Understanding Supply Chain Integration:
A Connectivity & Willingness Perspective.

Christer Ekholm
Abstract

Information and Communication technology (ICT) supported Supply Chain Management has been acknowledged by the literature to help corporations adapt to challenges posed by an increasingly globalised marketplace. However ICT-managers have in many cases not seen the positive effects expected from the investment in new technologies. This has by some been attributed to the lack of investigation into the supply chain partners’ ability to be integrated with based on the concepts of connectivity and willingness. In this paper I adapt these notions and apply them to empirical data gathered through a case-study of a corporation in the Swedish forestry industry. The aim of the paper is to understand how willingness and connectivity can help explain the level of integration in the existing supply chains in a wide array of customers from local to global. As a result a model is presented that confirms connectivity and willingness as contributing factors for integration with all customers but one moving in the direction of higher forms of ICT-supported collaboration.

1. Introduction

In an increasingly growing global market corporations are faced with new challenges and fast changing customer demands (Williamsson et al. 2004). To meet these posed challenges organizations are increasingly grouping together to form networks where different areas of expertise are pooled to allow them to evolve and generate new business opportunities or secure existing markets (Narasimhan et al. 2006). The network stakeholders can possess different areas of expertise such as logistics, planning, production or support and can among them differ in individual goals but with the common interest of a distribution channel which enables a competitive corporate structure and revenue (Bechtel & Jayaram, 1997). Structures of this kind have generated a large volume of research and have been referred to as supply chains, business ecosystems, business networks, or in the case of the Japanese market Keiretsu relationships (Bechtel & Jayaram, 1997). Although being closely related these labels put on the networks differ slightly in perspective. Supply chains are defined as a network of firms involved in various activities both upstream and downstream, in order to add value in the form of products and services delivered to end customers (Narasimhan and Jayaram 1998, Arshinder et al. 2008). Business ecosystems view the networks as living organisms which can choose to compete or cooperate with coexisting eco-systems (Katz & Shapiro, 1998). The other two definitions describe an even higher level of integration through the business networks “limitless” connectedness (Bechtel & Jayaram 1997) and the extremely tight relationship of the Keiretsu with for instance shared ownership (Bechtel & Jayaram 1997). Despite from which perspective one chooses to view these organizational relationships there is no question that with their growing size the corporations involved need to manage these relations to ensure its viability is also amplified.
Supply chain management (SCM) and platform governance has crystallized as two of the prominent fields of research in this area and both have identified a few key attributes which seem important to supply chain success such as information sharing and platform openness. These can be viewed as related ideas only defined in different contexts depending on perspective. Where SCM talk about inter organizational information flows (Williamsson et al. 2004), platform governance address open vs. closed platforms (Eisenman et al. 2008) but it all boils down to how open one should be with internal information in a business relationship.

In connecting different corporate entities to enable information sharing the use of information and communication technologies (ICT) plays a prominent role (Dong et al. 2009; Rai et al. 2006). Although proven to be a powerful tool to boost innovation, leverage resources and manage partners (Dong, 2009) in this context ICT is in no way a guarantee for a successful supply chain with efficient information flows as Fawcet et al. (2009) showed in identifying two dimensions of successful integration; connectivity and willingness. The first addressing the ICT aspect of actually being able to share and analyzing data and the second to what extent supply chain members actually makes information available. Although important the new opportunities offered by globalization the supply chain has to be managed on the local and historical market as not to lose existing market shares.

One sector which has undergone this change and is therefore faced with these issues from local to global is the Swedish forestry industry. From historically local sawmills selling to local customers its supply chains are today often complex and spanning the globe with a high level of following uncertainty stemming from both the numbers of supply chain stake holders as well as the built in uncertainty of wood quality, and supply. It is also an ICT intensive industry as the need to minimize raw material loss is essential since this is the major ongoing investment. This need to cut costs and rationalize the processing of raw materials has generated an incentive for high investments in the production part of the supply chain while the latter parts are often neglected.

The aim of this paper is to by adapting the supply chain definition of corporate collaboration and the concepts of willingness and connectivity attempt a categorization and explanation of existing supply chain information sharing enabling integration. Empirical data will be collected by performing a case study of a corporation in the Swedish forestry industry (SCA) to answer the following research question:

- How can willingness and connectivity be used to understand integration in supply chains?

This paper is organized as follows. In the next section related research is presented following. Then a methodology is defined and the implementation of this in the work with the paper is described. Next related research is presented and a vocabulary defined to be used throughout. Later the case study is introduced with a description of the papers focal corporation and a selection of its customers. In the finishing parts of the paper the collected data is merged in an analysis to form the basis of a discussion and conclusions.
2. Theoretical background

The theoretical framework of this paper originates from the notion that there is a benefit in grouping together in supply chains to meet the challenges made by a growing global market while still being able to handle one's existing local. This argument has been made by several researchers claiming the positive effects of collaboration (Van der Vaart & Van Donk, 2007; Tan 2001; Vickery et al. 2003). Some have even proposed that competition now is between different supply chains rather than between firms (Lambert & Cooper, 2000). This is a trend evident in the case of the Swedish forestry corporation SCA which has increasingly become a global supplier of forestry based products with an array of supply chain partners ranging from among others raw-materials suppliers, logistics firms, distributors and end customers.

