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Role of Information in an SME in a Local Food Supply Chain

Case Study of a Norwegian Craft Beer Retailer

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We are DONE after a long semester, time for a beer (from Gulating, of course)!

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Summary

Demand for locally produced food is increasing and the industry is gaining increased attention. But, many challenges are present for actors in local food supply chains (LFSC), and are especially related to limited capacity. Balancing supply and demand of their products is thusly extremely important in regards to inventory management and replenishment decisions. Local food actors, often small and medium enterprises (SMEs), especially need to reduce costs in order to be competitive. Supply chain management (SCM), which includes practices like, information sharing, has a focus on maximizing value for all actors in a supply chain, yet is underutilized by local food actors, including both local producers and local food retailers. Information technology is an enabler of SCM and has been understudied in an SME context. Therefore, the following research questions have been explored to gain a better understanding of how information and information technology (IT) can improve these types of SC:

- ***RQ1***: What is the role of information in an SME in LFSC?
- ***RQ2***: How can IT support use of information in an SME in LFSC?
- ***RQ3***: How can IT assessment be carried out in an SME to fulfill the role of information?

This thesis consists of two main sections, the literature study and the case study. The literature study gives background on LFSC, SCM and information, and information technology. The case study covers the retail operation of an SME, The Gulating Group, working in the craft beer industry. Multiple semi-structured interviews, a workshop and secondary sources were used to gather data related to the case. Thereafter, an analysis using relevant literature was done to assist in answering the research questions.

In the literature study, it was found that SMEs have received less attention regarding both SCM and IT practices than large enterprises. More specifically, studies on SME retailers are lacking. Therefore, using the existing literature on SCM and informational practices, and the case study, can give new insights to the requirements of IT and information in an SME retailer context.

The Gulating Group has multiple operations ranging from retail to import, though the retail operation will be in focus in this study. The suppliers comprise of local breweries, import and industrial actors, but the local breweries are prioritized. The replenishment process from these different suppliers vary, and range from using simple technology like SMS, phone calls and email to web portals. Besides ordering, little use of SCM practices, like information sharing, were found to be present. The nature of processes were often informal, intuition based and inconsistent. All available information was not found to be utilized in current planning processes. Increased growth, including opening of new stores, has led to difficulty in managing the multiple stores and suppliers, and spurred the assessment of possible IT to assist.

The first research question showed that information is an enabler of SCM, and assists in good decision making. Sharing information requires that information is of a certain quality in order to be fully utilized. The quality and utilization are affected by certain factors, both inter- and intra-organizational. SMEs have an informal nature, and thusly have access to less information, which is affected by quality dimensions such as timeliness, and completeness. This increases challenges in planning and controlling material and product flow.

The second research question covered how IT is used to support information capture, analysis and communication. IT can assist in operational to strategic levels of planning. Mainly operational has been focused, although some tactical functionality has been considered. SMEs often have a lower level of technology, but can benefit from IT.

The third research questions was answered primarily with literature by first developing an IT assessment process flow. With insights gained from the case company, it was modified later. Thus, an extra decision in the IT assessment process flow was added concerning, if current IT is underutilized or processes can be improved. This is especially relevant for SMEs, which are often constrained financially.

The findings from this thesis can assist SME retailers in LFSC and other industries to increase their competitiveness and performance through better use of information. IT can help in achieving

this, but the formalization and addition of some processes may offer improvement potential for SMEs and reduce required costs related to new technology adoption.

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Abbreviations

3PL	Third party logistics
ABV	Alcohol by volume
BBD	Best before date
CRM	Customers relationship management
EDI	Electronic data interchange
EOQ	Economic order quantity
ERP	Enterprise resource planning
HL	Hectoliter
ICT	Information and Communications Technology
IQ	Information quality
IS	Information System
IT	Information Technology
LFSC	Local food supply chain
MTS	Make to stock
POS	Point of sales
ROP	Reorder point
SaaS	Software as a service
SCC	Supply Chain Council
SCM	Supply chain management
SCOR	Supply chain operations reference model
SKU	Stock keeping unit
SME	Small and medium enterprise
SRM	Supplier relationship management
VMI	Vendor managed inventory

1. Introduction

This chapter presents how the research problem has been formulated within SMEs in local food supply chains (LFSC). The relevance of the research is also highlighted. Starting with practical challenges from industry, the research challenges and opportunities are presented. Based on these, the research objectives, research questions and scope have been designed. Finally, the chapter ends with an outline of the thesis structure.

1.1 Background

In the last few decades, locally produced food and local food supply chains (LFSC) have gained significant popularity, especially in Europe and North America (Eriksen 2013). Some of the reasons for this inclination are related to concerns of health benefits, environment, food safety, transparency in supply chains and the socio-economic benefits to the community (Winter 2003; Abatekassa & Peterson 2011; Visser et al. 2013; Martikainen et al. 2013). These trends of growing consumer interest towards locally produced food has been seen as a backlash against the large-scale standardized industrial food production system (Ilbery & Maye 2006; Martikainen et al. 2013). For example, there is an evidence of increase in number of industries producing local food around Northern Europe (Kvam et al. 2014). However, locally produced food has limited market coverage and is still accessible to only a handful of consumers (Kvam et al. 2014; Visser et al. 2013), since it is often sold through alternative channels, such as farmer's markets, farm shops and specialty retailers (Ilbery & Maye 2006; Dreyer et al. 2016).

Local food production is predominantly dominated by the small-scale producers, which has been categorized under the group of Small- and Medium Enterprises (SMEs) (Kneafsey et al. 2013; Ilbery & Maye 2005b). These producers have unique recipes, and way of production that keeps them distinct from the industrial mass-producers. In other words, special features of these food SMEs can be linked with high quality raw materials used, artisanal way of processing, small batch production and unique way of delivering products to different categories of customers (Dreyer et al. 2014). Locally produced food has been defined differently in literature as, small-scale food,

speciality food, niche food and artisanal products (see e.g.. Kvam et al. 2014; Abatekassa & Peterson 2011; Eriksen 2013; Ilbery & Maye 2006). Thus, local food producers can be seen as small-volume producers, delivering a value-added product.

Craft beer, often called "håndverksøl" in Norway, has differentiated characteristics in terms of product, production process and value it creates than industrial beer, "industriøl" (Sandvik & Undlien 2014; Clemons et al. 2006; Kleban & Nickerson 2012). Hence, craft beer uniquely represents locally produced food. Moreover, craft breweries have distinct characteristics than the large industrial breweries, and are an example of food SMEs. Currently, craft beer sales in Norway is below four percent of the total beer sales, but the market is in a state of growth and the figure is expected to increase up to ten percent by 2020 (Ramseng 2016; Sangachhen & Vallandingham 2015). A recent report by Brewers of Europe shows a significant growth in number of craft breweries in Norway from 2009 to 2014 (The Brewers of Europe 2016; The Brewers of Europe 2015).

Craft breweries are prone to many of the challenges faced by the other types of food SMEs. While, lower production volume is one of the inevitable characteristics and problem for small manufacturers (Dreyer et al. 2016), access to market and efficient distribution solutions are deemed as major challenges that lead to high transaction costs (Woods et al. 2013; Dreyer et al. 2016; Thomassen et al. 2014).

Special actors within LFSC, such as the Gulating Group, with dedicated stores (specialty retail stores) in different regions of Norway try to provide better market access for the small brewers. The Gulating Group does not have strict requirements regarding volume, delivery etc. for small breweries, while ensures higher returns, and acts as a hub for speciality beers in certain regions. In fact, higher product and delivery requirements have been found to limit access of small producers to conventional supermarket chains, large retail and Horeca (Hotels, Restaurants and Catering) (Martikainen et al. 2013).

Actors in LFSC need to operate efficiently and should have their supply chain strategy aligned with their competitive priorities in order to meet requirements (Dreyer et al. 2016), similar to other

supply chains (Chopra & Meindl 2013). Information sharing and its utilization have been deemed useful to improve efficiency of supply chains (Zhou & Benton 2007), in local food operations as well (Dreyer et al. 2016; Abatekassa & Peterson 2011). Information enables good decision making, which helps to better exploit supply chain resources through improved planning and control (Chopra & Meindl 2013). Information Technology (IT) can facilitate more effective communication with regards to sending orders, order confirmations, product tracking, inventory control etc. for actors in LFSC. It also helps to reduce administrative tasks and workload. Since SMEs often lack technical expertise, any forms of IT implemented should be simple enough for them to use (Thomassen et al. 2014).

There is a need of understanding the role of information and IT in SMEs. This thesis has considered an SME retailer working within LFSC. More precisely, the Trondheim retail store is the focus of this study. Thus, information, processes and IT of this selected retailer have been analyzed, in relations to replenishment.

1.2 Research Challenges and Opportunities

Local food actors contribute a large part to many economies. The demand for local food is also increasing, and steadily rising especially in recent years. These actors are found not to use information in a formalized way to plan and control their businesses, rather relying on intuition. It has been seen that these actors can benefit from better use of information, which includes aspects such as information sharing and technology.

Quality and utilization of information needs to be assured when planning and controlling operations (Myrelid 2015). Myrelid (2015) shows determinants of information utilization and information quality, which affect information sharing and performance. IT allows companies to store, retrieve and share large amounts of information (Porter & Millar 1985).

Improving information and material flow in supply chains in order to reduce costs and improve value for actors is a key aspect of supply chain management (SCM) (Chopra & Meindl 2013). Information Technology (IT) is important in SCM, and requires further study (Boone et al. 2007),

and has been even less explored in SMEs (Hamister 2012). SCM practices, such as information sharing and information quality, are connected to IT use. There lacks specific research looking at the relationship between information and IT in an SME context. Small retailers, especially, have not been studied in a SCM perspective. Therefore, looking at SCM practices in regards to information, and potential uses of IT in this type of business are of importance.

Most of the available literature on IT evaluation have been focused for large enterprises, while similar practices for SMEs have been lacking research (Fink & Disterer 2006; Cragg 2002; Haug et al. 2011; Bharati & Chaudhury 2015; Parker et al. 2015). Studies within SMEs have been found to focus more on the importance of IT only (Sin Tan et al. 2009; Kannabiran & Dharmalingam 2012; Efendioglu 2015). Cragg (2002) has deduced that targeted studies of IT in SMEs are required pointing out that, *"Overall, our understanding of IT management in small firms is weak."*

Moreover, majority of literature on IT adoption in SMEs only focus on the factors affecting adoption rather than on adoption processes and models (Manueli et al. 2007; Fink 1998; Lee & Runge 2001; Riemenschneider et al. 2003). Within the factors affecting IT in SMEs, studies on classifying these factors as drivers, enablers and inhibitors have been deemed necessary (Ghobakhloo et al. 2012).

Studies on role of information and IT in SMEs generally group them together as one, so a more specific in-depth study of particular cases could give better insights (Putra & Hasibuan 2015). Moreover, Runyan and Droge (2008), in their literature review on small retailers, have found that the adoption of technology for small retailers have been less explored and need more research.

Thus, as shown above, there are challenges and gaps in literature on study of supply chain practices in regards to information and IT management in SMEs, specifically local food actors, to improve planning and control. This motivates the thesis work primarily to identify the role of information in a LFSC and how IT can support them.

1.3 Research Objectives and Questions

Primarily, this thesis aims to study the role of information and IT to improve operations in SME retailers. This can be done by studying information used in their SC as well as the IT practices. Therefore, the main objectives are:

- To study the role and benefits of information in an SME in LFSC.
- To identify how the role of information in an SME in LFSC can be fulfilled by use of IT.
- To study IT assessment process for SMEs.

Based on the above objectives, the following research questions can be formulated to answer:

Research Question 1: What is the role of information in an SME in LFSC?

The role of information consists of finding how information benefits SMEs working in LFSC. Benefits are obtained from improved use of information in planning and control, where certain types of information can be shared between actors. The quality, and utilization of information are affected by certain factors, which need to be considered.

Research Question 2: How can IT support use of information in an SME in LFSC?

IT supports capturing, analyzing and communicating information. Different technologies can facilitate upstream and downstream processes in different ways, ranging from operational to strategic levels. The effects of IT on informational aspects, such as quality and utilization, in SMEs assist in understanding the importance of IT support in planning and control of a LFSC.

Research Question 3: How can IT assessment be carried out in an SME to fulfill the role of information?

IT of a company should be focused to meet business objectives. Implementation of IT can be inhibited by certain factors. Therefore, an IT assessment should be carried out in a systematic way

to find out if new IT is required for the company. Evaluation of possible technology adoption then is important.

This thesis will study an SME retailer in a LFSC. It will contribute to theory by assessing the role of information in an SME in a LFSC. While it will help the case company by identifying its informational requirements, and possible process improvements as a result.

1.4 Research Scope

This thesis will consider a specific supply chain i.e. LFSC operating within the SMEs environment. So, literature about food SMEs will give the background for the case company. Among the different actors in LFSC, a speciality retailer has been selected for the case study. More precisely, the Trondheim retail store has been the focus in the study.

Though a food SME retailer has been considered, the product (craft beers) the case retailer deals with are of varied nature than other local food products. Firstly, characteristics like: product perishability, shelf life, transparency etc. are not as significant for craft beers as they normally have longer shelf life and less chances of perishability. Hence, these areas have not been focused in this study. Secondly, craft beers being alcoholic product are strictly guided by alcohol policies, is acknowledged to some degree.

The relationship of the case retailer with its suppliers, which are mainly small Norwegian craft breweries, is the main focus. The interaction with the customer will not be studied in detail. Figure 1 below shows the specific object of study. The control model methodology will be used to map the supply chain, and show information and material flows during the replenishment process. And, the SCOR model will be used as a reference model to map detailed SC processes in a structured way, and to find information and process gaps in the replenishment process. Besides, internal coordination within other operations of the case company will also be considered.

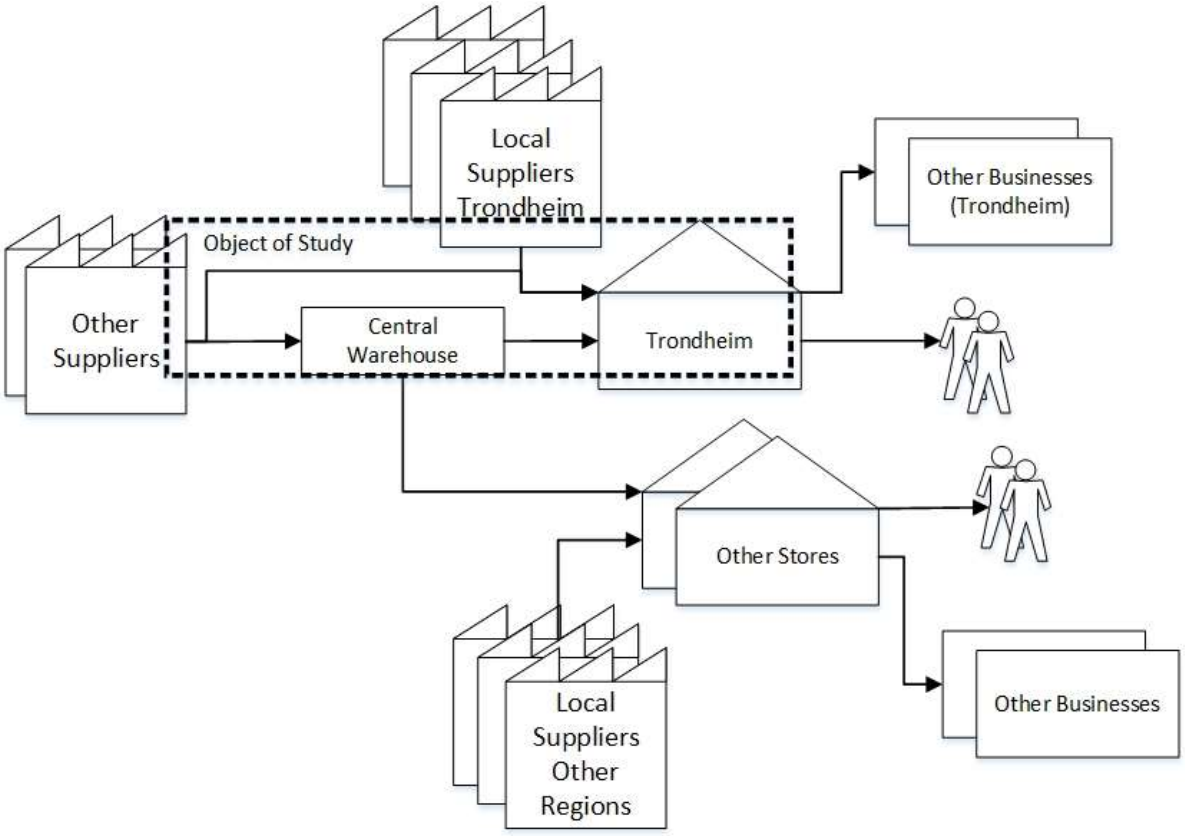


Figure 1: Object of Study

The terminologies IT and IS have been variously used in literature. Though, this thesis will attempt to present a difference between them. IT will be used to represent information technology (hardware and software). Informational practices and strategy in information capturing, analyzing, sharing and utilization will also be focused. Besides, supply chain management and replenishment for retail will also be studied as a focus area for IT and information practices. The theoretical scope is therefore related to SCM, IT and LFSC.

1.5 Thesis Structure

The thesis has been divided into six main chapters, a brief description is presented in Table 1:

Table 1: Thesis Structure

Content	***Description***
Chapter 1 Introduction	Research problem is formulated by introducing the background of SMEs in LFSC. Relevance of the research is highlighted and research objectives and questions are designed defining scope of work. A thesis structure is presented at the end of the chapter.
Chapter 2 Research Methodology	The research methods used to gather data, conduct interviews and analyze data are represented along with the argumentation for choosing those methods and their limitations are presented.
Chapter 3 Theory and literature study	Provides an overview of the relevant literature for this thesis. This chapter starts with literature on LFSC, which is followed with supply chain and information. Then, the role of information technology and factors affecting informational practices in SMEs are shown.
Chapter 4 Case Study	Presents an overview and description of the case company. Characteristics, areas of operation and informational processes are also described and mapped here.
Chapter 5 Analysis	The data collected from the case will be studied using the knowledge gained from the literature. A SCOR mapping of the detailed standardized processes will lead to analysis of information and IT for the case.
Chapter 6 Discussion	The research questions will be discussed and answered in relation to the theory and empirical parts of the thesis.
Chapter 7 Conclusion	Shows how the objectives have been fulfilled, practical and theoretical contributions, as well as the limitations and future research opportunities.

