APPLYING SUPPLY CHAIN VISIBILITY

- a study at a company in the paper and pulp industry

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ABSTRACT
This article is based on the study Applying supply chain visibility that was conducted at a company in the paper and pulp industry, hereafter referred to as 'the company', 2010 (Adielsson & Gustavsson, 2010). The purpose was to investigate how the company's warehousing problems can be reduced by applying supply chain visibility and related concepts.

During the study an analysis model was created based on an extensive literature review. This model illustrates supply chain visibility from a broader perspective and includes requirements for improved performance in the supply chain. The model was used to map the current situation at the company and to identify deficiencies in information sharing.

The study was divided into three case studies which investigated the product segments *fine paper*, *carton board* and *newsprint*. The findings from each case study were analysed separately but also a cross-case analysis was conducted. Four problems connected to warehousing were then identified and recommendations on how to improve were suggested to the company.

The results of the study shows that information sharing and increased visibility in the supply chain can lead to reduced inventory levels at the company.

1. BACKGROUND
Global companies are operating in a continuously faster changing environment. The supply chains are becoming more global with more actors involved which lead to more activities and larger flows of information. A challenge for the companies is to sort out relevant information and to make it available for the actors concerned. Also, if the information is not selected, managed and interpreted in the right way, variations and uncertainty in the supply chain may arise. If the companies on the other hand can make relevant information available in an effective way they will have a more efficient supply chain and lower costs. (Siems, 2005)

The company has a huge amount of information in their ERP-system. This system can be accessed by almost every employee. The company therefore wants to investigate whether this information can be used more efficiently in order to deal with their warehousing problems.

2. OBJECTIVES
The study had two objectives:

- To give the company recommended solutions on how to reduce the warehousing problems by increased visibility in the supply chain.
- To estimate the impact of these solutions.

3. METHODOLOGY
The study used a systems approach which allowed for taking synergies and relations between people and departments into consideration. The first phase was of exploratory art in order to understand the problem and the situation while the second phase was of normative art.

The data collection was qualitative and consisted mainly of interviews and observations. The reason for this was that the goal was to understand and describe to be able to draw conclusions and give

recommendations. The methods used are mainly inductive, based on observations, but existing theory was used to construct a frame of reference.

For the research design, case studies were selected. Since the aim was to investigate the company as a single unit, a complete picture, underlining the differences between different parts of the organization, was needed.

The working procedure is illustrated in Figure 1.

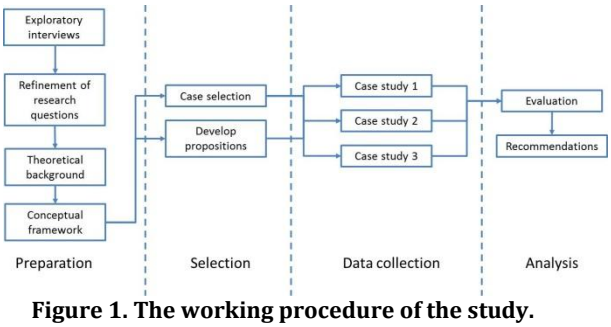

Figure 1. The working procedure of the study.

4. FRAME OF REFERENCE AND CONCEPTUALIZATION

Since the purpose of this study included investigating the concept of supply chain visibility, this was the starting point of the literature review. However, since the concept is relatively new, to fully understand its origins and meaning, closely related concepts were also reviewed. These included business processes, supply chain management, information sharing and 'bullwhip effects'. Important aspects and contextual relationships from all the concepts were then used to form a conceptual framework that provided the foundation for the analysis model.

The conceptual framework consists of the following three components:

- *Information quality*; in order to achieve successful information sharing, the information shared needs to be accurate, trusted, timely, useful and in a readily usable format. Barrat & Oke (2007)
- *Enablers*; the capability of sharing information and thus enablers of visibility. This can be both technological enablers such as IT-systems but also non-technological enablers such as personal meetings. Fawcett *et al.* (2007)
- *Organisational aspects;* this could include both willingness to share information among staff as well managerial support on collaboration. (Constant *et al.*, 1994; McKinnon *et al.*, 2003)

5. THE ANALYSIS MODEL

Using the conceptual framework, an analysis model was created, see Figure 2. This model illustrates the ingoing components and their relations for successful information sharing, which ultimately leads to improved performance in the supply chain.

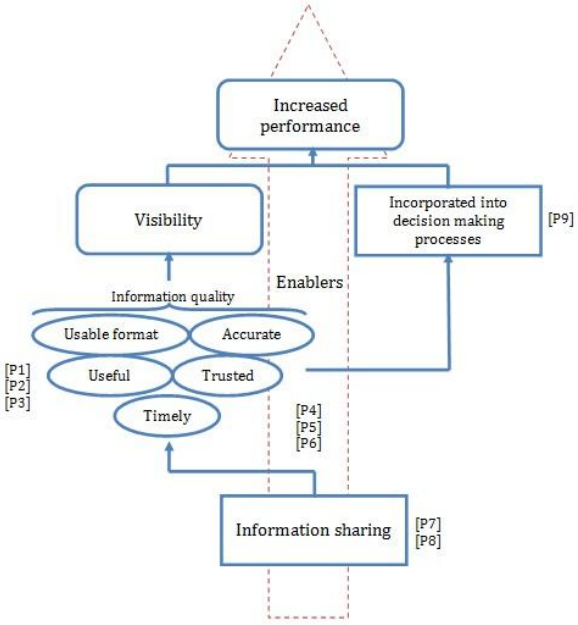

Figure 2. The analysis model: Supply chain visibility from a broader perspective - The prerequisites of increased performance by information sharing.