To fully utilize the potential of the supply chain the need to handle these relations has given birth to the field of supply chain management.

2.1 Supply chain management

SCM although originating in the field of logistics has grown to encompass all aspects of the supply chain such as operations management, materials and distribution management, marketing, as well as purchasing and information technology (Guinipero et al. 2008). Although slightly disparate the citations below describe the main focus of SCM as to form a strategy which enables the full potential of the integration of these aspects in inter firm relationships.

“Supply chain management is the management of interconnection of organizations which relate to each other through upstream and downstream linkages between the different processes that produce value in the form of products and services to the ultimate consumer” (Slack. et al, 2001)

“Supply chain strategies focus on improvement and innovation of end-to-end processes between firms and their customers and suppliers” (Lee, 2000)

It has been shown that a lacking quality in supply chains lead to negative consequences such as inaccurate forecasts, low capacity utilization, excessive inventory, inadequate customer service, inventory turns, inventory costs, time to market, order fulfillment response, quality, customer focus and customer satisfaction (Ramdas & Spekman, 2000; Barua et al. 2010).

To enable the positive effects of SCM the importance of ICT as an enabler has been noted and even seen as a natural and necessary part of SCM for these business relationships to even exist (Hsu & Wallace, 2007; Rai et al. 2006). A well designed ICT solution for SCM have been shown by researchers to help shorten lead-times and lead to smaller batch sizes, reduced inventory levels, faster new product design, shorter order fulfillment cycles, improved coordination, improved purchasing, operations and firm performance (Hammer, 1990; Anand & Mendelson, Clark & Hammond, 1997; Lee & Whang, 2000; Li, 2000; Hult et al., 2004; Cai et al., 2006; Shah & Shin, 2007). ICT does not in itself create these positive effects
but rather aids what can be described as three flows to be enhanced and thereby achieve a well functioning supply chain;

- The flow of information (Ho et al. 2002), partners need to share information to develop globally optimal plans.
- Physical flows (Lee, 2000), partners leverage the flow of materials by leveraging the visibility of resources.
- Financial flows (Mabert & Venkatraman, 1998), streamlines the billing and payment operations.

This use of ICT as a facilitator of “flows” in SCM is not new but has grown in importance over the last decades in what Williamsson et al. (2004) describes as four phases.

- Phase one; paper copies of orders, bills and invoices are made and distributed between supply chain partners and the use of information systems is very limited hence the information sharing within the supply chain is very limited.
- Phase two; An Electronic Data Interchange (EDI) based SCM-structure is implemented which handles order status, pricing, billing etc. This use of EDIs increases the quality in the information shared in the supply chain.
- Phase three; This is a more integrated approach to SCM where an Enterprise Resource Planning (ERP) is introduced to enable the sharing of for instance stock databases. This opportunity to openly share the business information with supply chain partners further increases and strengthens the quality of the supply chain.
- Phase four; Here the supply chain is defined by strategic two-way inter-firm information sharing accelerating decision making capabilities and thereby strengthening the supply chain and increasing end-customer satisfaction.

Although these phases are described as historical in no way do all corporations operate in phase four today. In fact a survey of 33,000 companies worldwide shows 80% in the initial phases above and less than 5% were integrating their information systems with other partners (Williamsson et al. 2004). Obviously many still have not found the incentives to move forward to a more technology based workplace and others simply have not managed to despite the possibilities it entails. Although no data is available to support such an assumption but this percentage of integration is probably higher today due to lowered costs of hardware and an increase in bandwidth as enabling factors. But this is not the whole truth as Fawcet & Magnan (2001) shows that despite investing in ICT-solutions for their supply chains many corporations have not achieved expected results. Fawcet et al. (2007) challenges the notion that (although necessary) ICT in itself is an enabler of a well functioning supply chain which supports the three flows. The authors instead identify the dimensions of connectivity and willingness and point to these as explaining factors in the understanding of a successful implementation of ICT in SCM. Connectivity describing the firms ICT structure and ability to collect analyze and share information and willingness addressing the issue of to
what extent supply chain partners are comfortable with making decision-making information available for its partners.

2.2 The nature of connectivity
Connectivity refers as stated above to the use of technology as for example EDI and ERP to collect, analyze and disseminate the information needed to enable effective supply chain decision making. As shown in the following examples this is a well tested strategy with at least in these cases successful outcomes.

- Wall-Mart uses their “Retail Link” to make it possible for companies to share historical orders, current sales trends and rolling forecasts on a real-time basis. Such information reduces decision-making uncertainty, helping the entire supply chain to perform more efficiently (Fawcet et al, 2009).
- United Parcel Service (UPS) has visualized their package handling by letting customers use their platform to track deliveries which enables them to improve inventory management (Rai et al. 2009).
- Cisco Systems has created a digital platform enabling near real-time transmission of information between supply chain-partners. This supports their planning and coordination within the partnership (Rai et al. 2009).
- By leveraging ICT to manage their supply chain Dell achieved dramatic results in cash flow cycles by only being forced to keep a four day stock (Rai et al 2009).