2. Research Methodology

According to Rajasekar et al. (2006), research methodology refers to systematic ways of problem solving. It includes procedures called research methods. Research methods help in collecting samples, data, analysis and finding solutions to a problem. Further, research methods can be either quantitative or qualitative. Quantitative methods deal with numerical, non-descriptive data and are conclusive in nature dealing with what, where and when questions of decision making. On contrary, qualitative methods deal with non-numerical, descriptive data, which cannot be graphed, and are exploratory in nature dealing with why and how type of questions (Rajasekar et al. 2006). Case research method under the qualitative research methods was chosen for this thesis.

Theoretical background for the research was collected from a literature study, while empirical data of qualitative nature was collected from the single case study. We used the triangulation method (Voss et al. 2002) by using multiple semi-structured interviews, a workshop, secondary sources and literature study as major sources of data. A research design is formulated to clarify how the research was carried out in different steps (Figure 2), and has been explained below.

This thesis work started with the aim of working in the food industry. Based on experience from previous project work, interest beverage industry and input from the main supervisor led to selection of the case company. The initial ideas formulated were related to distribution network optimization, business service offerings and improved order handling for the company. After discussion about these with the case company, it was found that the scope should be more related to the role of information, and information technology to improve replenishment and inventory management. This was also supported by the previous work from our supervisor, and other literature concerning LFSC. It led to study of literature on the main topics, like LFSC, Supply Chain Management, information sharing and information technology.

Required information was collected parallel with the case company through multiple semi-structured interviews, and a workshop to verify the correctness of research direction. The specific unit of analysis was the retail store located in Trondheim and the associated replenishment process. The findings from the case were analyzed and discussed using literature to develop the final results.

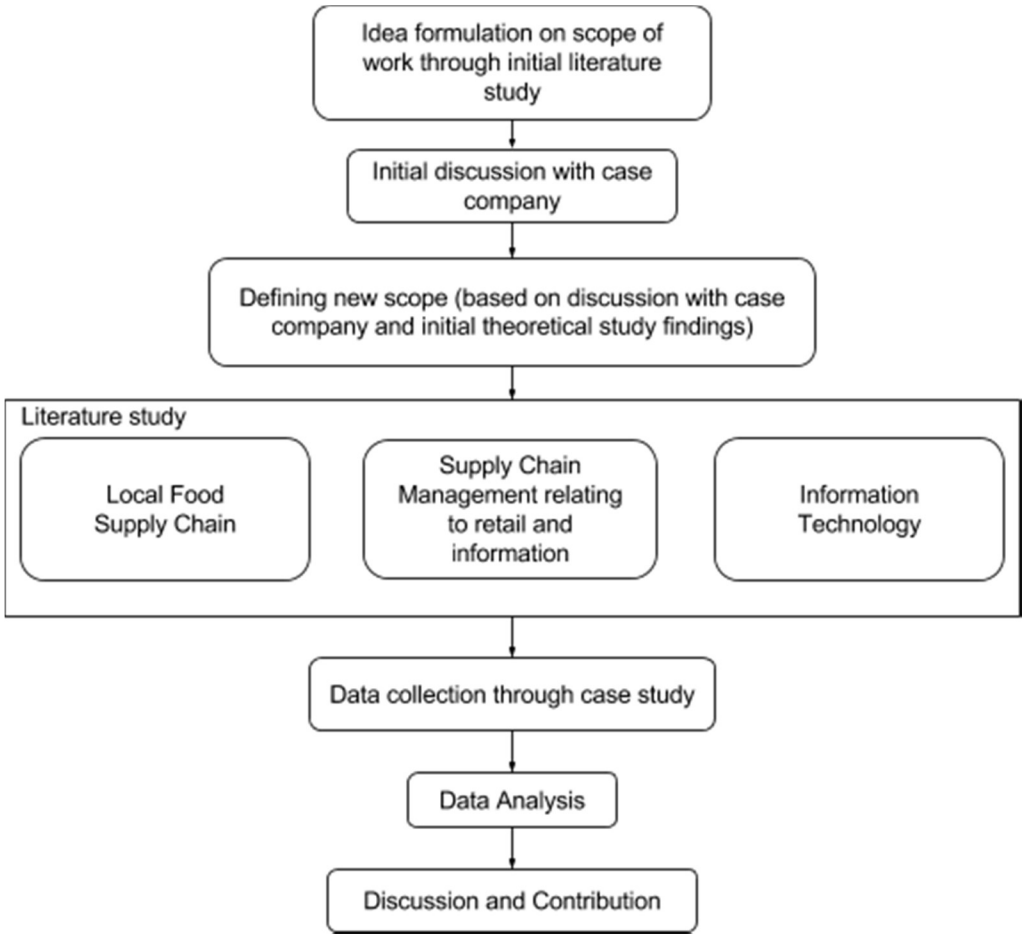


Figure 2: Research Design

2.1. Literature Study

Literature study of existing literature in the field of interest is a crucial part of academic research. It helps in determining the researchability of the topic and define the possible contribution and scope (Karlsson 2010). The areas of interest of our thesis is a combination of three main key ideas; 1. Local food supply chain (LFSC) including SMEs and craft breweries, 2. Supply chain management, related to retail and information sharing and 3. Information technology, and information systems (Table 2). Some part of background literature on LFSC, SMEs and craft breweries were also borrowed from the project work carried out during the fall semester, while comprehensive literature study was carried out for all topics.

Table 2: Keywords from Literature Search

Primary keywords	***Secondary keywords***
Local food supply chain	Trend Challenges SMEs Craft breweries
Supply Chain Management	Retail SME Retail Food retail Information sharing, quality, utilization
Information Technology	Information and communication Technology , IT adoption, Information System (IS), Influencing factors, barrier, enablers, advantages Software and Hardware solutions

The literature study was targeted to answer the research questions. Key words for the main topic were first identified (see Table 2). Literature search on different databases like, ProQuest, Emerald Insight, ScienceDirect, Google Scholar, Oria were done. Preference was given to peer-reviewed articles and review articles. Initially, articles were segregated by going through their title, keywords, abstracts, and findings. Those more relevant to the research questions were thoroughly studied. Their references were checked to find more related material on the topic using snowball sampling technique. A reference management system, Paperpile, was used to be able to collect and use references in collaboration.

2.2. Case Study

The case study research method was chosen for the thesis. More empirical research has been called for within supply chain and operations management in recent years (Barratt et al. 2011) Especially within IT and Operations Management questions relating to “how” and “why” rather than quantitative analyses were deemed crucial (Voss et al. 2002). The main purpose of the thesis will be mapping and theory testing. Mapping will include identifying key variables and process, while theory testing will be used for evaluating an already existing theory to the selected case (Handfield

& Melnyk 1998). Based on Yin (2003) a single case study design was used since the case company represents a unique actor in the industry.

2.3. Semi-structured Interview

Interviews are an important source of information collection in the case study method. Structured interviews often backed up by unstructured interviews and interactions are prime sources of data collection. Data can also be gathered from other sources like informal conversations, meeting, workshops, observations etc. (Voss et al. 2002). Primarily, semi-structured interviews are guided conversations rather than structured queries. It means that, though the sole purpose of the whole interview is to be consistent with the line of enquiry, questions asked in these interviews are likely to be flexible in nature and carried out in a conversational manner (Yin 2003).

Interview conducted during this thesis work was limited to individuals from the case company. An interview guide for conducting semi-structured interview was prepared. List of interviews is presented in Table 3 below. Based on (Voss et al. 2002), the funnel model of research protocol was used where the interview started with open and broad ended questions first and went on being specific and detailed towards the end, as we got a grasp on the discussion and interviewees thoughts. This protocol helped to prompt the interview and also assisted in making sure that all the topics were covered. A protocol, containing guidelines for interviewing, as well as the core questions was made based on Voss et al. (2000). The interview guide used has been presented in section Appendix 3 of this report. An outline of the questions was sent to the interviewees beforehand in order to give respondents time to contemplate and prepare.

Table 3: List of interviews

Date	*Position*	*Topic*
15.03.2016	Group Purchasing Manager	-Initial idea discussion for research scope
11.04.2016	Store Manager (Trondheim)	-Supply Chain Mapping -Information and Information Technology
14.04.2016	Store Manager (Trondheim)	-Verification of data -Follow-up questions
25.04.2016	Group Purchasing Manager	-Presentation of preliminary results - Verification of data
27.05.2016	Store Manager (Trondheim)	-Verification of data -Follow-up questions

2.4 Data analysis and review

According to (Yin 2003), data analysis includes different tasks of examining, categorizing, testing or combining qualitative and quantitative evidence to address the propositions of the study. Case study data analysis can be difficult because the strategies and techniques to do so are not well defined. Therefore, Yin (2003) has suggested three general strategies for qualitative data analysis:

1. Relying on theoretical propositions
2. Rival explanations
3. Developing a case description

In this thesis, we have relied on proposition regarding information and IT from the literature and also have developed a case description of the case company. Moreover, we have used control model methodology and SCOR (Supply Chain Operations Reference model) for data analysis. The control model methodology was used to show the material and information flow in the supply chain of the case company. Limitations in being able to interview other actors and benchmark against other SCs made the SCOR reference model important for us to find gaps in processes. The SCOR model was used to map the replenishment process because it shows proven standardized processes. SMEs do not often have formalized processes. Therefore, having a frame of reference for process flow helps in structuring the mapping, and benchmark against efficient supply chains.

2.4.1. Control Model Methodology

A control model is a representation of an organization's supply chain showing its relationship with its supply chain actors and how its operations are carried out and controlled. It is a very effective means of portraying the current state of a firm with AS-IS map and future state with TO-BE map. The control model methodology uses figures, tables and text to show the flow of material and information (Alfnes & Strandhagen 2000; Kvame et al. 2013). This methodology was helpful in mapping the collected qualitative data from the company, and provided a structured way of presenting the case description.

Control models help to study the current state of operations to identify non-value adding activities and leads to development of solutions for future improvement (Kvame et al. 2013). The control model methodology involves six steps; 1. Project start, 2. Mapping, 3. Analysis, 4. Design, 5. Implementation and 6. Project implementation. The first step involves setting goals and defining methods for mapping and analysis. It is followed by the second step of mapping in which the current state (AS-IS) model is made from available information and collected from interviews. Certain areas of improvement are suggested in the analysis step. In the design step, improvement solution is defined along with the future state (TO-BE) model. The final two steps which are primarily for practitioners and involve implementation of the suggested solution and aligning responsibilities so that the project will lead to desired output in future (Alfnes & Strandhagen 2000; Kvame et al. 2013).

2.4.2 SCOR model

The Supply Chain Operations Reference (SCOR) model was created by the Supply Chain Council (SCC) (Slack et al. 2013). The SCOR model has defined standardized processes to be able to communicate current operations and show improvement opportunities. By using business process modelling, benchmarking against similar companies, and best practice cases, improvement plans can be developed.

SCOR defines 4 levels of process modelling, where the first level defines the overall scope (SCC 2010). defines operations strategies and level 3 shows individual processes. Level 4 is not defined

in the SCOR model, but can be used to show company-specific processes and practices. The four levels are portrayed in Table 4.

Table 4: SCOR Process Levels

Level	***Description***	***Examples***	***Comments***
1	Scope	Plan, Source, Make, Deliver, Return and Enable	Defines overall scope
2	Configuration	MTS, MTO, ETO	Defines the operations strategy
3	Steps	Schedule delivers, receive production etc.	Defines individual processes configuration with focus on processes, inputs and outputs, practices, technology capabilities, performance and staff skills
4	Implementation	Company or industry specific steps	Detailed activities

2.5 Research Quality

The data was collected from interviews through both audio recording, and taking notes. These were then verified with the company. Relevant data was then kept in Google drive in conjunction with the interview documents in order to increase the reliability of the data collection. Several sources of data were used, including workshops, semi-structured interviews and observations, to improve the validity of the results. The research process was iterative in nature, in that interviews lead to further literature search and vice versa. This should increase the robustness of the results. The applicability of the research to other situations, like SMEs operating in other supply chains, is possible though there is a large focus on replenishment for SME retailers.

3. Theory and Literature Study

This chapter is based on a study of existing literature on local food, as well as information and IT in a SC context. An overview of the chapter structure and relation to the case study is presented in Figure 3 below. It firstly discusses LFSC, craft breweries and SMEs and shows how they relate to each other. Secondly, supply chain management (SCM) with a focus on retail is discussed. Herein, the role of information and information sharing is shown for better planning and control in SCs. Finally, information technology is presented as a prerequisite for effective information use in a supply chain. The overall objective of this chapter is to show the importance of information and IT for creating an efficient supply chain.

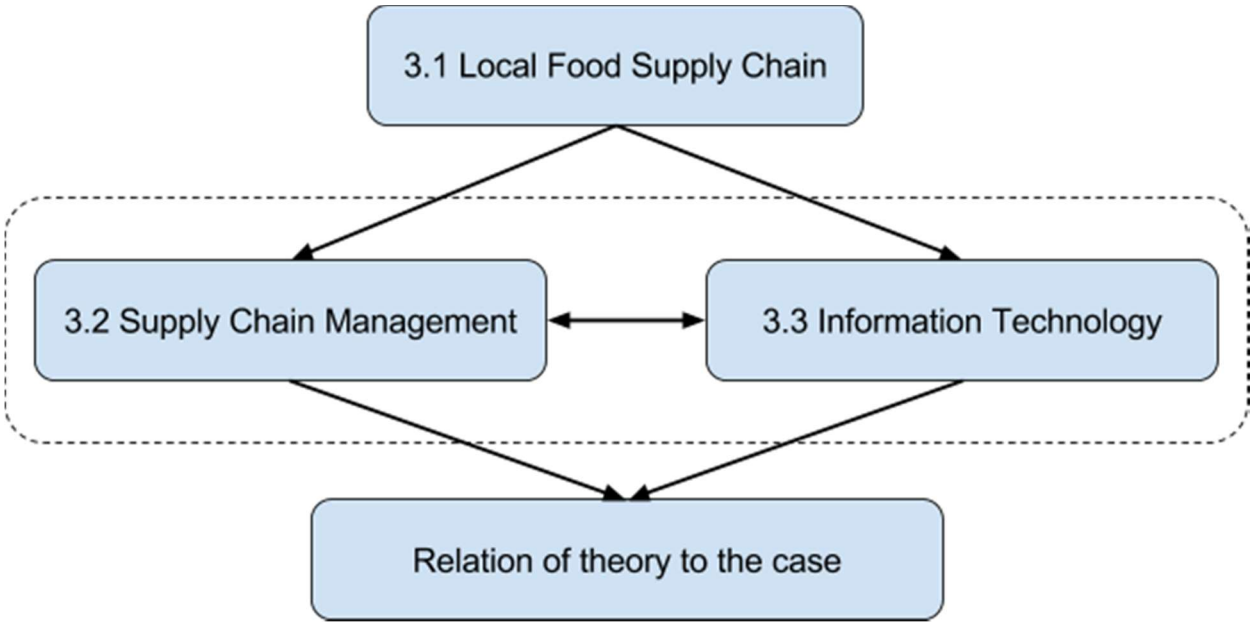


Figure 3: Overview of theory chapter

3.1 Local Food Supply Chain

The concept of LFSC is introduced in this section, whereafter the relationship to SMEs in this type of supply chains is shown. It is followed by showing the characteristics and challenges in this type of supply chain in the replenishment process. Finally, craft breweries are presented as a specific example of an LFSC.

Local food production has gained significant popularity in the last few decades particularly in Europe and America (Goodman 2004; Eriksen 2013). This has been regarded as a retaliation to the large-scale standardized food production system. Consumers perceive the food offered as industrialized and of low distinctiveness. In large food supply chains, food is mass-produced, processed and handled to gain volume benefits (Oglethorpe & Heron 2013; Ilbery & Maye 2006; Renko et al. 2014). There has been increased concerned on human health, environment, food safety and fair trade as a consequences of industrial mass food production. Further, it has increased the distance between primary food producers and final consumers (Maye et al. 2007; Abatekassa & Peterson 2011). With such concerns, certain group of consumers are being motivated for the locally produced food, which have better quality aspects and are speciality in nature (Kvam et al. 2014).

Local food has captured attention not only of consumers, journalist, farmers, and politicians but also of academicians, but has definitional ambiguities (Renko et al. 2014). Each of these actors have their own perception of what local food means based on their unique priorities, capacities, goals and values (Eriksen 2013). Some refer to local food as produced, processed, marketed and consumed within a limited geography (Morris & Buller 2003), while others consider a large geographical area of consumption (Peter et al. 2004). Though various dimensions like, social, environmental and quality have been considered to characterize local food (Ilbery & Maye 2005a), Eriksen (2013) considers three domains of proximities to come up with a new taxonomy. First, geographical proximity includes physical distances within which food is produced, retailed, distributed and consumed. Second, relational proximity includes market relations between different actors. Third, values of proximity include value attributed by different actors. Within these plethora of concepts on local food, research shows that the predominant factor that represent the local food and its supply chain are the attributes of freshness, taste and quality (Eriksen 2013).

Food products in local food supply chain consists of specialties features of certain nature, which could be in terms of raw material used, unique recipe, artisanal or manual way of production and processing, and place of origin. These food products are often termed by different meanings like, specialty food, craft food, artisanal food and small-scale food (Ilbery & Maye 2005a; Abatekassa & Peterson 2011; Dreyer et al. 2014). Food industries involved in local food supply chain are mostly of small-scale in terms of investment and capacity, and belong to small and medium enterprises (SMEs) sector (Martikainen et al. 2013). Thusly, the term local food can be understood as products that are typically produced with a unique recipe and raw materials in small-scale production plants using artisanal production processes and which is unique in quality giving added value to the customers (Dreyer et al. 2014). Product categories in this group includes dairy products, meat products, agricultural products, craft beer and so on.

3.1.1 SMEs and LFSC

In general understanding, SMEs are small-scale enterprise with few employees and limited production volume. But, defining the scale of small or medium is difficult (Wells 2015). While Loecher (2000) explains that different attempts have been made in literature to define scope and size of SMEs. Typically, the criteria of number of employees and turnover are referred to categorize enterprises into small, medium and large. These criteria varies according to different sectors of business operation, such as retail and industrial sector (see Table 5). The term SME has been defined by the European Union by setting the quantitative upper limits of the companies to; less than 250 employees and maximum of 40 million Euros of annual turnover. Within this classification, sub-categories range from micro, small, medium and large (Loecher 2000; Eurostat, [no date]).

Besides these quantitative parameters, Loecher (2000) points out an important qualitative trait of SMEs as most of them are family owned and owner managed. Other authors like Ghobakhloo et al. (2012) and Levy and Powell (2000) agree that owners play a central role in SMEs in handling all the administrative, organizational processes and decision making.

