (2008-2010) indicates that the amount of bankruptcies of SME in the northern Swedish timber industry has been fewer than country average. The reasons for this can be many but the authors firmly believe that horizontal supply chain collaboration among the SME is a reason, certainly among others, as horizontal supply chain collaboration provides a flexible business climate leading to improved SME competitiveness and survivability on a volatile market.

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