What these examples do is to establish high connectivity as something that has the ability to afford positive effects to the corporations who invest in it by enabling the sharing of information between supply chain members.

2.3 The nature of willingness
Although strong connectivity in many ways is a prerequisite to communicate and share information it is not a guarantee that this will be done. In fact some decision makers feel that the sharing of information regarding their own business will put their firm at a disadvantage (Williamson, 1975). Thus they withhold information needed by supply chain partners that could help the performance of the supply chain as a whole impairing the decision making process of supply chain partners (Fawcet et al., 2009). Willingness therefore plays an important role in the sharing of information within the supply chain and needs to be nurtured and invested in. This is by no means as easy as just upgrading a firms connectivity by employing experts and purchasing new technology, but rather an ongoing process of cultivating a culture of openness. This can, for instance, be done by managers supporting information sharing programs (Hammer, 2004). In corporations where a real effort has been put into the development of willingness Cachon & Fisher (2000) showed that supply chain costs were cut by an average of 2,2%, resulting from shorter lead times and lower batch sizes. As shown in this section in examples from both research and practice there is a possibility for corporations to gain the positive effects seen in figure 1 from investing in supply chain information sharing, enabled by willingness and connectivity.
Figure 1. Information dependent contingent response Adapted from Fawcet et al. 2009.

In this paper I will use connectivity and willingness to explore how these concepts can be used to explain the level of integration between SCA and their customers.
3. Methodology
To gather empirical data on the different types of customers and levels of integration that can occupy the different supply chains of one supplier a case study was performed. This entailed a qualitative approach to the acquiring and processing of data. The reasoning behind this is based on the complex nature of the case studied and the influence of participants’ perceptions of rationale behind the implementation of shared information ICT structures and the range of these. A qualitative study in this context provides a well formed framework of investigation due to its focus on verbal formulations (Backman 2008, s33). A quantitative approach to this issue would in the authors mind prove insufficient in examining these underlying perceptions due to its main use to describe numerically based research results (Backman, 2008, s33).

3.1 Qualitative case study
In accordance with the philosophy stated above a qualitative case study of a business in the Swedish forestry industry has been undertaken. The aim of the case study has been to gather empirical data on the research questions posed and evaluate in the light of existing research. This choice of technique is based on the definition of qualitative case studies below.

“investigates a contemporary phenomenon within its real life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used.”
(Yin 1989, s23)

The focal firm in the study has been chosen on the grounds of its characteristics as a business which deals with a variety of customers differing both in size, corporate structure and nationality in a wide array of supply chains whose information flows are in various degrees digitized. These characteristics do in the authors mind make it an excellent study object since it encompasses all of the issues raised in the aim of the paper and the research questions posed.

3.2 Data Collection
During the work with this paper data has been gathered by qualitative semi structured interviews with a mix of open and closed questions. The use of the qualitative interview technique is an extension of above reasoning and the semi structured form is a good match in this context to get to the core of the interviewees reasoning behind the level of integration in the supply chain as this leaves room for afterthought while keeping the interview from drifting into for the paper irrelevant domains.

Eleven interviews were performed with a total of seven respondents. Interviews vary in length from 42 minutes to 15 and were in the face to face situations taped. The choice of respondents has been made based on their impact on the supply chains in question from strategic standpoints as well as day to day dealings and actual construction on the ICT solutions used to support the supply chain objectives. The positions held by the respondents vary from production managers, IT managers, developers, sales executives and logistics
management and do in the authors mind constitute a well qualified group to offer information on the subject of the paper based on the definitions above. If possible the interviews have been face to face since this allows for the best setting for a qualitative interview. However some interviews were performed via email and telephone to overcome geographical distance between the author and the respondents. The focus of the interviews has been the get respondents’ view of current supply chain performance specifically focusing on the aspects of ICT and data integration. The object of the interviews has been to collect data on the different types of customer relations in the case studied and the information sharing taking place in these. An effort has been made to find different types of customers based on firm size, size and spread of market.

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Interview type</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product manager 1</td>
<td>Face to face</td>
<td>42 min</td>
</tr>
<tr>
<td>Logistics manager</td>
<td>Face to face</td>
<td>26 min</td>
</tr>
<tr>
<td>Product manager 1</td>
<td>Face to face</td>
<td>11 min</td>
</tr>
<tr>
<td>IT-manager</td>
<td>Face to face</td>
<td>22 min</td>
</tr>
<tr>
<td>Product manager 2</td>
<td>Telephone</td>
<td>20 min</td>
</tr>
<tr>
<td>Product manager 3</td>
<td>Email</td>
<td>-</td>
</tr>
<tr>
<td>Sales manager</td>
<td>Face to face</td>
<td>30 min</td>
</tr>
<tr>
<td>Product manager 2</td>
<td>Telephone</td>
<td>10 min</td>
</tr>
<tr>
<td>Product manager 3</td>
<td>Email</td>
<td>-</td>
</tr>
<tr>
<td>Product manager 4</td>
<td>Telephone</td>
<td>20 min</td>
</tr>
<tr>
<td>Product manager 4</td>
<td>Email</td>
<td>-</td>
</tr>
</tbody>
</table>

*Figure 2. Interview chart*

During the work on this paper an office was provided by SCA where I spent several days conducting interviews and performing other related tasks. This opportunity to observe the day to day operations has also contributed to my understanding of the case. Additional material was provided by SCA in the form of presentation material regarding corporate structure and product information.