Businesses within LFSC have been categorized under the quantitative and qualitative limit of SMEs in literature. Authors have related the scale of operation of local food industry as small-scale and within the SMEs scope (Martikainen et al. 2013; Ilbery & Maye 2005b). Kvam et al. (2014), in a Norwegian context, has pointed that most the local food business are privately owned family firms often with less than 10 employees.

Table 5: Classification of SMEs (Loecher 2000; Eurostat, [no date])

Branch of Business	***Size of Business***	***No. of Employees***	***Annual Turnover***
Industrial	Small	1-49	< 1 million euro
	Medium	50-499	1-12.8 million euro
	Large	>499	>12.8 million euro
Craft/Artisan/Skilled traders	Small	1-2	<50,000 euro
	Medium	3-49	0.5 -1 million euro
	Large	>49	1 million euro
Retail	Small	1-2	<250,000 euro
	Medium	3-49	0.25 - 5 million euro
	Large	>49	5 million euro
Service and self-employed	Small	1-2	<50,000 euro
	Medium	3-49	0.5 -1 million euro
	Large	>49	1 million euro

3.1.2 Characteristics of LFSC

A supply chain can be characterized by understanding the characteristics of different variables, like producer, product and production process, distribution and market (Dreyer et al. 2014). As discussed earlier, major actors involved in LFSC belong to SMEs sector. Small-scale producers in LFSC are well known for the special recipe they use and traditional way of production. With less technological intervention in their operations, they are low volume producers selling from their stock following a make to stock (MTS) strategy (Kvam et al. 2014). Food products from this supply

chain are speciality in nature with added value due to quality and uniqueness of raw material used, offering a differentiated taste to consumers though at a premium price (Magid et al. 2002).

Market segments for food products in LFSC are mostly limited to direct consumers (buying directly from the producers) and alternative market channels like specialty retailers and farmer's markets within the regional boundary. While products sometimes also reach out to national and export market, when large distributors are involved (Ilbery & Maye 2006; Morris & Buller 2003). Regarding distribution, products reach market through producer's own distribution or using services offered by logistics providers (Dreyer et al. 2014).

3.1.3 Challenges in LFSC

Small-scale actors in LFSC faces several challenges in their operation, most of which are related to their low volume operations. With lower production volumes, they cannot get the scale-benefits leading to higher production costs and product prices (Abatekassa & Peterson 2011). While, coordinating the marketing functions with respect to the production is also an equally challenging task. It is mostly related to market access and efficient distribution of the products (Dreyer et al. 2016), which often causes higher transactions costs (Woods et al. 2013). Thus, often their products are known by handful of consumers preferring speciality products through limited number of stores (Kvam et al. 2014; Visser et al. 2013), while they have limited access to the supermarket chains, large retail chains and Horeca sectors (Martikainen et al. 2013).

Besides, lack of differentiation strategy for their products based on market, geographical areas, customers and using the principle of "one size fits all", is another challenge actors in LFSC are facing (Dreyer et al. 2014). With an organic nature of management based only on owner's perspective and experience, they have informal management system (Levy & Powell 2000). Especially, small producers within LFSC are found to be using only historical sales information for production planning and control. But, sharing information related to demand, stock levels, production plans, sales, delivery status, and market activities have been found lacking within the actors in LFSC (Dreyer et al. 2016; Abatekassa & Peterson 2011). This creates more pressure on their already limited capacities.

Thus, lack of regular information sharing, collaboration and effective supply chain practices highly affects their ability to balance supply and demand, and improve performance (Dreyer et al. 2014; Abatekassa & Peterson 2011; Zhou & Benton 2007).

3.1.4 Craft breweries

Craft beers which are often called as "håndverksøl" in Norway, are speciality beer (Sandvik & Undlien 2014; Ramseng 2016) . Craft beers are popular for their traditional production methods, special recipe and different varieties available in terms of color, flavor, aroma, and alcohol content. Craft breweries use high grade malt with their unique brewing style improved over generations of brewers, which are relatively slow and in low volume. Besides the high quality malted barley, their unique recipe also includes special formulas of adding non-traditional ingredients like, spices to create unique styles (Clemons et al. 2006; Kleban & Nickerson 2012).

The Brewers Association [no date.a] has defined craft beer as "*beer produced using 100% malted barley, in contrast to the 30-40 % rice or corn adjunct used by mass producing breweries".* It is a value added product that has unique flavor and aroma, which has best flavor if consumed within three months. Shelf life varies for different type of craft beers and temperature, light and other conditions, they are exposed to (Brewers Association [no date.b]). Craft brewers also claim their product to have a shelf life of up to two years (Sangachhen & Vallandingham 2015).

Consumers go for these speciality beers to enjoy new beer styles and to experience high quality beer, though they have relatively higher prices than the industrial beers (Clemons et al. 2006; Kleban & Nickerson 2012). Wells (2015), also classifies the craft brewery business model as the small-scale production of distinctively-flavored high quality product that is sold at a premium price compared to commodity beers.

Craft brewers are often known as artisanal brewers and include microbreweries and brewpubs. Brewpubs are the brewers that produce and sell beers on their own premises only, while microbreweries are small-scale brewers that sell their products through retailers. The scale of operation or volume of these breweries are defined differently in different markets (Wells 2015).

For instance, brewers producing under 17,600 hectoliters (hl) per year are considered craft breweries in the US (Brewers Association [no date.a]), while those producing less than 1000 hl per year are considered in that category in Europe (The Brewers of Europe 2015).

Craft beer has proliferated highly and represents a greater part of market in the US than in Europe (Aquilani et al. 2015). Craft breweries represent over 12% of the total beer market in the US (Brewers Association [no date.c]). Murray and O'Neill (2012) has also mentioned that the craft beers are gaining market share from large national and international breweries. Meanwhile in Norway also, craft beer industry represents a growing trend. According to a recent article by the Brewery and Beverage Association of Norway, there has been 25% increase in beer volume produced by small-scale breweries in 2015 (Ramseng 2016). Regional small breweries have grown in recent years. Despite only accounting for 4% of total beer sales in Norway, the sector has been able to contribute to the job market with one in every five brewery jobs. It has been expected that the market share for craft beer will climb up to 8-10 % before 2020. These show the increase in the market and popularity of craft beer segments in Norway.

The craft beer industry shares similar challenges of other LFSC, especially in regards to balancing supply and demand. From a different aspect, craft brewing industry is a very competitive environment currently with constantly emerging competitors. Thus, profit margins can be very tight for the actors within the craft brewery sector even though it is a differentiated product (Danson et al. 2015).

3.1.6 Section Summary

This section has presented the increased popularity of local food and shown how SMEs are related to LFSC. The characteristics and challenges existed in LFSC have also been highlighted. Similarly, evidence of increased popularity of craft breweries has been shown and their products have been presented as differentiated products. This section ends with the note that effective supply chain practices, information and information sharing is crucial to achieve improved planning and control in LFSC actors. Thus, the subsequent chapter will discuss on importance of supply chain management and information sharing in a general and SME perspective.

3.2 Supply Chain Management

This section starts by describing SCM and how it relates to retail, specifically showing about planning and control of replenishment. Next, we show that information sharing is necessary for SCM, and that the type and quality of information have an effect on utilization of shared information. After, we show that IT is a prerequisite in sharing information. Finally, the necessity of SCM, information sharing and IT in SMEs is shown.

3.2.1 Supply Chain Management

A supply chain is made up of different actors, which includes suppliers, warehouses and retailers, whose end goal is to meet customer requirements (Chopra & Meindl 2013). The processes in a supply chain consist of physical and information flows (Prajogo & Olhager 2012; Bowersox et al. 2012, pp.38–40), as well as financial flows (Lee & Whang 2000).

Chopra and Meindl (2013, pp.13–25) consider the final objective of a supply chain as to create and maximize value generated by all the actors. The profitability of the supply chain depends upon the ability to create higher customer value than supply chain costs. Since the consumers are the source of revenue for supply chains, managing the processes efficiently further up the supply chain is of utmost importance. Performance of the supply chain can be increased if actors work together, and thus more value can be created for the consumer and the actors (Chopra & Meindl 2007, pp.13–30; Zentes et al. 2012, p.298). Supply chain management (SCM) has emerged from this and has been defined by Lambert et al. (1998) as:

"The integration of key business processes from end user through original suppliers that provides products, services and information that add value for customers and other stakeholders"

The use of SCM for retailers has become more important for ensuring success of retail businesses (Ganesan et al. 2009/3). Retailing provides product availability to the final consumer through stores (Fernie & Sparks 2014, pp.1–12; Dani 2015, pp.53–68), such as supermarkets or specialty stores (Van Weele 2009, pp.367–368). Thus, retailers have an intimate role with the consumer, and are able to get demand information directly from the source (Zentes et al. 2012, p.305). "Getting

the right products to the right place at the right time" is considered a challenge for retailers, since both demand and supply can fluctuate in large amounts (Fernie & Sparks 2014, pp.1–12). As such, the profitability of a retail supply chain is directly affected by its ability to balance supply and demand (Hübner et al. 2013).

Supply Chain Management in SMEs

SCM and information sharing are of importance in small as well as large enterprises. It has been noted that there is a scarcity of literature regarding SCM in SMEs (Quayle 2003). The use of SCM practices in SMEs has been found to improve operational performance (Koh et al. 2007; Hamister 2012). Although, SMEs may implement SCM practices for other reasons, such as improved customer responsiveness or supply chain communications (Meehan & Muir 2008). SMEs do not emphasize integration of systems as much large firms (Terje I. Vaaland & Morten Heide 2007), even though systems integration is seen as a critical factor in SCM (Cooper et al. 1997). Further research on SCM information technology has been proposed to improve performance of SMEs (Thakkar et al. 2008).

Research of SCM practices and effects in SME retailers has been found to be especially lacking, as most literature focuses on manufacturers or large retailers (Hamister 2012). A study on small retailers and SCM showed that both information sharing and information quality are of key importance (Hamister 2012). Although, information sharing was seen as extremely important, the integration of information systems within SMES may have less importance (Hamister 2012; Kuo et al. 2005).

Planning and Control

Planning and control of activities is important in balancing supply and demand (Slack et al. 2013). Planning refers to future events, and tries to formulate an idea of what will happen in the future. Control, on the other hand, is for dealing with changes to plans. Planning can be considered to constitute a longer time horizon, whereas control is more crucial in short term situations.

Decisions in supply chains can be seen in three different levels; strategic, tactical and operational (Hübner et al. 2013; Chopra & Meindl 2013, pp.13–30). Strategic design decisions concern

several years in the future and can be related to location of facilities, make-or-buy decisions, and choice of information systems to implement. Tactical decisions are usually done quarterly to yearly and are constrained by strategic decisions. Tactical decisions include inventory policies, timing and size of promotions, which location should supply which market. Operational decisions refers to decisions weekly or daily. These decisions are related to fulfilling orders, setting delivery schedules, ordering shipping etc.

The Replenishment Process

Retailers do not often have a production process, but source products from suppliers (Van Weele 2009, pp.367–368). The replenishment process denotes the process in a supply chain, where inventory is supplied from an upstream location to a downstream location (CSCMP 2010). This describes the operation between a retailer and suppliers (Chopra & Meindl 2013). To facilitate this process, orders are sent from retailers upstream to suppliers. Thereafter, the order is confirmed and then sent to retailers via a form of distribution. A simple representation is presented in Figure 4. But, if supply and demand are not aligned well, then the retailer will be left with either too much inventory, which must be priced down or thrown away (Hübner et al. 2013). Or, it is left with not enough inventory, which could result in expensive logistics issues trying to fulfill customer requirements.

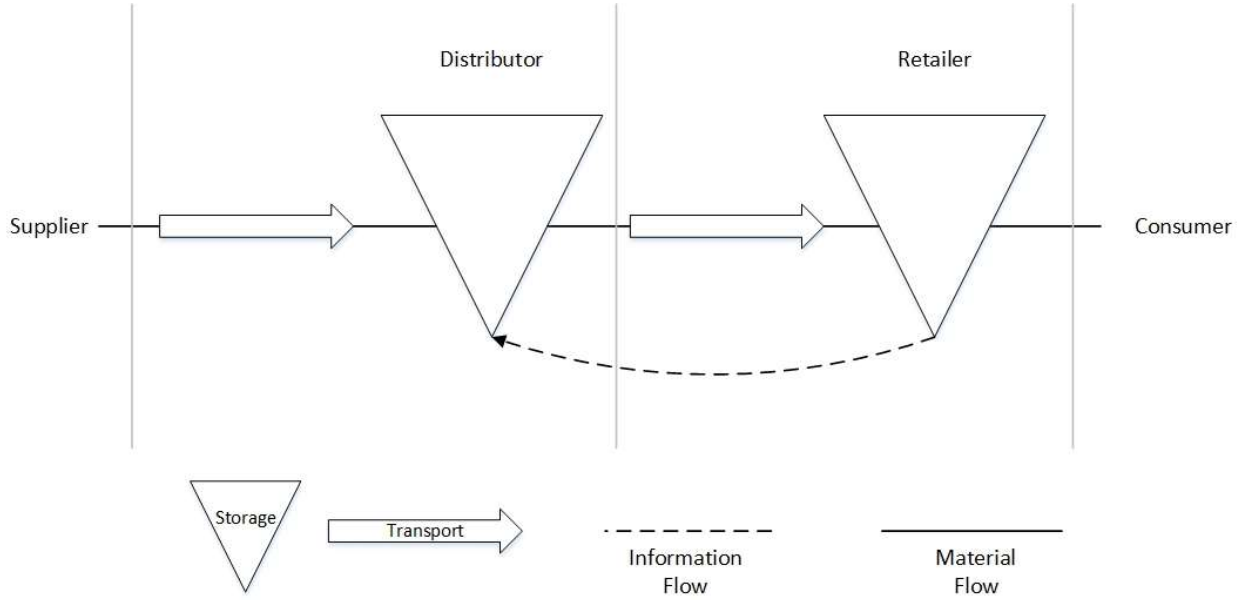


Figure 4: Information and Material Flow in Traditional Replenishment

To effectively manage inventory, a company must be able to have accurate records of inventory, and make decisions on when to release orders and the quantity to order (Stevenson 2012). How much to order consists of finding cycle stock, and safety stock. Cycle stock covers the probable demand of the product. Safety stock acts as a buffers against variability in demand and lead time. Models like Economic Order Quantity (EOQ) define the quantity to order. Re-order point (ROP) defines when to order based on the level of inventory. The fixed-order-interval model is relevant for finding quantity to order when suppliers require orders to be placed at fixed intervals, i.e. weekly, monthly.

Keeping track of inventories can be done periodically or perpetually (Stevenson 2012). Smaller retailers often keep track of inventory periodically. A periodic system is where the manager checks both the shelf and stockroom inventory at certain times. Based on this information a decision is made regarding how much to order and when. Perpetual information, on the other hand, keeps track of inventories continuously and can facilitate in utilizing, for example, ROP for order decisions.

3.2.2 Information and Information Sharing

The demand information that travels upstream to suppliers has been seen to fluctuate largely (Forrester 1997) and is known as the bullwhip effect (Lee et al. 2004). Time delays in ordering and distribution, along with a low level of information sharing contributes to this effect (Simchi-Levi 2005). Information sharing enables better integration and coordination of supply chain processes (Lee 2000; Lee & Whang 2000). Improving information flow in a supply chain can reduce, for example, both lead times and stock levels in a supply chain (Eastham et al. 2007, pp.150–165). Sharing information gives companies the ability to better respond to changes in demand (Zhou & Benton 2007; Mason□Jones & Towill 1997), reduce costs and improve performance (Yu et al. 2001). Information can be shared both internally, and between organizations. Ruppel (2004) states that the ability of a firm to share information internally directly affects its ability to share information to other actors in a supply chain.

Information in a supply chain is used to make decisions, and therefore must be of the right quality (Chopra & Meindl 2007, pp.421–423; Jonsson 2008). If of insufficient quality, information leads to increased costs in the supply chain, and a mismatch in supply and demand (Omar et al. 2010). Information quality has different dimensions (Wang et al. 1997; Chopra & Meindl 2007; Jonsson 2008, pp.421–423), although the different dimensions vary greatly (Myrelid 2015). Some common dimensions are related to accuracy, timeliness, correct, and ease of use (Jonsson 2008, pp.421–423; Chopra & Meindl 2007, p.501). A list of dimensions are shown in Table 6,

Table 6: Information Quality Dimensions adapted from Myrelid (2015)

IQ Dimensions	***Description***
Timely	The age of information, and how up to date it is (Wang et al. 1997)
Reliable	Accuracy, and correctness of information (Lee et al. 2002)
Complete	Includes all required information for the task (Lee et al. 2002)
Concise	Compact and conciseness of information, which is not overwhelming (Wang et al. 1997)
Consistent	Use of the same format for information (Lee et al. 2002)
Valid	The information measures the correct information (Gustavsson & Wänström 2009)
Secure	How restricted information is (Myrelid 2015)
Relevance	The information is applicable and value adding in the situation (Omar et al. 2010; Wang et al. 1997)
Accessible	How easy it is to retrieve information (Omar et al. 2010)
Credible	Information is believable (Lee et al. 2002)
Understandable	How easy information is to comprehend (Lee et al. 2002)
Ease of operation	How much rework required to access (Jonsson 2008, pp.421–423)
Appropriate amount	Quantity of information is not too much (Omar et al. 2010)
Objective	If information is impartial and based on facts (Lee et al. 2002)

Information Types

The types of information shared can vary greatly, and depend on the needs of the firm (Omar et al. 2010). Different authors have classified different types of shared information. Lee and Whang (2000) group information into six categories; Inventory, Sales data, order status, sales forecast, production/delivery schedules and others. Huang et al. (2003) has a similar classification where information is grouped into product, process, resource, inventory order, and planning information. Moberg et al. (2002) group information into types, as well as into strategic and operational levels. Strategic information includes such information as promotional strategies and distribution strategies, whereas operation include inventory level, order status etc.

Inventory level is a commonly shared type of data in supply chains. By communicating this type of data, the supply chain can become more responsive to actual customer demand (Christopher 2005, p.99). Inventory information can encompass both the current on-hand level, but also backlogs and, work-in-progress (Huang et al. 2003). A further extension of this is Vendor Managed Inventory (VMI), which gives the upstream supplier access to stock level the customer, and requires the upstream supplier to be responsible for replenishment (Lee & Whang 2000).

Sales data most often only encompasses orders, which include order quantities, expected due dates and batch sizes (Huang et al. 2003). By only providing order information, and not actual sales data, the bullwhip effect may be more evident (Lee et al. 2004). Retailers may order in large batches, which means the producer will not receive orders very often and thusly have difficulty planning production (Huang et al. 2003; Lee & Whang 2000). By gaining access to the sell-through data producers can better plan production (Lee & Whang 2000).