When using the model to analyse the current situation at the company, a number of propositions were developed connected to each of the components. The propositions, listed below, were then tested in each case study.

P1: "Inventory levels cannot be decreased by improved information quality regarding order forecasts from the customers."

P2: "Inventory levels cannot be decreased by improved information quality in the communication between customer service centres and mills."

P3: "Left-over inventory cannot be reduced by improved information quality at the customer service centres."

P4: "All information needed to provide visibility in the supply chain can be found in the ERP-system."

P5: "The ERP-system does provide information of sufficient quality to achieve visibility."

P6: "A software tool cannot help increase the visibility at the company."

P7: "The managerial support on collaboration and information sharing within the company is sufficient."

P8: "There is a willingness among staff members to share information within the company."

P9: "Information made available through information sharing is used by staff in their daily decisions."

6. RESULTS AND RECOMMENDATIONS

The case study results are summarized in Figure 3.

Case/ Proposition	News-print	Carton board	Fine paper
P1	√	X	√
P2	X	√	X
P3	X	X	n/a
P4	X	X	X
P5	√	√	√
P6	√	√	X
P7	X	X	X
P8	√	√	√
P9	√	√	√

Figure 3. Summary of propositions.

One interesting finding is that there are no significant differences regarding problem areas between the segments, although the products and markets are very different. For example, in each case problems with communicating delays could be found as well as a lack of routines for communicating.

Another interesting finding is that staff in general seems to have a positive attitude to share and use information that is provided to them. This is not utilized in an optimal way by the company today and it is mainly due to insufficient managerial support and unclear responsibilities.

Four specific problems were finally identified that all affect the inventory, some in a more direct way than others. The problems, consequences and recommended solutions are summarized in Figure 4.

Problem	Possible consequence	Solution
Different focus on the sales plan	Difficulties to set accurate and timely quota	Communicate the purpose of the sales plan to the right people and earlier locking dates
Bad communication regarding delays	Insecurities among customers who might exaggerate their orders	Clear action plan, better knowledge and communication among staff
Hard to know what information to share and to whom	Important information not shared	More meetings involving multiple departments, continuous improvement work with information sharing
Bad communication between segments	Innovative ideas and solutions not spread within the company	Benchmarking and shared process/activity mapping

Figure 4. Identified problems, consequences and recommended solutions.

The first problem, different focus on the sales plan leads to problems with timeliness and accuracy for the quota. This can in turn lead to a poor distribution of production capacity and inventory piling up at the wrong locations.

Bad communications regarding delays is a major problem meaning that customers are not always informed in time if delays in production or transportation have occurred. If this happens frequently some customers might to exaggerate their orders and inventory levels become unnecessarily high.

The problem regarding difficulties in knowing what information to share and to whom, can mainly be derived from a lack of routines for information sharing and unclear responsibilities. The problem leads to information that is useful for the receiver not being provided. The connection to warehousing problems is hard to determine but it is the author's opinion that a more holistic view in all parts of the organisation will lead to staff knowing what information is beneficial to share in order for the receiver to perform the daily work more efficiently.

The last problem identified, bad communication between segments, is very important to deal with. In this study many innovative and successful working procedures have been found that can be useful in other parts of the organisation. An example of this is that the fine paper segment works with a forecasting tool that uses historical sales data. This has been very successful and is often more accurate than the customers own forecasts. The recommendation is to learn from each other and use the knowledge that already exists within the organisation.

7. CONCLUSIONS

The impact of increased supply chain visibility is hard to estimate, especially the connection between information sharing and warehousing problems. One reason for this can be that most research on the subject is focused on the retail industry. The paper industry, which the company operates in, is more complex. The fixed costs are way higher than the inventory costs which mean that the production facilities always need to be kept running. This means that visibility in the supply chain can only affect the inventory levels to a certain degree.

8. FURTHER RESEARCH

During this study, the authors have noticed that the business processes at the company need to be analysed from a broader perspective. As concluded above, information sharing can only affect the warehousing problems to some extent and therefore a wider scope can be useful to have.

This study is mainly focused on operational staff and their daily work. If more attention can be directed to management and analysts, perhaps other use of information sharing can be found. Also, the study is limited to warehousing problems but benefits that are of a more administrative art could also be noticed.

Due to the limited time frame of this study, only three segments could be investigated. A similar investigation, including several more segments, can therefore be interesting. To further strengthen the results, a more quantitative investigation can also be carried out. This approach can help providing a more detailed mapping of internal differences within the segments since it can include more employees.

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