Related research used in this paper has if possible been collected from the basket of journals defined by the Association for Information Systems (2007). This choice was made to add validity to the sources used. When statements made in used articles refer to previous research the referenced material has been used.

### 3.3 Data collection analysis

This paper describes my understanding of the Swedish forestry industry supply chains based on the data collected during the paper work. This understanding has been an evolving process due to my initially non existing experience in the field of SCM and the forestry trade. To remedy these shortcomings I initially visited the Rundvik offices and sawmill to get a tour of the facilities and a basic understanding of the trade. This gave me a foundation for forming my research questions and the related research in my mind needed to answer these by getting a first glimpse into the difficulties facing the industry such as the uncertainty of supply of qualitative raw materials and the following complex supply chains in the global distribution process. Throughout the work with the paper the Rundvik offices became a second place of
work where I was given my own office. This opportunity to get an inside view of the day to day dealing with customers as well as being able to pop in for a couple of quick questions is something that has helped my research by expanding the context of how SCA perceives the supply chains and the basis for implementation of ICTs into them.

The response from the employees both in the offices at Rundvik as well as the ones placed elsewhere has throughout been very helpful and open minded. The interviews made were summarized and used as reference throughout the work with the paper and follow up questions were asked throughout the process as new information generated them. Although some information considered business sensitive for instance pricing and sales volumes have been asked to not be published in the article these have been helpful in assisting me in getting a deeper understanding of the issues facing SCA in their supply chain relationships. To help the reader understand my process and conclusions drawn from the related research in correlation with the interviews I have tried to as carefully as possible create a continuous reasoning behind them by using quotes and careful referencing to literature. The decision to limit the related research to SCM and the explanatory factors willingness and connectivity was not an easy one to make due to the number of articles published on SCM. The basis for the final use of these two was something that formed over time working with the paper as these have been empirically tested as shown in the related research section to be influencing the performance of supply chains.

To gather empirical data to form a basis for an analysis based on willingness and connectivity a case study was performed at the Swedish forestry corporation SCA. The selection has been made to represent all types of supply chain partners to the highest extent possible given the time restraint of a bachelors’ paper. The description of customers is one based on the view of SCA employees which is a limitation made based on the viewpoint chosen in the paper to evaluate integration from a supplier perspective but is also a consequence time and budget constraints. The difference in text volume stems from the complexity of the supply chain related to the specific customer.

Once the data collection process of this paper was completed I applied the concepts of willingness and connectivity to help craft the model presented in the analysis section. This model helps the understanding of integration between a supplier and several types of customers.
4. Case

In this section I will describe SCA and some of the customers served by SCA Timber. The information gathered is from the perspective of SCA and will function as a basis for the analysis of the customers based on the notions of connectivity and willingness. SCA is in my mind a perfect company for a case study laying the ground for an analysis based on willingness and connectivity. This is because their wide range of customer types from the local lumber yard to the multinational corporation buying huge volumes. It is also an old industry which has functioned in a certain way for a long time and has therefore experienced the move from a local economy to a global one forcing them to adapt to new customer demands while still keeping their old customer base.

4.1 SCA forest products & timber

The supply chains examined in this paper primarily concerns the SCA Forest business section and specifically SCA Timber. SCA is a company that produces and markets personal care products, tissue, packaging, publication papers and solid-wood products. Production of SCA Timber comprises publication papers, pulp and solid-wood products, and is conducted at 17 facilities in three countries. Products are mainly sold in Europe, but also in Asia, North Africa and North America. Having its own logistics is part of the company’s integration strategy, with loading and unloading terminals in Sweden and on the continent and freight transportation on vessels. SCA’s forest assets are located in northern Sweden, where the Group has built up an efficient supply system for its own mills and sawmills. In solid-wood products, SCA develops and further processes purpose-designed products for interiors, carpentry and the building trade. All products are customized for the next stage in the processing chain and are supported by services and warehousing integrated into the customer’s distribution and sales.

![SCA forest products organization chart](image-url)
SCA Forest is one of the largest producers of wood-based products in Europe with an annual production of 2.2 million m³. The product catalog is completed with offerings of logistics services to customers primarily in the wood industry and the builders’ merchant sector. The European market for solid-wood products amounts to some SEK 110bn, with demand primarily deriving from the construction and house building industries.

In the solid-wood products area, the strategy is to move towards more value-added and customized products in markets that offer long-term growth. SCA is a qualified supplier of purpose-designed wood products to industry for further processing into such items as panels, floors, windows, doors and furniture. Finished-wood components for window manufacturing, for example, represent another growth market. Products for the “do-it-yourself” markets are delivered planed and pre-packaged. Service and advanced logistics solutions are of key significance for the building materials trade. SCA works in close cooperation with its customers in its principal markets in Scandinavia, France and the UK. In Italy, Asia, North Africa and the US, SCA is a specialized supplier within several niche markets. SCA has further developed its operations towards processed and customized, semi-finished products and components with high-value content and more balanced demand.