Downstream actors may share sales forecasts with upstream suppliers (Lee & Whang 2000). This allows upstream suppliers to better plan production, as it reduces the needs for multiple forecasts. By sharing this type of information, supply chains can work together to reduce the entire amount of inventory at each echelon in the supply chain caused by double or triple forecasting (Huang et al. 2003).

Retailers may have promotions that can increase demand for certain periods of time (Hamister 2012). This peak of demand is artificial in that it is spurred by lower pricing or offers, and therefore the demand often evens out after a promotion. If the supplier of a retailer is unaware of this promotion, excessive inventory may be built up by the supplier. Therefore, sharing of information regarding promotions can help reduce this effect. For seasonal products, sharing information early in a season can help suppliers respond better to the fluctuation in demand (Chopra & Meindl 2013, pp.262–282; Hamister 2012).

Information Utilization

Information can increase competitive advantage of firms, but firms must be able to capture, store and analyze information (Porter & Millar 1985). The degree of quality of information, as well as the amount of information available, are important for effective balancing of supply and demand (Omar et al. 2010). Information usage can be classified into four different levels, which include potential usage, intended usage, actual usage and efficient/effective usage (Myrelid 2015). Potential usage is the usage of information that is possible. Intended usage is what the company intends to use the information for, whereas actual usage is what they actually do. Finally, efficient and effective usage denote usage that actually gives benefits.

Utilization of demand information depends on many determinants, according to Myrelid (2015). These determinants, listed in Table 7, include information quality, inter-organizational relationships and intra-organizational factors. Information Quality was explained previously. Inter-organizational relationships refer to the relationships between companies, and intra-organizational factors are factors that are within the company. For example, collaborative relationship is an inter-organizational relationship factor between the supplier and the customer. The more collaborative a relationship is, the more willing the companies will be to use information.

Information technology has made more information available to firms, but firms must be able to use the information (Porter & Millar 1985). Information technology reduces costs and improves performance related to gathering, processing, and communicating data to other companies (Kotzab & Bjerre 2005; Porter & Millar 1985). Real-time information can be achieved due to increased speed of transactions (Kotzab & Bjerre 2005). Increased performance and efficiency of

transferring information, as well as limiting errors, is also made possible by IT (Zentes et al. 2012, pp.365–381). Information Technology can be seen to assist both in terms of communicating, and in utilizing information.

Table 7: Utilization Factors (Myrelid (2015))

Factor	*Type of factor*	*Impact on utilization*
Collaborative relationship	Inter-organizational relationship	Willingness to use
Information dependency	Inter-organizational relationship	Willingness to use
Human skills and understanding	Intra-organizational at supplier	Ability to use
Planning system functionality	Intra-organizational at supplier	Ability to use
Process formality and structure	Intra-organizational at supplier	Ability to use
Value of information	Information quality	Willingness to use
Accuracy of information	Information quality	Willingness to use Actual usage
Information format	Information quality	Ability to use Actual usage

3.2.3 Section Summary

This section has presented SCM, and specifically, how retailers use SCM concepts to improve performance related to replenishment and inventory management. Effective supply chain practices are dependent on information. The types of information, and its quality directly affect the ability to utilize the information to increase performance. As the amount of information available increases, IT can help gather, process, and further communicate data to the necessary actors. SMEs, and more specifically, SME retailers have not adopted SCM and IT to the same extent as their larger counterparts, and thus is important to be studied. The next section will examine the role of IT in general and in an SME perspective.

3.3 Information Technology

This section introduces the role of information technology (IT) in a supply chain. Other terminologies like, Information system (IS) strategy and Information systems (IS) have also been used and differentiated. Overall, the section has been divided into two parts. First, IS strategy and IT from a general supply chain perspective is demonstrated. The second part then focuses similar aspects on SMEs. Studies on IS strategy and IT adoption by SMEs have been discussed, including the benefits and factors affecting IT adoption. The factors affecting IT adoption in SMEs have also been categorized as enablers and inhibitors.

3.3.1 Information System (IS) Strategy

Chopra and Meindl (2013) state that supply chain success is dependent upon information availability and analysis. This in turn leads to good decision making. Businesses should have an information system (IS) strategy that is aligned with its overall business strategy (Olsen & Sætre 2007; Ross 2015). This IS strategy will then guide the information system (IS) in the organization. Information system (IS) can be defined as a *"system for collecting, processing, visualizing, retrieving, and distributing information within the enterprise and between the enterprise and its environment"* (Bernus & Schmidt 1998).

IS encompasses both hardware, software, data, people and procedures i.e. both computerized and non-computerized systems (Silver et al. 1995; Nguyen 2009; Alshawi 2001). While, Information Technology (IT) consists of a wide range of technology based resources mostly hardware, software and peripheral communication systems for sharing, processing and analyzing information (Ongori & Migiro 2010; Alshawi 2001; Kushwaha 2011). Thus, IT is a part of IS as represented visually in Figure 5. In a business, an IS should provide high quality information at the appropriate time and to the appropriate people (Bernus & Schmidt 1998).

This thesis has used the term IT to represent the technological parameters of hardware and software, while process improvements related to use of IT are also emphasized.

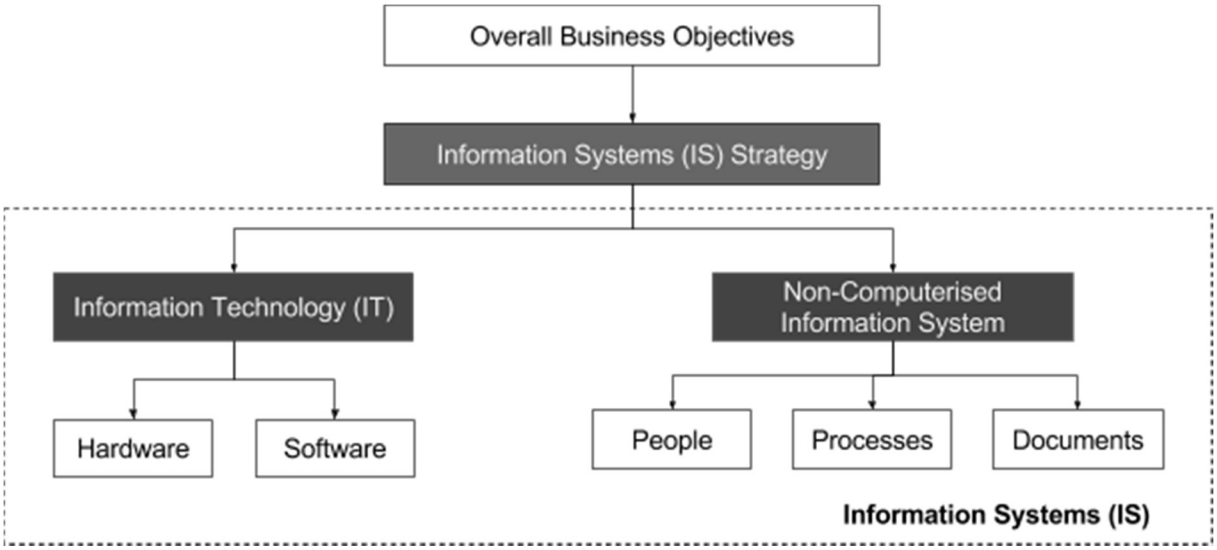


Figure 5: Representation of IS Strategy, IS and IT (based on Silver et al. 1995; Nguyen 2009; Alshawi 2001)

Qrunfleh and Tarafdar (2014) explain that IS strategy for supply chains is motivated by two major objectives i.e. IS strategy for efficiency and IS strategy for flexibility (Table 8). The IS strategy for efficiency supports the operational and inter-organizational systems and monitors day to day activities to improve operational efficiency of supply chain. And, IS strategy for flexibility uses IS for market information and quick strategic decision support.

Table 8: IS strategy for efficiency and flexibility in SC (Qrunfleh & Tarafdar 2014)

Type of IS strategy for SC	*Typical application portfolio*	*Description*
IS strategy for Efficiency- use of IS for intra- and inter-operational SC processes	Operational support and Inter-organizational systems. E.g. ERP, EDI, e-procurement systems	Primary use of IS to monitor and control day to day operational activity in SC
IS strategy for Flexibility- use of IS for market flexibility and quick strategic decisions	Market information and strategic decision support systems. E.g. CRM applications	Primary use of IS for monitoring product and market trends to be able to respond quickly

3.3.2 Information Technology in a Supply Chain

Role of IT in a supply chain has been discussed by different literature (see e.g.. Bowersox et al. 2012; Ross 2015; Jonsson 2008; Chopra & Meindl 2007). Bowersox (2012) have categorized the

role of IT in a Supply Chain process, similar to what Ross (2015) has categorized. The basic role of IT in a SC starts from supporting day to day activities like, data collection, order management. Its role then increases to management control, decision analysis and SC collaboration with suppliers and customers as the SC matures (Bowersox et al. 2012; Ross 2015). Figure 6: IT Functionality in a SC (Bowersox et al., 2012)shows how IT functions in a SC develops from transactional level to strategic level. While, Chopra and Meindl (2013) state that IT should address the three major supply chain macro processes; Customer Relationship Management (CRM), Internal Supply Chain Management (ISCM) and Supplier Relationship Management (SRM).

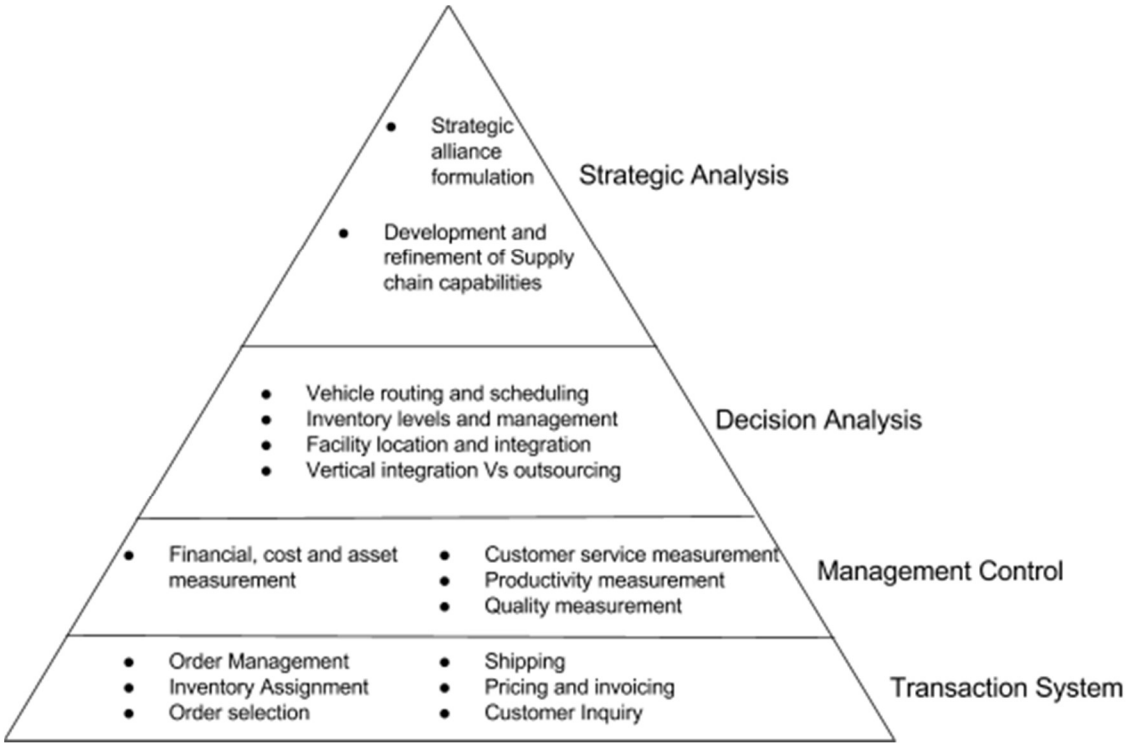


Figure 6: IT Functionality in a SC (Bowersox et al., 2012)

Software application made for supply chain management (SCM) can be categorized as Transactional and analytical software applications from a data management point of view. The transactional applications involves software like; POS systems, e-commerce systems and ledger systems that enable a firm to collect, process and communicate raw data from its supply chain operations (Helo & Szekely 2005). This group of applications are targeted to cover the transactional functions of supply chain information system as pointed by Bowersox et al. (2012)

in Figure 6. While, analytical software applications include software for evaluating and disseminating decisions based on available information databases. They help in management control and decision analysis by generating reports on firm's performances (Helo & Szekely 2005).

3.3.3 Information Technology (IT) in SMEs

Extensive research on IT practices are targeted for large organizations, while the understanding of IT in SMEs is not strong (Blili & Raymond 1993; Cragg 2002; Fink & Disterer 2006; Chibelushi 2008; Ballantine et al. 1998). Large companies often have formal procedures, whereas SMEs have ad hoc procedures (Salles 2006). With their organic nature of SC and scarce resources, IT adoption in SMEs is more difficult (Levy & Powell 2000).

Most of the research on IT for SMEs discussed the advantages (Ballantine et al. 1998; Sin Tan et al. 2009; Kannabiran & Dharmalingam 2012; Efendioglu 2015). But despite this research being focused on IT benefits to SMEs, researchers claim that the topic of IT within SMEs has been lacking research (see e.g. Chibelushi 2008; Fink & Disterer 2006; Haug et al. 2011; Riemenschneider et al. 2003). Other studies have confirmed that SMEs hardly use any IT to share information and rather mostly depended on direct communication like, phone calls and meetings only (Welker et al. 2008/6).

Early frameworks for IT evaluation in SMEs have been developed by Blili and Raymond (1993b), Ballantine (1998) and Thong (1999). These were mostly based on learnings from IT evaluation in large firms, with adjustments for SMEs. Though, Thong (1999) has explained that since SMEs lack time and skills required for planning, not all organization theories applicable to large enterprises may fit SMEs. Subsequent attempts on IT evaluation models have focused more on SME characteristics (Levy & Powell 2000; Sarosa & Zowghi 2003; Ghobakhloo et al. 2012)

In regards to specific IT, SMEs should focus on free and open source software (FOSS) like Openoffice and Google Docs instead of using proprietary software, like Microsoft office along with effective use of email and internet for recording, analyzing and sharing information (Varma & Khan 2014; Kushwaha 2011). More advanced software, like enterprise resource planning (ERP) software, can be useful for SMEs provided that they have a need and the resources to afford it.

Implementing one of the standard ERP package could be a possibility for SMEs, but Olsen and Sætre (2007) warn that it could weaken the competitive advantage for SMEs, since it may not be tailored for niche operations. This goes against Carr (2003), who states that business should be followers regarding information technology.

More appropriate low-cost alternatives can be web-enabled ERP services for SMEs. This has created wide scopes for cloud-based solutions like, software as a service (SaaS), which covers major business functionalities with lower startup and maintenance cost. Salesforce.com is a leading supplier of SaaS, while major ERP software suppliers SAP, Oracle, Microsoft are also developing services based on SaaS model (Chopra & Meindl 2013). ERP solutions targeted for SMEs like, Dynamics NAV (Navison) by Microsoft and SAP, provide links to real time data using mobile technology (Chopra & Meindl 2013; Kushwaha 2011). On contrary, as argued by Olsen and Sætre (2007), developing an in-house system to cater its core functionalities can also be a suitable option for niche SMEs since IT development is now less expensive than before. There are vendors like, Susoft.no and Pipechain.com that help SMEs develop such services based on SaaS model (pipechain [no date]; susoft [no date]).

3.3.4 Benefits of IT in SMEs

As mentioned earlier, plethora of literature have pointed out advantages of IT in SMEs (Ballantine et al. 1998; Evangelista & Sweeney 2006; Barba-Sánchez et al. 2007; Vanpoucke et al. 2009; Sin Tan et al. 2009; Kannabiran & Dharmalingam 2012; Efendioglu 2015). Table 9 below shows a summary of IT benefits on SMEs as described by different authors.

Evangelista and Sweeney (2006) in their study on the use of IT by small 3PLs points out some key roles of IT. Usage of appropriate IT systems helps to increase intra-company integration; facilitate smooth exchange of information from customers, suppliers and other actors; improve customer satisfaction; enlarge customer base; and improve competitiveness (Evangelista & Sweeney 2006; Ongori & Migiro 2010; Kushwaha 2011).

Table 9: Benefits of IT adoption in SMEs

Benefits of IT adoption in SMEs	
Improved communication with suppliers and customers	(Kannabiran & Dharmalingam 2012; Sin Tan et al. 2009)
Increased competitiveness	(Evangelista & Sweeney 2006; Ongori & Migiro 2010; Kushwaha 2011)
Operational cost reduction	(Sin Tan et al. 2009; Antlová 2009)
Strategic Integration with other supply chain actors	(Evangelista & Sweeney 2006; Ballantine et al. 1998; Ongori & Migiro 2010; Efendioglu 2015; Sin Tan et al. 2009)
Market Growth	(Ongori & Migiro 2010; Evangelista & Sweeney 2006)
Increased visibility, reduced bullwhip effect and inventories	(Zhang et al. 2011; Vanpoucke et al. 2009; Efendioglu 2015)
Increased productiveness	(Barba-Sánchez et al. 2007; Evangelista et al. 2013; Efendioglu 2015; Sin Tan et al. 2009; Kushwaha 2011)

Adoption of IT is responsible for increased productivity and effectiveness of activities and the entire firm (Barba-Sánchez et al. 2007; Evangelista et al. 2013; Efendioglu 2015). Furthermore, IT tools can cost-efficiently help businesses compete, gain larger market share, and improves customer and supplier communications (Sin Tan et al. 2009). While, Zhang et al. (2011) and Vanpoucke (2009) have pointed how IT helps in supply chain coordination by improving effectiveness of distribution channels, increasing visibility in overall supply chain, reducing bullwhip effect and inventories. Moreover, IT can help SMEs in cutting cost by increasing their overall productivity. It helps them to improve their internal business processes, expedite communications with suppliers and customers, improve inventory control and increase sales (Kannabiran & Dharmalingam 2012).

3.3.5 Factors affecting IT adoption in SMEs

IT adoption in SMEs is influenced by multiple factors, which different literature have classified in their own ways (Ghobakhloo et al. 2012; Bharadwaj & Soni 2007; Lee & Runge 2001; Riemenschneider et al. 2003; Thong 1999; Nguyen 2009; Spinelli 2016; Hunter 2015). Some

factors support SMEs in adopting IT, called enablers. Other factors act like barriers and can be called inhibitors. A list of enablers and inhibitors have been shown in Table 10. Some authors have seen IT adoption factors in SMEs as determinants of technology adoption in SMEs (Spinelli 2016; Martínez-Román & Romero 2016). Particularly, Nguyen (2009) and Ghobakhloo et al. (2012) have classified the IT adoption factors as internal and/or external pressures (factors), which they refer to as drivers of adoption.

Predominant internal factors that influence IT adoption include characteristics of the owner (manager), resource availability of the firm, competence of staff (users) and organizational characteristics, IT planning etc. While, the major external factors include pressures from business competitors; network relationship with suppliers, customers and business partners; availability of IT solutions and external expertise available; and partly government regulations (Nguyen 2009; Ghobakhloo et al. 2012; Thong 1999). Each of these individual factors can be elaborated with the sub-factors that influence it. For example, owner's characteristics as an internal influencing factor of IT adoption in SMEs determined by his/her perception of IT, knowledge about IT and degree of innovativeness.

Table 10: Enablers and Inhibitors of IT adoption in SMEs (based on Hunter (2015))

Factors	***Description***
	Enablers
Owner's characteristics	IT experience or result- oriented perception of business owner towards IT promotes IT adoption. ● Knowledge and experience on IT [1],[2],[3] ● Innovativeness [4],[5],[6] ● Perception towards IT [7]
Organizational characteristics	Type of business, its structure, size (no. of employees, turnover) enables IS adoption [4] ● Firm's IT and financial resources [5],[6],[7],[16] ● Staff competence and involvement [5],[8],[9],[10]
External forces	External expertise, relation with suppliers and customers, and increased adoption by competitors promotes IS adoption. ● Access to external IS expertise and services [4],[7],[8] ● Network relationship with suppliers and customers [2],[5],[7] ● Increase IT adoption by competitors[8],[7],[11] ● Supporting role of government for SMEs [6],[16]
	Inhibitors
Small-scale operation	Lack of resources being small-scale challenges IS adoption [2],[6],[5],[7]
High implementation cost	Perceived high cost of planning, implementing and post implementation restrains IS adoption by SMEs [5],[7],[10],[12],[13],[14],[15]
System complexity, data security, process compatibility	Unsuitability for business and insecurity of business information hinders adoption [5],[7],[10]
Uncertainty in investment cost and benefits	Unclear returns to business and total cost [7],[10]
Lack of planning and strategy	Shortage of study and implementation plan [5],[14]
Resistance to change	Resistance from employees to change to new system and technology [7],[16],[11]

[1] (Thong 1999), **[2]** (Nguyen et al. 2015), **[3]** (Prananto et al. 2003), **[4]** (Martínez-Román & Romero 2016), **[5]** (Nguyen 2009), **[6]** (Ghobakhloo et al. 2012), **[7]** (Spinelli 2016), **[8]** (Riemenschneider et al. 2003), **[9]** (Bharadwaj & Soni 2007), **[10]** (Sin Tan et al. 2009), **[11]** (Bharati & Chaudhury 2015), **[12]**(Evangelista & Sweeney 2006), **[11]** (Shin 2006), **[13]** (Ongori & Migiro 2010), **[14]** (Blili & Raymond 1993), **[15]** (Love et al. 2005), **[16]** (Sarosa & Zowghi 2003), **[17]** (Bayraktar et al. 2009)

3.3.6 IT Adoption in SMEs

Different literature have tried to analyze the IT adoption in SMEs (Premkumar & Roberts 1999; Lee & Whang 2000; Manueli et al. 2007; Ongori & Migiro 2010). But most of these studies on IT adoption focus on factors, rather than the process to adopt IT. Despite this, a more precise attempt to suggest how practical IT adoption in SMEs can be done has been developed by Sarosa and Zowghi (2003) and Ghobakhloo et al. (2012).

Ghobakhloo et al. (2012) have designed a conceptual model for IT adoption in SMEs (see Figure 7 below) with three distinct stages of the technology innovation cycle, namely; 1. Initial adoption stage, 2. IT implementation stage and 3. Post-implementation stage. This is similar to the model developed by Thong (2001/4). In the initial adoption stage, decision for need of new IT is taken, which is followed by the implementation of IT infrastructure. Finally, after it is implemented, learnings and feedbacks are used for further improvements in the post-implementation stage (Ghobakhloo et al. 2012). This thesis will only consider the initial adoption stage.

Within the first stage of IT adoption, there are three sub-stages; IT Requirements Analysis, IT services/products availability and Organizational readiness. Through IT requirement analysis, the process and activities within business area, which needs to be assisted with IT are analyzed. After, suitable available services and products are assessed. The services selected to be used should cater unique constraints and characteristics of SMEs operational environment. Use of external consultants on IT can help SMEs find best suited services. Finally, readiness of the SME is determined. By looking at the aspects relating to IT readiness, a gauge on the ability of a company to implement new IT projects can be assessed, and it also help to deem where resources should be focused if a low level of readiness is found in a company (Spinelli et al. 2013).

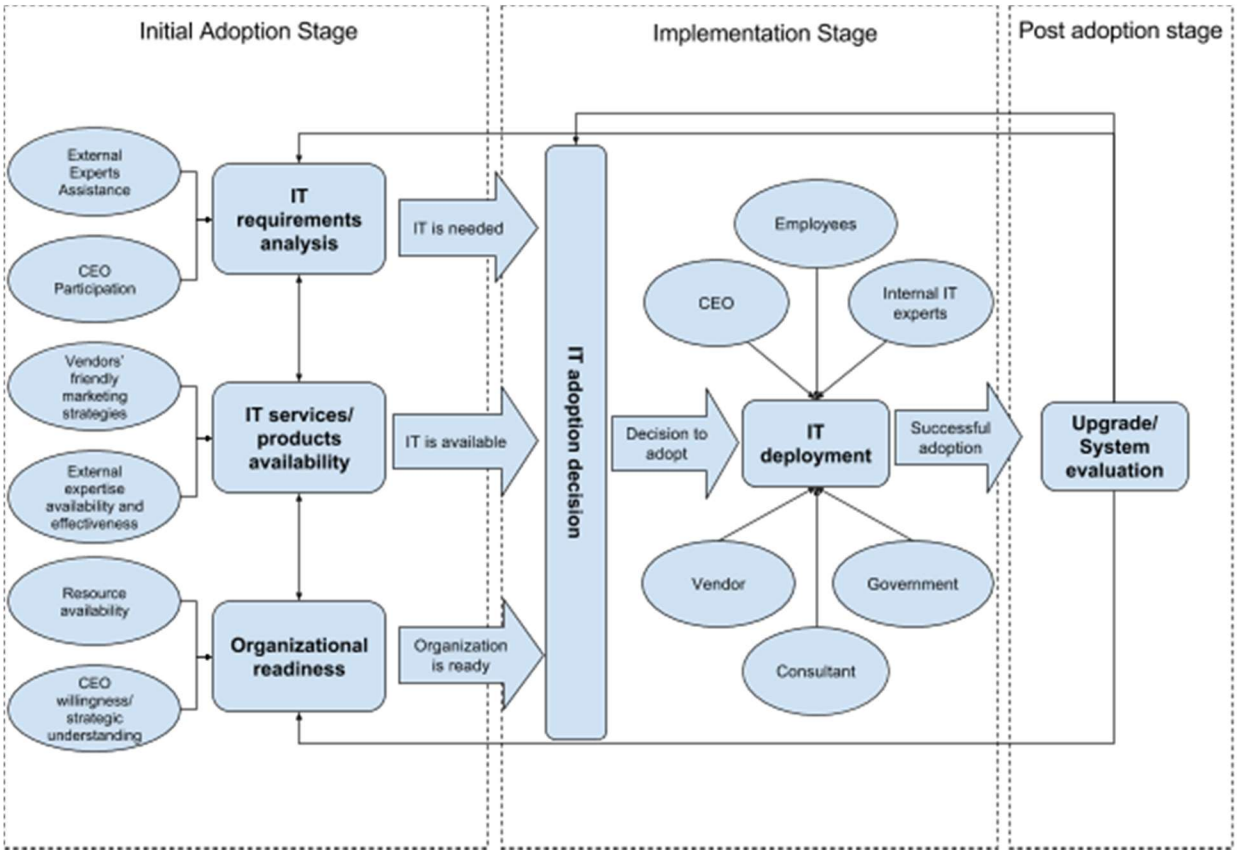


Figure 7: Conceptual mode for IT Adoption in SMEs (Ghobakhloo et al. 2012)

Studies show that IT readiness in SMEs is largely affected by the owner/manager of the company. Aspects such as previous experiences with IT, involvement in IT related decisions, and perceived benefits of IT by the owner/manager are included in both Spinelli et al. (2013) and Haug et al. (2011). Present level of IT infrastructure and the management capabilities of the company also determine the IT readiness level for SMEs (Spinelli et al. 2013; Haug et al. 2011). Some of the elements of organizational IT readiness are presented in Table 11 below:

Table 11: Elements of Organizational IT readiness

Elements of Organizational IT readiness	***Author***
• Strategic Vision • Process Management Capabilities • IT application infrastructure	(Spinelli et al. 2013)

• Company Characteristics
  ○ Pressure to change processes
  ○ Room for risks
• Management Characteristics
  ○ IT acquaintance
  ○ IT project support
• Employee characteristics
  ○ IT skills
  ○ IT project attitude
	(Haug et al. 2011)

3.3.7 Section Summary

This section has presented how IS strategy is guided by business strategy. The role of IT to support different level of business operations from basic transactional level to strategic level have been clarified. It was shown that businesses try to integrate with each other's IT to collaborate as the maturity level of the SC increases. Context of IT was discussed first through a general SC perspective first and later through an SME perspective.

The benefits of IT implementation for SMEs have been evaluated and presented in Table 9. Similarly, the enablers and inhibitors of IT adoption in SMEs have been presented in Table 10. Very few studies were found to be dedicated on IT adoption in SMEs. Existing IT evaluation model for SMEs were found to be developed from large enterprises.

Based on the knowledge from this section, an IT assessment process flow for SMEs has been proposed in the following section, and partially implemented in the case and analysis.

3.4 Proposed IT Assessment Process

Information systems (IS) strategy plays significant role to define and determine how IT in a company will look (Kushwaha 2011; Olsen & Sætre 2007). Blili and Raymond (1993) have developed a simple framework for planning analyzing IT for SMEs, learning from similar approaches in large enterprises. But, unlike large enterprises, IT approaches developed for SMEs should consider their informal nature (Levy & Powell 2000). Levy and Powell (2000) have developed a refined framework particularly for IT approach in SMEs. Similarly, (Sarosa & Zowghi 2003) and (Ghobakhloo et al. 2012) have also developed guidelines for technology adoption in SMEs.

There is a divide in literature between technology adoption and the actual formation of the information strategy in SMEs. Therefore, by combining the two different knowledge streams, a more complete understanding can be achieved. Thusly, with the relevant knowledge from the literature (such as Blili & Raynmond (1993); Levy & Powell (2000); Ghobakhloo (2012)), a simple IT assessment process flow for SMEs has been proposed (Figure 8 below).

The foremost task an SME has to do for IT assessment is to analyze its AS-IS conditions. This is done to check if the current level of technology covers its owner's business vision, the challenges from competitors and meet its business processes. Only if the current technology does not fulfill the business objectives, they need to decide for adopting a new technology. A technology adoption should then be carried out. It involves listing the technology requirements showing which processes needs to be supported by new technology. Then, it should be checked against both the readiness of the organization and the availability of technology. This leads to the adoption decision, where suitable technology is chosen and implemented. After this, evaluation of the technology should give feedback to check if the initial requirements are fulfilled.

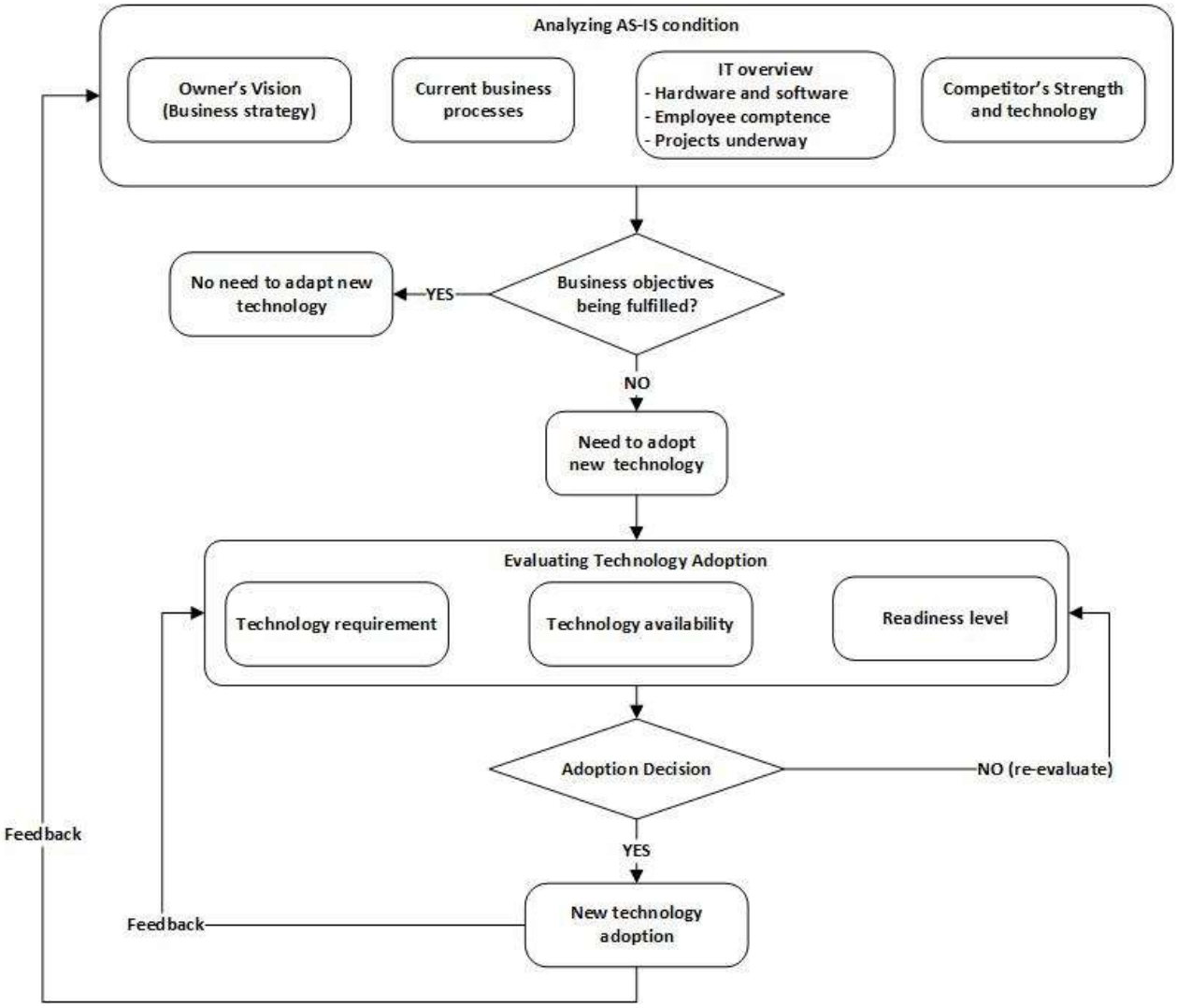


Figure 8: Proposed IT assessment process flow for SMEs

4. Case Study

This chapter first presents an overview of the Norwegian beer industry in which the company is competing. Thereafter, the case company background is shown with a description of the operations. The supply chain characteristics, including suppliers, products, customers and the information systems are explained as well. Finally, a supplier categorization and detailed mapping of the supply chain and processes related to each supplier type are shown using control model methodology.

4.1 Beer Industry Overview

The Norwegian beer industry has an intricate network with suppliers of raw materials, producers, wholesales & importers, distributors, and retailers. A simple representation of what the Norwegian beer supply chain looks like has been mapped in Figure 9. The industry is largely dominated by a handful of large beer producers, importers and distributors, while there are other emerging small players too. The Norwegian beer supply chain can briefly explained below:

At the very top level, there are the suppliers of raw materials like, hops, malt, yeast and packaging materials for the breweries. The next level is producers. Producers dominating this category are Ringnes (53.7%) and Hansa (26.7%) followed by Aass, Mack and Grans accounting for a total of nearly 16 % of the beer market (Sangachhen & Vallandingham 2015). The remaining part of the beer market is covered by the small-scale breweries, denoted craft breweries, accounting for less than four percent (Ramseng 2016; Sangachhen & Vallandingham 2015). Products produced by the large players are mostly lagers which are the industrial beer or "industriøl", while that produced by the small breweries are mostly ales, which are "håndverksøl" (Sandvik & Undlien 2014; Clemons et al. 2006).