4.2 SCA & ICT
SCA Forest has their ICT-department in Sundsvall in order to have it close to their main offices. SCA uses the SAP R3 platform business wide a system which they find works well for them especially after implementing different add-ons as Process Integration (PI) to enable the exchange of different xml standards. The lack of a business-wide standard is a problem for SCA forest and there is a constant need to address this issue by custom solutions. The paper industry has its XML standard Papinet which is sometimes used within Forest as well but is by no means a business standard. SCA also builds different kinds of EDIs based on customer requests and these mainly support the placing of orders and the exchange of different types of documents. Often a third party solution is used to enable the merging of data. They feel that the positive effects of a specific solution with smaller customers is hard to make because of cost vs. positive effects but in the case of medium and large corporations with a well established ICT-infrastructure which can enable a support in the production of the EDIs.

4.3 SCA Customers
In this segment I will present the customers used to gather empirical data on the levels of integration in this paper.

4.3.1 Klockestrand såg & hyvleri AB
This customer is a small saw and planing mill formed in 1936 and located in Sandöverken. They focus on a local market in a wide array of products which are possible to adapt to customer wishes. The contact between this customer and SCA is primarily based on telephone, email and fax. Where the ordering of products from SCA is done by telephone via the local product manager at the SCA Bollsta sawmill. An order confirmation is made by the product manager within 24 hours via email or telephone. If there are questions about length or if the requested item is not in stock a contact by telephone is made to the customer to
discuss this issue. After a complete order has been made a person responsible for logistics at SCA arranges delivery with a third party.

4.3.2 Olssons såg
Olssons såg & Hyvleri a fourth generation family owned business that in addition to a wide selection of products has a focus on customized products. An order confirmation is made by the product manager within 24 hours via email or telephone. If there are questions about length or if the requested item is not in stock a contact by telephone is made to the customer to discuss this issue. After a complete order has been made a person responsible for logistics at SCA arranges delivery with a third party.

4.3.3 Nylands trä
Nylands Trä a formerly family owned distributor established in 1945 which in the last five years have been assimilated into the Interpares/Woody family. The company initially only impregnated wood but through several changes of ownership the markets has broadened to also become a lumberyard with a wide range of products for the local market. The latest step in the company history was taken in 2010 when they moved further into the home improvement market with a separate store opened in Kramfors under the Woody brand name. The interaction with SCA is in many ways the same as with Klockestrands såg and Nylands trä although the communication have moved more and more into an email based one but telephone and fax are often still used.

4.3.4 Byggmax
Byggmax is a relatively young corporation (formed 1993) focusing on low price building materials with 70 stores in Norway, Sweden and Finland. Byggmax is one of the three large Swedish building materials distributors and purchases as the others a variety of products from SCA to meet market demands. Although similar to the others Byggmax is the only SCA customer which has a functioning EDI-solution for ordering and confirmation with SCA today. The EDI was developed by SCA on the initiative of both partners and uses a third party solution for the integrating of data types between the two firms. Byggmax places an order into the EDI which is received by SCA who looks over their stocks and arranges for delivery based on these. The delivery created is not necessarily the exact same as the order made. It may for example consist of fewer packages than requested or it may lack some of the dimensions ordered. As the delivery is created by SCA a message is returned to Byggmax with confirmation of the order with the accepted deliveries shown. The message back to Byggmax also contains information about the delivery date which has been arranged by SCA with a third party logistics firm. This is most often done via email or telephone and in rare cases the third party has a web-solution which supports booking of transports. There are ideas at SCA to offer more services as for instance handling Byggmax stock and delivering as this drop to arranged levels. However this is just an idea and not anything that is being worked on currently.
4.3.5 Beijer
Beijer (formed 1886) is Sweden’s largest construction materials distributor and a part of the Wolesley group. The corporation has stores in 63 locations and has a turnover of SEK 5 bn and 1400 employees. They mainly focus on three markets the private consumer market, small contractors and larger entrepreneurs. Beijer buys as the other actors in the construction supplier business a large volume of different products from SCA. The deal with SCA is a long running one, when the stocks at the local Beijer warehouses run low an order is placed with their local sales representative most likely by email or fax. The order is then processed by SCA to ensure its correctness and their ability to fulfill it. If any questions arise contact is made with Beijer to discuss these in the same way as the ordering. As an order has been approved the transportation to the Beijer location is made by the local logistics manager either by telephone or email and in rare cases by entering the requested transport on a third party web service to later be contacted via telephone or email with confirmation. There are some plans from the SCA side to implement an ordering EDI in the same style as the one used by Byggmax.

4.3.6 K-Rauta
K-Rauta is a subsidiary of the Finnish trade group Kesko and opened its first store in Sweden in 1996. K-Rautas business is based on the statement “The warehouse for the whole house” which in their mind entails all needed for the Do It Yourself (DIY) customer. As with the other firms occupying this segment they buy a wide range of products from SCA. The K-Rauta supply chain is in many ways identical to the one of Beijer and plans to move more into the modus operandi of the Byggmax-relation is also a priority here from both K-Rauta and SCA.