Wholesalers and importers fall under the third level in the Norwegian beer supply chain and has been referred to agents. These actors handle mainly the products from larger producers and foreign producer and are specialized for dealing with alcoholic products, like beer and wine. Beer Enthusiast AS, AMKA Norway AS, Cuveco, Vectura are some of the existing players in this category. Finally, via logistic service providers, the products reach the retail segment like,

Vinmonopolet, Speciality stores and also Horeca, which includes pubs and restaurants (Lai et al. 2013; Nome 2015; Hundevadt & Hanekamhaug 2014)

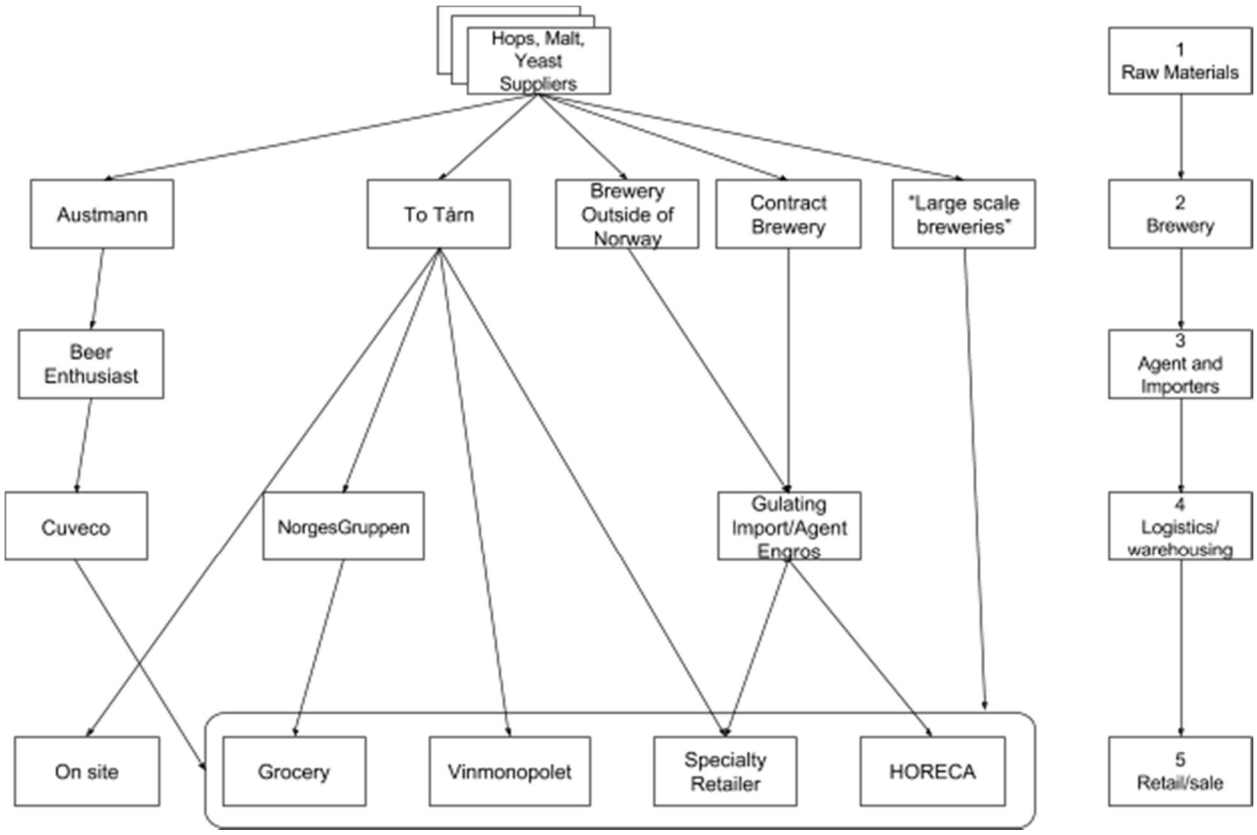


Figure 9: An overview of the Norwegian beer supply chain (Lai et al. 2013; Nome 2015; Hundevadt & Hanekamhaug 2014)

4.2 Case company - Gulating Group

The Gulating Group started as a pub in 2012 in Dale Sunnfjord Norway, where they brewed and sold their own beer. The group today has a diverse operation. With a unique concept of working with craft breweries, the Group is a new player in Norwegian beer market dedicated to promote craft beer and improve market access of the craft breweries, making a business out of it.

Based on the characteristics, such as a few number of employees and an annual turnover below five million euro, the company can be classified as an SME in a European context (see Table 5). The characteristics of the case company are presented in Table 12 below.

Table 12: Overview of the Gulating Group

Company	***The Gulating Group***
Operations	1. Speciality Retail store (including Franchise stores) 2. Pub 3. Craft brewing 4. Import 5. Wholesale
Products	1. Craft beer from Norwegian Craft breweries 2. Imported craft beers 3. Gulating Brand (outsourced production)
Customers	1. Store customers 2. Pubs
Ownership	AS
No. of Employees	40-45
Annual Turnover	< 5 million Euros

4.3 Operational areas

Currently, Gulating operates in five business areas namely; 1. Gulating Beer store, 2. Gulating Pub, 3. Gulating Craft brewery (contract brewing), 4. Gulating Import and 5. Gulating Wholesale (Skår 2015). Each of the business areas are further elaborated on hereunder:

The Gulating Beer store

The Group is mostly known because of their presence in the retail sector with their own beer stores. The Gulating beer stores, unlike other stores, are dedicated to selling craft beers from different regions of Norway and Europe. They aim to promote the craft beer tradition by making craft beers easily available through their stores. Currently they have 10 stores. They are mostly concentrated in southern Norway, but there is also a store in Bergen and mid-Norway in Trondheim (see Figure 10 below). Besides, the Group aims to open more franchise stores under their brand in other regions of Norway. They currently have two franchise stores at Fredrikstad and Kristiansund.

This part of their business has repeatedly been referred to as a speciality retailer, since they deal with craft breweries, many of which are SMEs or micro-enterprises. While, the Group prefers this part to be compared with other Norwegian stores like, Vaaland Byrne and Varna Mineral Moss.

The Gulating Pub

The current stage of the group started from the pub they had in Dale in Sunnfjord in 2012, where they sold their self-produced beer. Currently, they have two pubs in Lillestrom, where they sell a large selection on Norwegian and foreign brewed craft beers from taps and bottles. They further aim to establish more pubs under their brand in coming days. The group prefers to compare this area of their operation with Crowbar and Cafe Sara in Oslo and Neighbor in Trondheim.

The Gulating Craft Brewery (contract brewing)

Under this business operation, the group has beers under their own brand name. However, they do not own any production facility. They outsource the production to other craft breweries, but with their own recipes. Thus, the group acts like a contract brewer. Some of their contract brewed beers are: Bjørr, Hveiti, Inland, Vikinger, Myrkr and Bragda which are produced in the region that typifies the style of beer. For example, some typical English style beers, like the Brown Ale (Myrkr) and the Pale Ale (Vikingr), have been outsourced to a brewery in England.

With its own brand contract-brewed beer, the Group tries to ensure reasonable prices of the final product. They also have produced special occasion beers, like Christmas beer (juleøl).

The Gulating Import

In this part of their business, they aim to import craft beers from around the world. They currently only import a few beers, which they store centrally in their main warehouse. The beer is then sold through their own stores, pubs, restaurants. With target of adding more beers in import segment, they prefer this area of their business to be compared with Brewery International or Beer Enthusiast AS in Norway.

The Gulating Wholesale

The wholesale division of Gulating group mainly works to supply their stores. The Group is planning to supply to other retail outlets as well as Horeca from this operation in the future. They have their main wholesale distribution warehouse at Vestfold, which is a tax free warehouse for the imported beers, outsourced beers and beers from Norwegian producers. Then they distribute from this warehouse to their own stores and pubs and to other stores they have agreements with. They compare this part of business with Vectura, Vinhuset and Måkestad. Both the import and wholesale part of their business represents the agents in Norwegian beer supply chain.

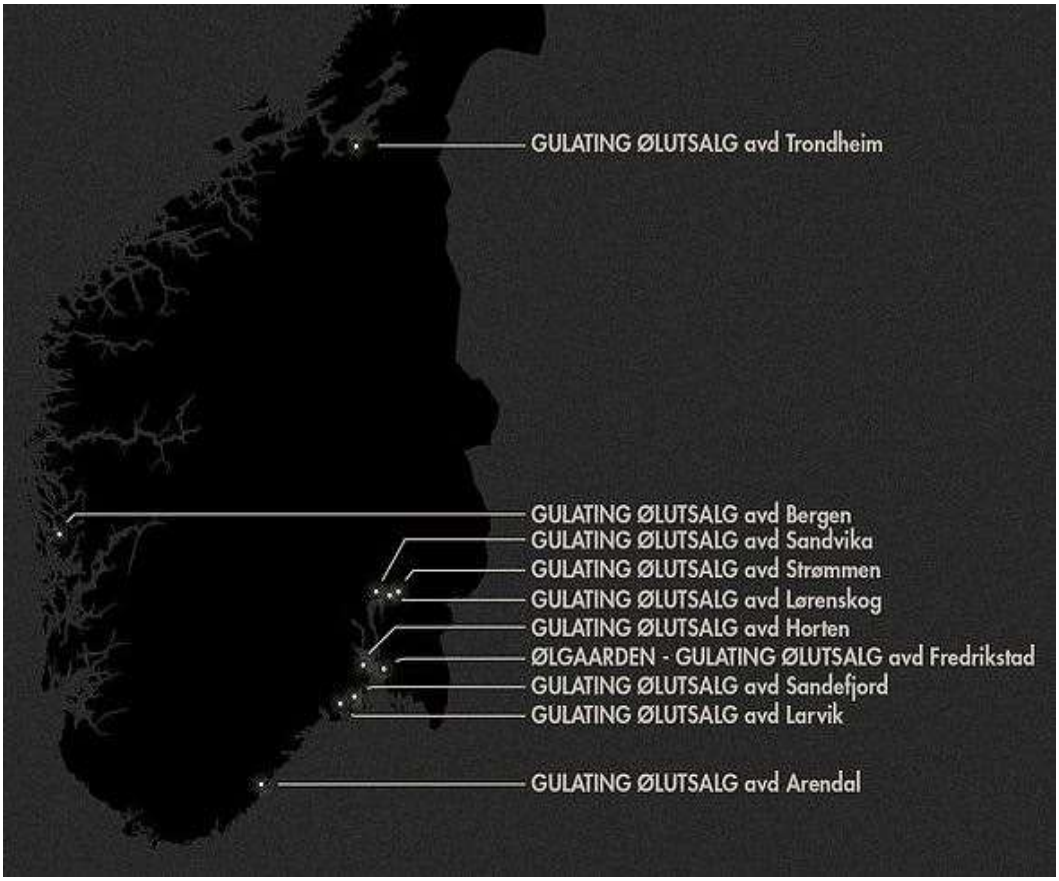


Figure 10: Location of Gulating Beer Stores

4.4 Supply chain characteristics

This subsection gives an overview of the key supply chain characteristics of the Gulating Group with respect to their:

- Suppliers characteristics
- Product characteristics
- Market/Customer characteristics
- Information technology

4.4.1 Suppliers characteristics

The case company deals with craft beers from Norway and abroad. They have several suppliers of craft beer from Norway and a few from abroad. Mainly, their suppliers can be grouped into three categories based on the replenishment process as:

a. Small suppliers (local craft breweries)
b. Large suppliers
c. Contract Brewers and Import suppliers

While, based on delivery types, the list of breweries delivering directly and by using large suppliers have been shown in Table 13.

The first group, which are the highest in number, includes the local craft breweries. Each region may deal with the store directly, rather than going through the wholesale department. Orders to this group happen on an ad hoc basis, and usually the orders are large to reduce transportation costs per item. Depending upon the location of their stores, the number of these small breweries vary. For example, the Trondheim store and the Bergen store deal with a large number of small breweries, whereas in other regions the stores order mainly from their wholesale unit. These suppliers are SME producers, most of whom deliver to the Gulating specialty store either by themselves or by using a logistics service provider, such as Bring. These suppliers have low volume production capacity and follow the MTS strategy. Each stores have their own categorization of the local suppliers they have, based on the volume they sell and how products

are delivered to the store. The level of supply of uncertainty from these suppliers is high since lead time range from a day to a few weeks.

The second group, large suppliers, include both large breweries and agents. The large breweries, like Hansa and Ringnes deliver themselves. But, their products, called "industriøl" do not have the same specialty nature as that of the craft beers. While, the agents supply import and craft beers from breweries who do not deliver themselves. Each individual store orders via the suppliers' web portal once a week. Goods are delivered once a week, as well. The supply reliability with these suppliers is high.

The third group of suppliers include both import and contract brewers. The case company has suppliers abroad in Germany, England and Czech from where they import their own label craft beer. Normally, products from these suppliers are ordered in a large batch and are directly received and stored in the central warehouse of the case company at Vestfold. The contract brewers, who brew the recipe of the case company are both located abroad and within Norway. For some years, they have been buying production from breweries in Czech, but recently they have also started buying production from the local Norwegian breweries, like Røros brewery.

Depending upon the location of the contract brewer, products are either directly sent to the central warehouse or to a store. Typically, contract brewed products from abroad are sent directly to central warehouse, but the breweries in Norway send to both the central warehouse and the stores in Trondheim and Bergen. Here, the Trondheim store and Bergen store have more key roles than other stores and both of them act as a regional warehouse for the company. These suppliers group also offer a high degree of reliability.

Table 13: List of breweries delivering to Gulating (Skår 2015)

Delivery Type	***Breweries***	
Direct Delivery (using a 3PL or own resources)	➢ Fjellbryggeriet, ➢ Nøisom ➢ Ego, ➢ Hadeland, ➢ Arendals ➢ Ringnes (Large Supplier) ➢ Hansa (Large supplier) ➢ Storm Brygghus ➢ Stjørdalbryggeriet ➢ Lofopils ➢ Lindesnes ➢ Lindheim ➢ Trondheim ➢ Mikrobryggeri ➢ Stavanger Brygghus ➢ Little Brother ➢ Reins Kloster ➢ Namdals Bryggeriet	➢ Kinn, ➢ Nøgne Ø, ➢ To Tårn, ➢ Haandbryggeriet ➢ Røros, ➢ Lervig, ➢ Færder, ➢ Rena ➢ Klostergården ➢ Nua ➢ Inderøy ➢ Ølve på Egge ➢ Berentsen ➢ Sundbytunet ➢ Gulating ➢ Vossabrygg ➢ Ode
Delivery via Large Supplier	➢ Nordlands ➢ Sagene ➢ Fredrikstad ➢ Borg ➢ E.C. Dahls ➢ CB ➢ Frydenlund ➢ Cold Boy ➢ Aass ➢ Mack	➢ Ægir ➢ 7 Fjell ➢ Austman ➢ Balder Brygg ➢ Troll Bryggeriet ➢ Hubertus ➢ Laagen ➢ Lillehammer ➢ Atna

4.4.2 Product Characteristics

The products the case company deals with have been grouped as a part of LFSC, although because of the alcoholic nature of the product, there are stricter regulations. Also, unlike other food products, shelf life and perishability are less of an issue for craft beer. In general, beer has three months Best Before Date (BBD) (Brewers association [no date.b]), while the shelf life is up to 2 years. Also, shelf life depends upon beer types and is affected by storage temperature and light

conditions (Brewers Association 2015a). The craft breweries also claimed that the shelf life of craft beer is up to two years (Sangachhen & Vallandingham 2015). The Alcohol by Volume (ABV) for all products sold at the stores need to be less than 4.75% due to the regulations in Norway (Lovdata, 1989). This means that the products they sell are unique from the products sold at Vinmonopolet, which is the state-run alcoholic beverage retailer for products containing over 4.75% ABV and up to 60% ABV.

The primary products the case company sells from their stores are different types of Ales from craft breweries. Some of these are Pale Ale, Blonde Ale and Porter. These products often have a higher price due to their specialty nature, but the company tries to keep the prices in a reasonable range. They offer hundreds of SKU from the craft brewers in their stores. A single store, like the Trondheim store alone features over 400 SKUs of different beers. They also offer beers with extra features like, gluten free beers, organic beers etc. They also feature seasonal beers from the craft brewers, like Christmas beer and, Easter beer.

The case company also sells industrially produced beers in their stores, in order to have product availability and variety. But, these products have a lower profit margin. Since the case company competes on differentiation by selling a wide variety of craft beers, the industrial beers are not considered their primary product.

Other products they feature are the imported beer and their own private labelled beer under the Gulating brand. The craft beers under their private label are contract brewed and sourced from specific regions from which the style of beer is produced. These beers are purchased in higher volumes by the case company, since they are MTO products and thusly the cost is lower if purchased in larger quantities.

The company also aims to further promote craft brewing by selling home-brewing raw materials, equipment and kits, for customers that wish to brew their own beer. In addition to this, they sell books on brewing and beer glasses. This makes them a unique player in the beer industry.

4.4.3 Market/Customer characteristics

Most of their beer sales are to consumers at the stores. They also supply kegs of beer to their own pubs and other Horeca actors with whom they have agreements. Sometimes, they also sell kegs of beer to private customers, for events or celebrations. Other market channels include other retail stores, like Meny and Vinmonopolet, where they are aiming to supply products. They have also started to establish their franchise stores, with stores opened at Fredrikstad, Kristiansund recently. Demand for their product changes depending on season, weather and promotional activities.

Consumers that buy from them are often beer enthusiasts, or interested in a more specialty product, but may lack knowledge of the types of beer. By providing customers with a large variety of craft beers, as well as customer service, they are able to provide a differentiated experience from that of other retailers. While, service level is not formally defined by the company, as the products have a high degree of substitution. This is in line with what Clemons et al. (2006) have stated about the craft beer market, *"Purchases are motivated by customers' desires but not by customers' requirements."*

The business model of the case company is fairly unique in Norway, in that there are only a handful of other specialty stores dedicated to selling craft beer. While, the case company also has wider areas of operation with multiple stores in strategic locations. They see grocery stores, which do offer some variants of craft beer, as their competitors though in minor scale. But, they being a speciality store dedicated in craft beers offer more variety and also organize tastings, where they feature the brewers at their stores. These give them more leverage in the business though they experience certain degrees of competition.

4.4.4 Information technology

The degree of manual work is extremely high within the company, using a lot of simple "pen and paper" to collect information during the ordering, receiving and tracking of goods.

In terms of information technology, they depend upon email, phone calls and social media to communicate with the small brewers and use email and/or web portals to communicate with the

large brewers and suppliers. For data collection, they are using a cash register system and with a connected barcode scanner in product checkout. The cash register system has been in use for recording their store sales and tracking inventory, but they do not seem to be aware of all the features of this system. Each product SKU has a unique barcode. Bar coding system has been in use only to track products for record keeping during checkout but not for inventory management or planning orders. Sharing of inventory levels internally happens by sending excel sheets via email.

The communication within the company (between stores and from stores to central warehouse) or to the suppliers do not follow a consistent communication process. So, there are often conditions when information is not clearly conveyed while sending orders, dispatching orders and sending order confirmations. Details about their current information flow has been presented in Section 4.5 below.

Thus, they currently do not seem to have a structured and defined information system strategy. With this informal and unstructured use of IS, they are facing problems in supplier management, order handling and inventory management.

4.4.5 Summary of SC Characteristics

A summary of the SC characteristics has been presented below in Table 14:

Table 14: Summary of SC Characteristics for Gulating

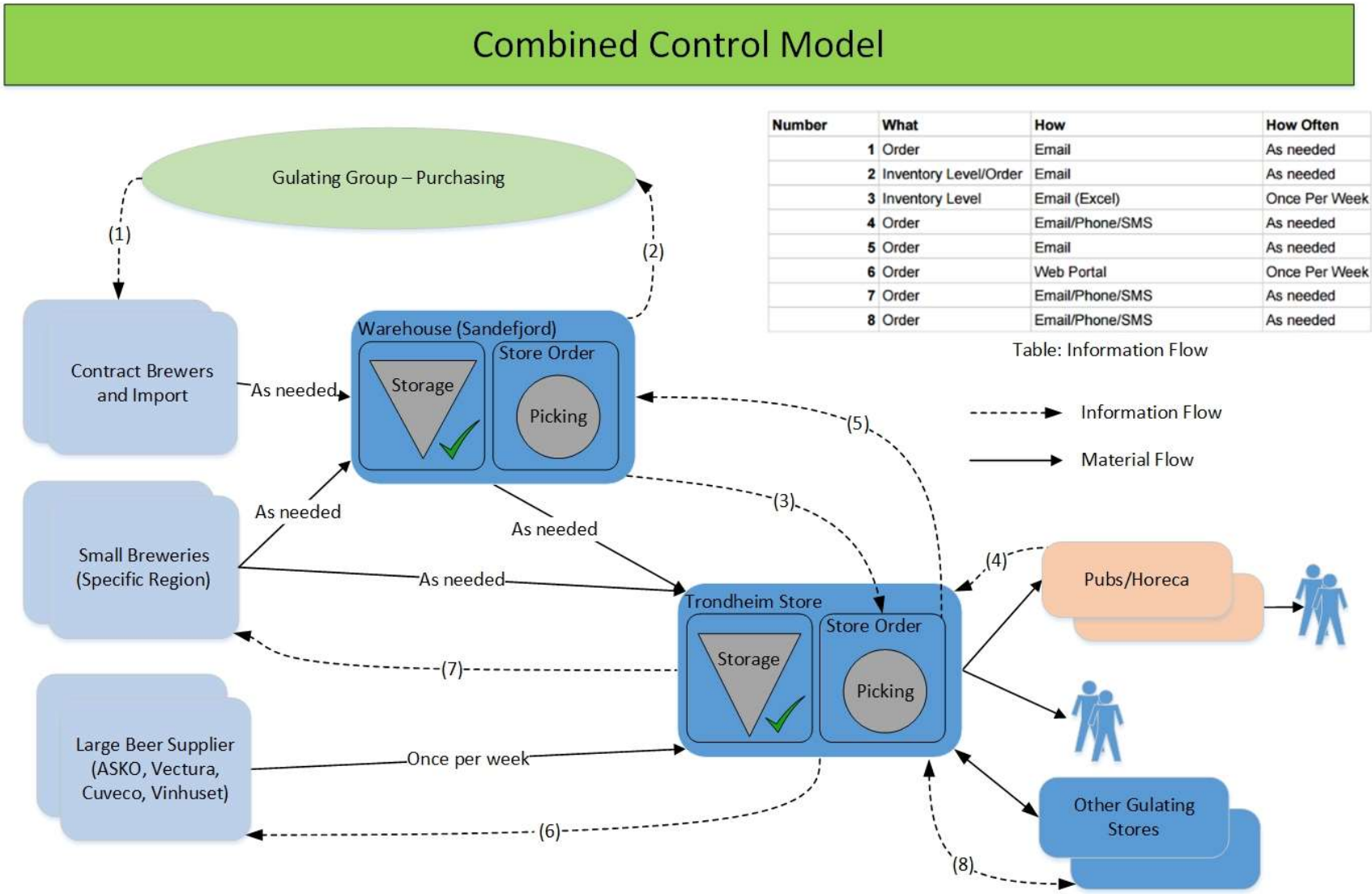
Characteristics	***Description***
	Suppliers Characteristics
Suppliers category	Three group of suppliers; Small suppliers (craft breweries), Large suppliers and Contract Brewers & Import suppliers.
Delivery type	Suppliers deliver by themselves or uses a wholesaler
Supply Uncertainty	Large suppliers are reliable, small suppliers have a lead time ranging from one day to a few weeks
	Product Characteristics
Perishability and shelf life	Shelf life of up to two years, although freshness is best before three months.
Variety	Suppliers offer approximately 4-5 SKUs each, with a total of over 400 products offered in a store
	Market/Customer Characteristics
Demand Uncertainty	Uncertainty is high and depends on weather, season, and promotions.
Customer types	Major sales to store consumers, but also sold to Horeca.
	Information Characteristics
Communication Links	From retail store to central warehouse, from retail store to suppliers, and from central purchasing to suppliers and between the stores.
Technology	Email, SMS, Social Media, POS system (cash register), Barcode scanner
Issues	High degree of manual work, underutilized IT functionality

4.5 Replenishment Process

The replenishment process for each individual supplier type has been mapped in the following section. Two stores have been represented in the diagrams to show how stores interact with each other. Although, the focus is only on the Trondheim store.

Based on the collected information, supply chain of the company was mapped using control model methodology showing the material flow, information flows and frequency, wherever relevant. A combined control model, including all suppliers, has been shown in Figure 11, whereas individual control models for each group of suppliers are elaborated in the following sections. The green check marks represent the customer order decoupling point (CODP) in each of the control model. The control principles being used at the retail store are based on intuition, but resembles reorder point. There is no fixed minimum stock level, but when product inventories get "low," then an order is placed by the store manager.
In Figure 11, three supplier types, their warehouse, Trondheim store and other Gulating stores are considered. The frequency and method of information flow between each actor is shown in the table in the top right corner.

Simple process diagrams were first developed to understand based on Jonson (2008, p.344) (see Appendix 1) and were detailed using the SCOR model. The SCOR model methodology has been used to further elaborate specific processes and information flow in order to find information gaps.



Number	What	How	How Often
1	Order	Email	As needed
2	Inventory Level/Order	Email	As needed
3	Inventory Level	Email (Excel)	Once Per Week
4	Order	Email/Phone/SMS	As needed
5	Order	Email	As needed
6	Order	Web Portal	Once Per Week
7	Order	Email/Phone/SMS	As needed
8	Order	Email/Phone/SMS	As needed

Table: Information Flow

Figure 11: Combined Control Model including all suppliers

4.5.1 Small suppliers

Figure 19 (in Appendix 1) maps the simplified replenishment process from small suppliers (brewers), while Figure 12 below, shows a control model diagram of the case company and the small brewers. Small local breweries in the region where a Gulating store is located are the major suppliers for them. Mainly the stores in Trondheim and Bergen have a large number of small brewers associated with them. The store in Trondheim has around 25 small brewers supplying on average 4-5 different products each. The stores order directly from the local suppliers in their area and are delivered directly. The orders do not follow a particular frequency, but are based on intuition, which resembles an informal and fluctuating reorder point. The delivery lead time varies from a couple of days to two weeks. Often the group purchasing head is not directly informed about what each store is buying from their local suppliers.

When a store has to order products from local suppliers in another store's region, the order goes through the store who has the supplier in their region. For instance, when the store in Bergen needs products from Trøndelag then it first contacts Trondheim store, which then sends the order to each of the small breweries. When products are to be delivered, they flow through the Trondheim store to the Bergen store. This happens because the order size from each Trøndelag supplier to the Bergen store is small. This is not economical for each of them to deliver directly to the Bergen store. Thus, the store at Trondheim here acts like a hub and bundles small quantities from multiple small suppliers to make a deliverable package and finally dispatches to the Bergen store.

If the order quantity is large enough, some small brewers also directly send products to the central warehouse at Sandefjord from where it is dispatched to other stores. This happens less often because beers from Trøndelag have higher demand in the Trondheim store than other stores. Here most of the communication between the small breweries and the store take place via email and phone calls, while they also use social media, like Facebook, to send orders between their stores.

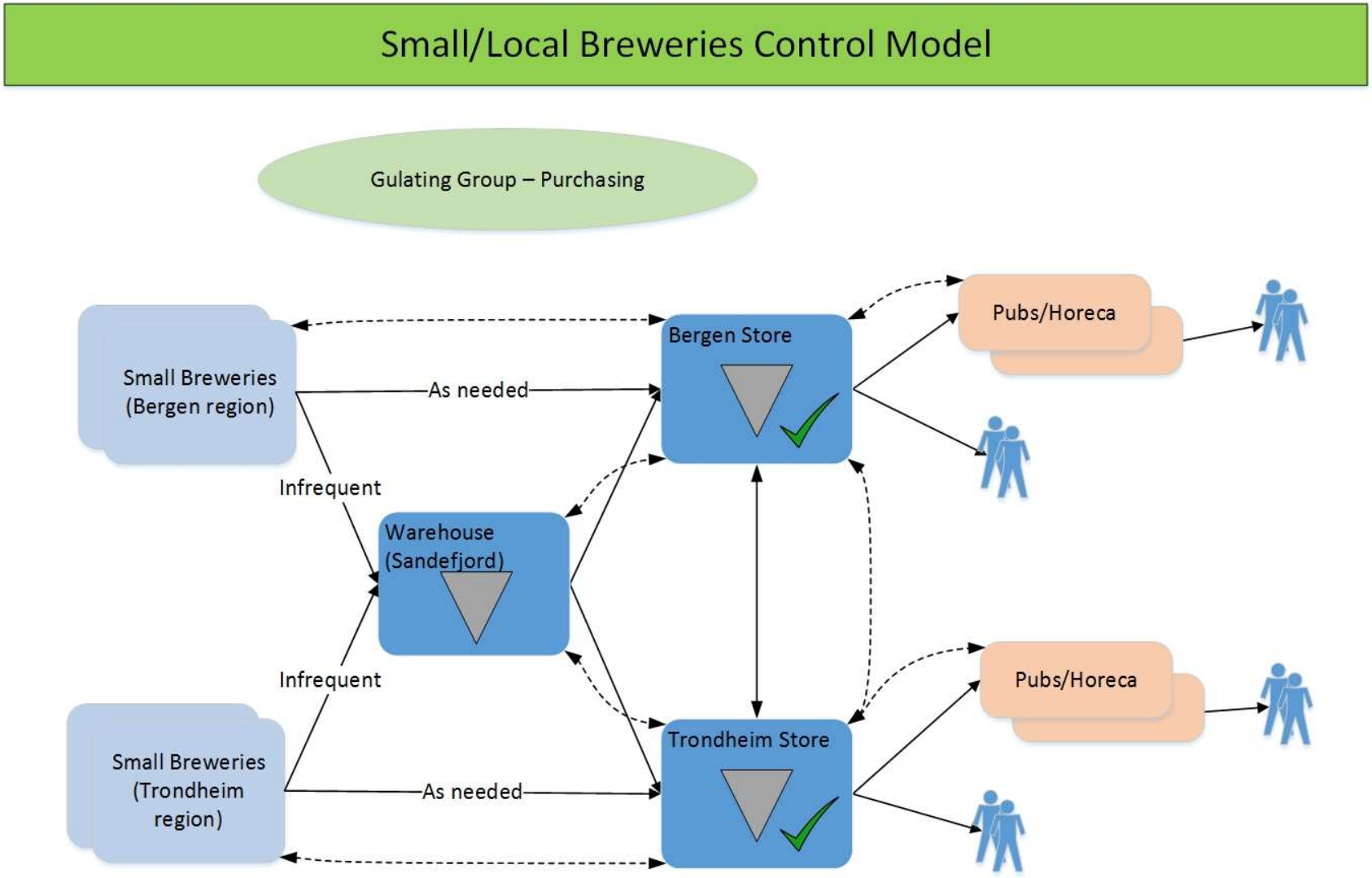


Figure 12: Control model diagram of product procurement process (from small suppliers)

4.5.2 Large suppliers

As mentioned earlier, large suppliers include large breweries and agents. Products from the large breweries, like Ringnes, Hansa, called “industriøl”, are not of primary focus area for the case company. Craft beers from the breweries who do not deliver themselves are ordered from the agents like, Vectura, Cuveco etc. For instance, craft brewers, like Austmann, deliver through an agent, Beer enthusiast, which uses Cuveco for distribution and warehousing. A simplified process flow diagram and a control model diagram representing the replenishment process from large suppliers is shown in Figure 20 in Appendix 1 and Figure 13 below respectively.

The replenishment process with large suppliers is more standardized. It is because there is a fixed frequency of ordering and delivery associated with them. The orders are based on intuition, as with small suppliers, where quantity is based on previous experience. Although, large suppliers, have a minimum order quantity. For example, some suppliers have a minimum order of three thousand Norwegian kroner. Orders are placed by individual stores every week by logging into the web portals of these suppliers. After the order is confirmed, it gets delivered to the respective stores the following week. The follow-ups and other communication between the stores and the large suppliers take place via email and telephone. The group purchasing is not directly updated with what order each store places.

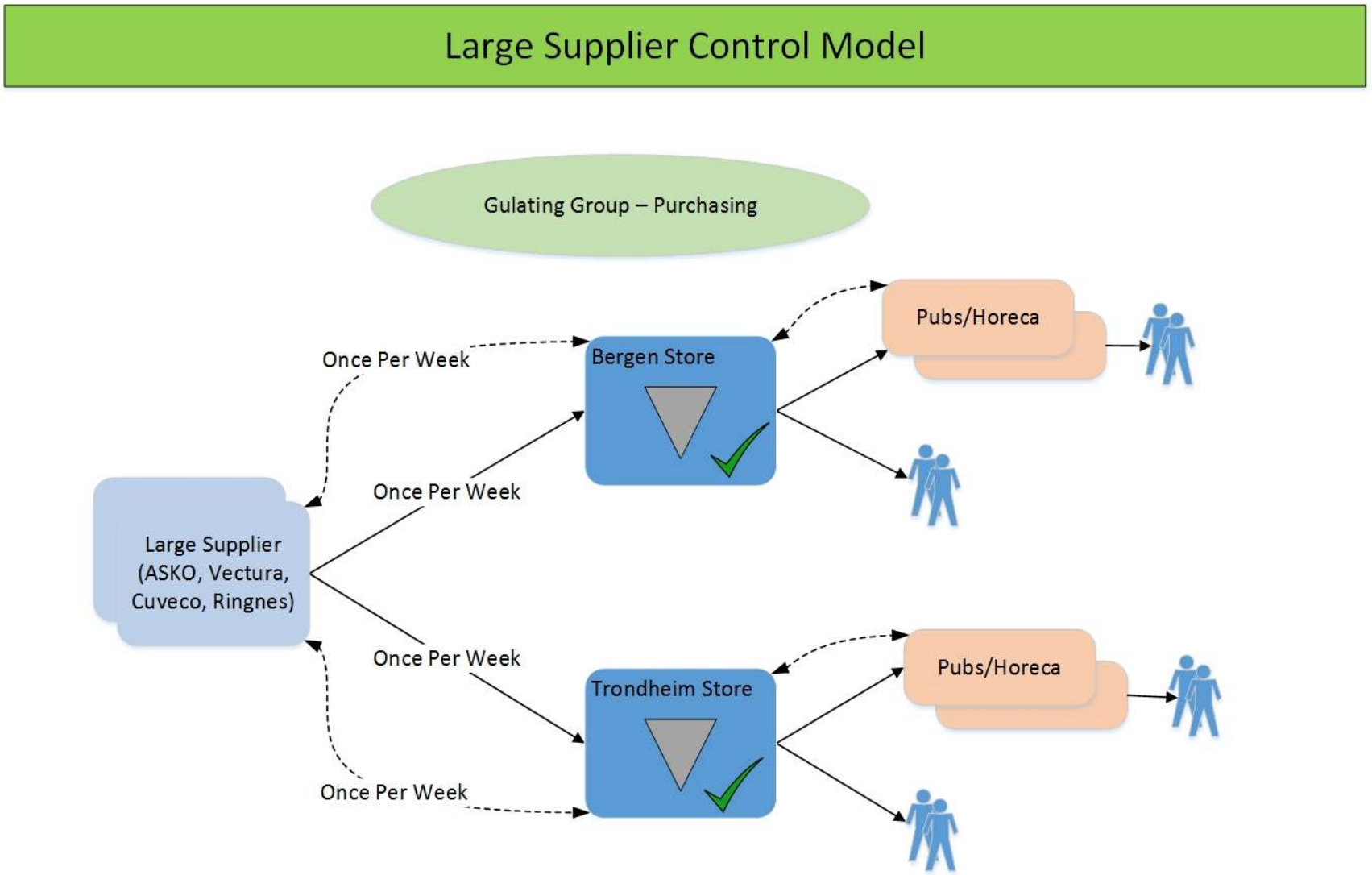


Figure 13: Control Model Diagram for large suppliers

4.4.3 Import and Contract Brewers

A simplified process flow diagram and a control model for the import and contract brewers are shown in Figure 21 in Appendix 1 and Figure 14 below respectively. Ordering from contract brewers and import is similar in terms of material flow. Information flow is more detailed and collaborative for contract brewed beers, especially in the initial phase. For the contract brewed beers, since the case company provides the recipes, extensive communication is necessary to coordinate the desired product characteristics. When the recipe is finalized, ordering procedures are similar for both import and contract brewers.

The Group Purchasing Manager places orders based on the quantity available at the central warehouse in Sandefjord. The quantity ordered is based on the intuition of the purchasing lead, and frequency of orders is as needed. The warehouse sends updated inventory lists to the Group Purchasing Manager, and based on this information, a decision of whether or not to order more product is made. Ordering happens via telephone or email, and the lead time for receiving the product from initial order is up to four weeks. Upon receipt, the shipment is verified from the warehouse against the order placed by the Group Purchasing Manager.

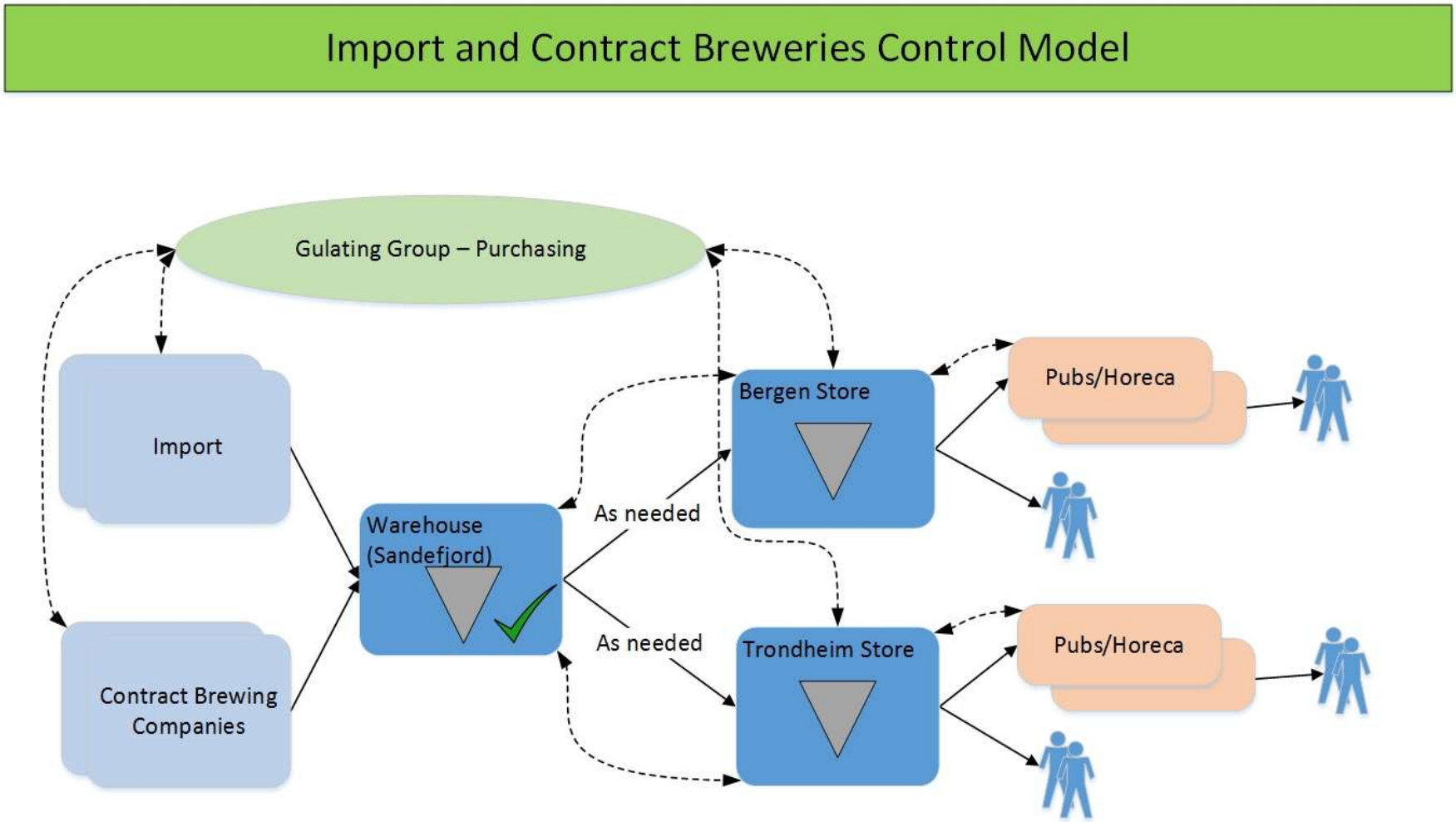


Figure 14: Control model diagram with contract breweries and import

4.6 Summary

A general description of the Norwegian beer industry was shown, including a detailed map of the actors. An overview of the case company was given showing that they fall under the category of SMEs. Their different operations were described, including beer stores (speciality store), wholesale, import, pubs, and contract brewing and compared to the general beer industry.