4.3.7 Meiken
Meiken is a Japan based lamwood producer and is SCAs largest external customer. The deals are made on a three month basis where volume and price are renegotiated each time. This might seem as a short time span but the two firms prioritize each others businesses and other suppliers act as bumpers if SCA are not able to deliver the volumes requested. Meiken only buys one product from SCA for the production of lam wood and is therefore a customer which offers great potential for standardizing. Once a deal has been made original papers are sent by post between the two parties and production is distributed among several SCA sawmills. A shipping schedule is drawn up in cooperation with SCA Transforest and during the three month period these schedules are emailed to the customer once a week. As the product is unloaded in the Japanese harbors the SCA responsibility is ended and further transport is handled by Meiken. With Meiken there is virtually no implementation of integrated ICT-solutions today which may be attributed to the fact that they are a relatively new customer but there are plans of an integrated solution for sharing of documents regarding contracts, ordering, billing and shipping schedules. This is just on a planning stage and no timeframe has been set as to when such a solution could be in place. The reason for this planning is a desire from both Meiken and SCA to standardize and simplify the transfer of documents by digitalization. Although it is a wish from both SCA and Meiken to have such a solution the SCA representative feels that is they that SCA will have to be the ones to drive
such a project through but are willing to do so as they feel that they tie the customer closer as well as reducing administrative costs and following errors.

4.3.8 The Home Depot
The Home Depot or simply Home Depot is an American retailer of home improvement, construction products and services. The Home Depot operates 2,248 big-box format stores across the US. The Home Depot is headquartered from the Atlanta Store Support Center in Atlanta, Georgia. In terms of overall revenue reported to the U.S. Securities and Exchange Commission, The Home Depot is the largest home improvement retailer in the United States, ahead of rival Lowe's, and the fourth largest general retailer. The store operates out of large warehouse style buildings averaging 105,000 ft² (9,755 m²) with megastores operating in larger facilities (the company's largest store, located in Union, New Jersey is 225,000 ft²).

The business relationship between SCA and Home Depot was initiated in 2001 at a forestry product fair where the SCA representatives approached Home Depot with product samples. This lead to a deal being made between the firms for a trial supplier period if which lived up to the Home Depot standards of product and delivery quality would lead to a longer engagement. This has today grown to three products and SCA is the main supplier to the Home depot of these specific dimensions and Home depot is today SCAs second largest external customer. The deals between SCA and the Home Depot is made long term but can be subject to renegotiation at any time in regards to price and volume. The deal states that SCA are to keep a stock in distribution centers all over the east coast and that the volumes must stay at a level that is acceptable to the Home Depot. The products delivered must also live up to a high standard which is controlled by Home depot employees at the local stores which if the deem products not satisfactory discards of them. This percentage of discards cannot drop below a certain point or SCA is in breach of contract. The contract can be dissolved at any time and for any reason with a three month notice from any party in the agreement.

Since gaining Home Depot as a customer SCA has consciously worked on streamlining their production process by implementing new systems for gaining the most out of the raw material in the mill and 90% of the products sold to the Home Depot today is produced at the Rundvik sawmill with the last 10% being produced in Bollsta. These last 10% is also to be moved to the Rundvik production line for SCA to be able to further streamline their production.

As a new product is agreed to be delivered to the Home Depot its product info is entered by SCA into the Home Depot platform which hold information about all of their products and is used as a basis for online sales. This is a requirement made by the Home Depot. When a product is produced it is packed into standardized packages to be shipped to large distribution centers in Philadelphia and Houston. Each package has an individual number and also a barcode. The objective of the package number is to simplify tracing of lost packages and to help control the flow of product from the distribution centers. The barcode however is not used in any way but was a requirement from the Home Depot that SCA spent a great effort into implementing. After arriving at the distribution centers in Philadelphia and Houston the handling is handed over to an American logistics company that further distributes the packages to thirteen smaller distribution centers spread across the east coast.
to later be picked up by the Home Depot. As the packages are taken from the smaller distribution centers it is counted of the local stock and this is also the point where the SCA ownership of the product is ended and the Home Depot is now the proprietor. The logistics up to this point is all planned by one employee at SCA Rundvik who gets the package numbers emailed to her from the US logistics partner in a sometimes scanned form or in some instances excel sheet. She then plans and governs the flow of packages from Rundvik to the distribution centers to keep a stock that is not too low, which is a requirement from the Home Depot and can lead to a termination of the and not too high since this ties down funds for SCA in product that is not invoiced. The planning is today handled in a large excel sheet full of different macros which are updated on the grounds of the package numbers manually entered by the SCA logistics employee. The planning is thereafter adjusted by the employee based on previous sales and experience.

5. Data Analysis

As shown in the case description SCA has a number of different levels of integration, sharing of information and customer types whose business relation to SCA is handled in a wide range of ways. In this section I will implement the concepts of willingness and connectivity to try and explain these various levels of integration.

I begin this examination by looking at the customers who purchase minor volumes locally and whose supply chains therefore lacks the complexity of the larger global customers. Fitting this description are Nylands trä, Klockesstrand såg & hyvleri AB and Olssons såg. These are the types of customers that SCA has always had and as one product manager puts it “They will always be customers, even if our long term strategy is to move towards larger customers who enable standardizing of the production process”. This is based on the knowledge that even if SCA acquires more large customers they will never buy the range of products that utilize all of the raw material. This creates a need for customers that buys smaller volumes in wide varieties.

These three customers are all in what is described as phase one integration. This means that the interaction between SCA and them is mainly telephone and fax based. Contact between SCA and these types of customers have always been made in this manner. In fact most of them first made a call to their local SCA product manager to find out if SCA would be able to supply them. The product manager handling the customers in question gets the feeling that they enjoy this type of personal contact and the willingness to start ordering their products through an EDI solution today is quite low. This is in his mind due to the high average age in the industry which likes things to be done the way they always have been. These customers also exhibit a low level of connectivity connected to this satisfaction with the status quo which bring no incentive to invest in ICT capabilities. Their product manager however feels that because of the employees of these businesses are approaching their pension the following generational shift will bring with it higher levels of willingness to integrate through ICT solutions. This is something that he feels SCA needs to take into account when forming a strategy for these customers for the future.
The above description fits Klockestrands såg & hyvleri and Olssons såg. Because of their low levels of connectivity and willingness I define these as type 1 customers.

Although similar in market and corporate structure Nylands trä has by moving into the Woody family shown a willingness to integrate and this also affords an ability to gain ICT knowledge which also heightens their level of willingness. Therefore they do not fit into the same category as Klockestrands såg & hyvleri and Olssons såg which makes me classify Nylands trä as a type 2 customer defined by high willingness and low connectivity. This means that they probably are on a path to request a more integrated solution with SCA.

Worth mentioning in this context is that according to the IT-manager interviewed SCA has a quite low level of willingness to integrate with these customers since the feel that because of the low volumes purchased it is hard to financially motivate a solution being constructed.

Examining the remaining customers from the case study I find similarities between Byggmax, Beijer and K-Rauta. These similarities are both in the types of products and volumes are purchased from SCA as well as the existing or planned EDIs which are to be used as tools for placing orders and getting confirmation. Not similar in the first two aspects but with a similarity in the respect of a planned device aiding the interchange of documents is Meiken. These corporations all share the qualities of high levels of connectivity paired with a willingness to integrate. Paired with the volumes purchased from SCA this has prompted a conscious effort to create ICT solutions supporting integration.

This third type of customers recognizable by high levels of connectivity in many cases related to firm size which creates a need to integrate within themselves and also high levels of willingness to integrate with SCA I choose to define as type 3. Although type 3 customers rates high in both willingness and connectivity the level of integration is still at phase one or two but with an intention from SCAs side to find new ways to supply these customers with different types of services made possible by integration. For instance one product manager states that “It would be great to be able to offer the service of handling our customers stock as in the case with the Home Depot. For instance if we could be able to automatically get a notice when their stocks reach a critical level and then a delivery would be arranged by the system”.

This categorization leaves only the Home Depot which by its high level of connectivity shows very low willingness to integrate with SCA. This may be due to the scale of the Home depots business which dwarfs SCA in comparison. Although SCA are becoming an important supplier of three products in the grand scale of things they still represent a minor part of Home Depots product range. This reasoning is the same that can be seen in reverse with type 1 and 2 customers where SCA shows a low level of willingness to integrate with them. The high connectivity of the Home Depot is in some ways connected to firm size where integration within itself is important. Defined by high level of connectivity and low willingness the Home Depot is placed in the last category of customers type 4.

This categorization will form the foundation for the construction of a model when paired with the description of phase level integration to better understand the intertwined relationship between these concepts.
5.1 An integration model of SCA customers

Using the customer types above a model describing integration can be created based on the level of willingness and connectivity paired with the level of integration.

What is immediately obvious when implementing the different customer types in the model is that for high levels of integration to exist there need to be a high level of willingness and connectivity from both the supplier and the customer. This is evident from the type 4 customers who display a high level of both and where some kind of integration is in use already or in the planning stages. The model also shows the other end of the scale with type 1 customers where the low level of connectivity and willingness from the customer leads to virtually no integration. For type 2 customers we can see that although there is no integration today but they possess willingness the most difficult parameter to implement. This forms a basis for the more accessible parameter of connectivity to leverage them into higher levels of integration. The type 3 customer shows a high level of connectivity much due to its firm size although the technological potential of integration exist this customer chooses not to utilize it.

To sum up this model well describes the different levels of integration between SCA and the customers described in the case study. It is however important to note that the level of integration in this model does not display what type of information which is being shared. To fully make the most of the possibilities afforded by the high levels of connectivity and
willingness of type 3 customers both the supplier and the customer need to share strategic information and not only historic data.

6. Discussion

In this paper I set out to get an answer to how connectivity and willingness can be used to understand the driving forces behind the level of ICT-supported integration in supply chains on a global and local scale. To answer this I had to gather empirical data from a corporation faced by the challenges associated with this which was done by a qualitative case study of SCA, the largest producer of wood-based products in Europe. SCA is a company that has in the last few decades undergone just this kind of transformation from a local producer to a global one. A model was presented that in a comprehensive way describes the level of integration between SCA and its customers based on their level of connectivity and willingness. Although it is impossible to guarantee this models viability and usefulness in other industries or even other firms within the forestry segment I firmly believe that because of the non industry specific parameters used it could be used by others facing similar issues.

If we examine the customers of each type we see that the phase of integration is fairly low basically phase one in type 1, 2 and 4 but in type 3 there is at least a conscious move towards the higher levels of integration enabling information sharing and ultimately the positive effects made possible by phase three or four integration. This is only natural since this is enabled by the high levels of willingness and connectivity. One critique that can be made is the low willingness of SCA to share information about for instance stock levels. This impairs their supply chain partners ability to keep their stock levels especially in the case of Byggmax where the delivery is not always identical to the order.

For type 1 integration is a priority from neither the customers nor SCA. From the customers’ side it seems to stem mostly from an historical way of doing business paired with inexperience in computer use i.e. low connectivity. But the lack of integration is not only due to the customer but from the SCA side the willingness to create a solution for integration. They feel that it is hard to fund such a project but it might also be contributed to the SCA strategy to moving into growing markets where there is a possibility to streamline production. An ICT solution will however probably be requested in the not so distant future this due to the generational shift in the industry and the lowering cost of hardware which will probably move these small firms higher up to the right in the model and a need for integration will be requested. Low levels of willingness are not a problem with smaller customers as the potential cost of losing them is smaller but mainly because the complexity of the supply chain in infinitely smaller.

Type 2 organizations are in some ways on this path already. Although lacking in connectivity because of small firm size this attribute will probably change in the near future for the same reasons as in type 1. In the specific case of Nylands trä the collaborative work with Woody will probably help speed up this process to increased connectivity because of the possibility to share ICT-infrastructure and personnel.

A common trait for these three customer types is a current or by SCA product managers predicted move in a direction to the upper right corner of the model which in its most evolved
configuration enables phase four integration. This forms a basis for understanding future customer requests of their suppliers and helps SCA take a proactive stance and meet these before even requested. This understanding enables afterthought in the production process of ICT-solutions which could lead to higher reusability and thereby lower overall development costs and higher quality artifacts. This movement to higher forms of integration does however not seem to be the case with the remaining customer type.

The type 4 customer which in this case is represented by the Home Depot is defined by its high connectivity in some respects linked to its firm size and low willingness to share information with its supply chain partners. This lack of willingness seriously cripples the possibility for integration between SCA and the Home Depot and due to this supply chain being the most complex with SCA providing the service of stock holding it is the one where the sharing of information is most necessary. For instance if the Home Depot were to share information about upcoming promotional campaigns this possible peak in sales could be anticipated and addressed by SCA and both partners would profit, SCA by being able to keep an even flow in production and the Home Depot by not being faced with empty shelves. This problem is in some respects handled by SCA by the plans of an integrated solution with their logistics partner. However the main focus of this project does not seem to be a utilization of the information available i.e. the package numbers but rather an automation of the entering of package codes into the excel-system used today. The low level of willingness shown by the Home Depot seems to be enabled by their powerful position as a customer by the volume of product purchased from SCA. Even if SCA wanted to they could never integrate with the Home depot to the extent that they want because even with 100% of the product share in their segment they would still be a small supplier in the Home Depots eyes and therefore the incentive for an integrated solution would be to low just as SCA shows in the case of their type 1 customers.
7. Conclusion

The research began with a core question: How can connectivity and willingness be used as a strategic tool to evaluate existing customer relations from an integration perspective? A case study was performed to examine the different levels of integration and see if connectivity and willingness could be used to explain the information sharing capability and phase of integration in the different supply chains. A model was constructed depicting this relation and paired with the case information showed a future movement into higher levels of connectivity and willingness in all customer types but one. This last type with the attributes of low willingness and high connectivity shows no intention of sharing information with the supplier who is left with the option to more closely integrate with their other supply chain partners. The research also shows that moving into a more service oriented market increases the need for information to be shared both upstream and downstream in the supply chain which leads to the following conclusions.

- Willingness and connectivity can be used as tools to understand the different levels of integration in supply chains by implementing them into the model presented in this paper.
- If the willingness of the customer is low extra care has to be taken to find other supply chain members who in some ways can help minimize the damage by high levels of willingness.

7.1 Implications for practice

If SCA has the intention to strengthen their supply chains by ICT-solutions as EDIs and ERPs the following considerations in my mind need to be addressed based on the previous discussion and conclusions.

- ICT-solutions are likely to be requested by most small and medium enterprises in the near future. Therefore a proactive stance should be taken in this matter to this matter.
- When developing an EDI solution for the Home Depot supply chain the focus should be on creating business intelligence not mainly a tool to support individual administrative work. This minimizes the person dependence of the stock planning for the distribution centers as well as hopefully making it more accurate.
- There are possible positive effects in sharing internal stock levels with supply chain partners since the prices are negotiated forehand this only enables better planning capabilities for the customer and thereby higher satisfaction.

These implications are all based on the condition that a strong and concise ICT-strategy is formed by SCA and that their level of willingness is heightened as a result of among other things the conclusions of this paper.
8. References