The SC variables like; suppliers, product, market/customer, and IT used to show the SC characteristics of the company. A summary is shown in Table 14. Their suppliers were categorized into three groups; small suppliers, large suppliers and contract & import suppliers. Replenishment processes from suppliers along with the internal order fulfilment processes were mapped. These processes were found to differ, in terms of variables like order volume, order frequency, product variety and level of IT use. These variables have been shown as control parameters and information parameters for each supplier type in Table 15 below. This gives background in order to map and find improvement areas with the use of SCOR methodology.

Table 15: Current Control Principles and Information Parameters

Variables		*Supplier Types*		
		Small Scale	***Large Supplier***	***Contract Brewers/Imports***
Control Parameters	**Order (initiated by)**	Store	Store	Purchasing Lead
	Delivery Location	To store	To store	To warehouse
	Order Frequency	As needed	Once per week	As needed
	Lead Time	Up to two weeks	A week	Up to 4 weeks
	Average Order Size	Large (in relation to supplier's capacity)	Varies (minimum volume determined by supplier)	Large
Information parameters	**Information Shared**	Informal inventory levels and product feedback	N/A	Warehouse stock level, once per week (Excel file sent via email)

5. Analysis

This chapter analyzes the case company using SCOR model methodology. The SCOR models shows informational inputs and outputs of processes. Next, an analysis of the informational inputs and outputs in relation to quality and utilization shows where improvements should be focused. Finally, the improvement suggestions related to both process, information and IT are presented.

5.1 Supply Chain Analysis

The SCOR model has been used to map the replenishment processes with each supplier type. This allows for a standardized and more detailed view than the control model methodology. In the SCOR models developed, the swimlanes represent different actors, as well as internal functions of the company. Key actors of SC considered are the respective suppliers, transport service providers and different functions of the case company including the stores, accounting, purchasing lead and the warehouse. Processes have been represented by rectangular boxes. The alphanumeric codes on each of the processes represent the standard SCOR model codes, details of which are given in Appendix 2. More details about the SCOR model has been given in section 2.4.2 of the methodology chapter.

5.1.1 Small Suppliers

The replenishment process from the small suppliers has been represented by the SCOR model (Figure 15). Establishing sourcing plans (P2.4) aims to find suitable suppliers for the company. This process is done by the purchasing lead. Information such as, forecasts and stock-out history are not currently used in establishing sourcing plans. By agreeing on contracts with suppliers, the individual stores then are able to send orders as needed to small suppliers. To determine the order (S1.1), the stores currently use only their inventory information from manual counting. Whereas, they could have considered other information, like internal inventory level from cash register, previous stock-out history, sales forecast and inventory level at the suppliers to improve the ordering process. In addition, waste data, which is information regarding slow moving items that go out of date, could also be used. And, as mentioned earlier, orders are sent via email, phone or SMS.

Once the order is confirmed with the small suppliers, products are usually delivered (D1.12) within a week. Small suppliers are themselves responsible for shipping the product, and therefore transport methods may vary. Some suppliers deliver themselves while other use transport services (see Table 13). The shipment notification is not a standard output of the process, where only some companies supply this information. Thus, it can be classified as a potential information.

When receiving the product (S1.2), inventory level is updated at the site in the cash register system. Authorizing of supplier payment is done through the Gulating accounting department. When selling a product, inventory level registered in the cash register changes during checkout. POS data is available from this system, but not a particular output in any current process.

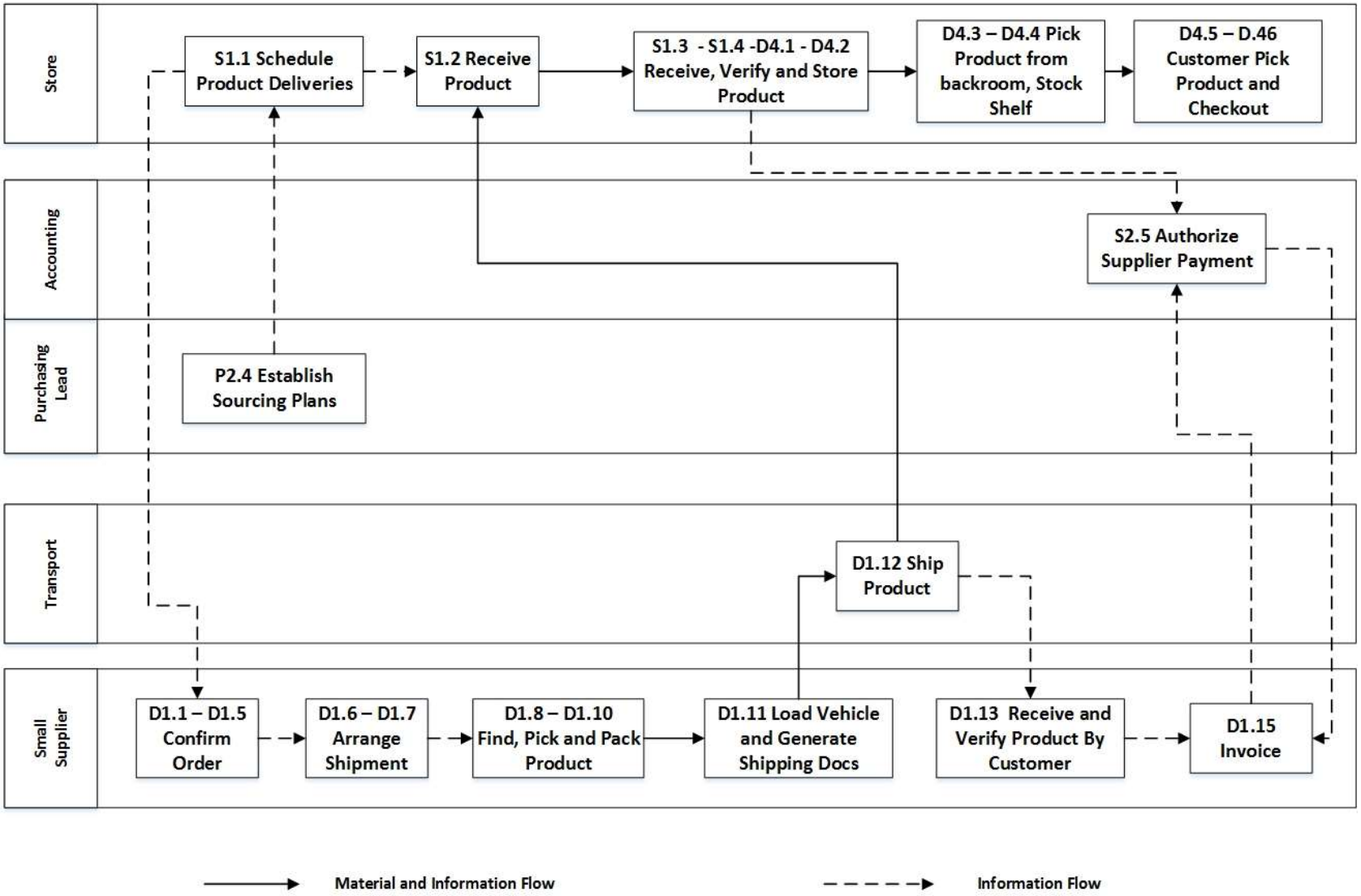


Figure 15: SCOR Model for Small Suppliers

5.1.2 Large Suppliers

Replenishment with the large suppliers has been shown in Figure 16. It has similarities in material flow like for small suppliers. A major difference in the process is that the large suppliers receive orders from each store through a web portal, at a fixed period each week. Confirmations are sent from the large supplier when products are shipped. Therefore, order fulfillment from large suppliers is a more formal process.

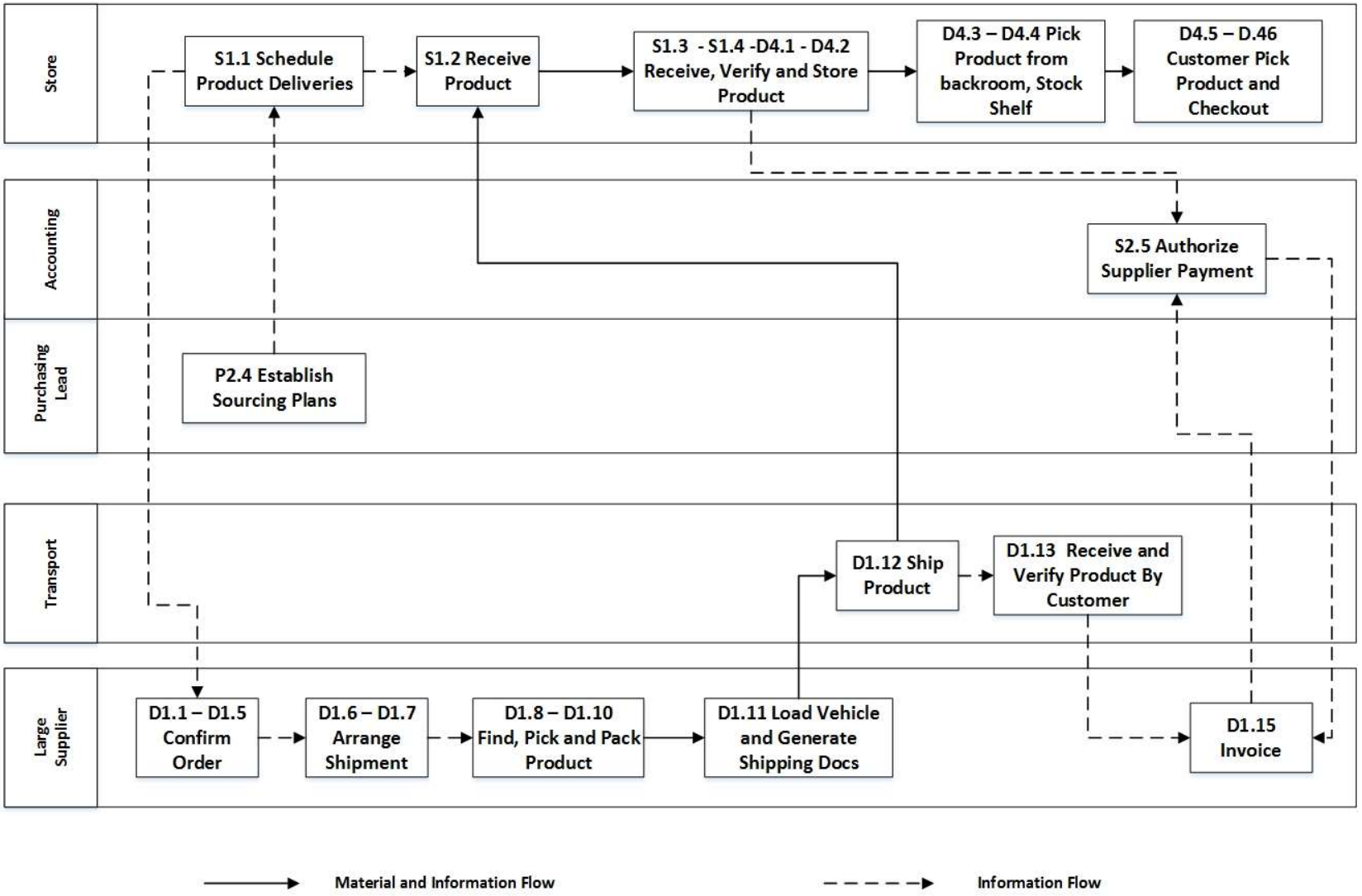


Figure 16: SCOR model for large suppliers

5.1.3 Import and Contract Brews

The replenishment from import and contract breweries has been shown in Figure 17. Import and contract suppliers have an increased level of complexity, since material flows first to their central warehouse and then is further shipped to stores as required. Therefore, orders are generated from both the warehouse and the individual stores. The scheduling of product deliveries to the warehouse is a process consisting of communication between the purchasing lead and the warehouse. Inventory levels are communicated within the group via emailing of excel sheets from the warehouse and orders are then sent to suppliers by the purchasing lead.

The orders that the contract brewery fulfills are MTO, and therefore they do not usually have any stock on hand. While, import suppliers often supply from their stock. For some suppliers, sending shipment notifications is not a standardized process, but it can be sent via email or SMS. The warehouse does not also have a standardized process for sending shipment notifications to stores. Lead time is up to four weeks from order placement to receipt at warehouse.

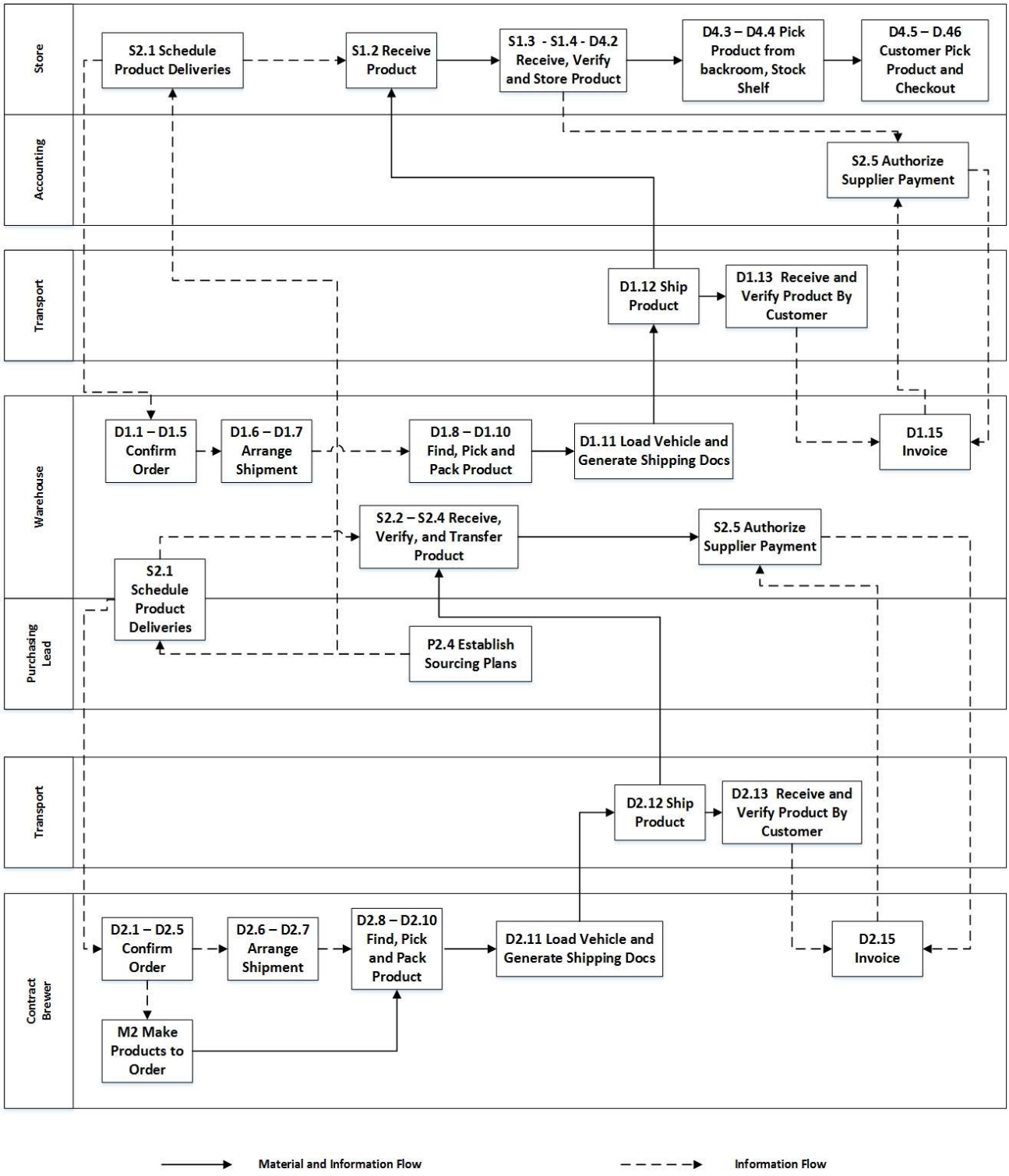


Figure 17: SCOR model for contract brewers

5.1.4 Contribution from SCOR models

The replenishment defined by SCOR for a store have been shown in Table 16 below. Each of the processes have been shown with related input and output information. Further, potential information that needs to be considered in each of the processes have been identified.

The process starts with establishing sourcing plans (P2). Establishing sourcing plans considers product requirements and product availability from suppliers as input information. Here, the suppliers and their respective products are considered against the needs to determine which suppliers will be used. In planning the stocking requirements (P4.1) it is important to determine how much to order and how much to have on the shelf in the retail store.

Orders are sent to the suppliers after scheduling product deliveries (S1.1). The input information to this process are supplier information, as well as sourcing plans. The output then is an order, which includes a scheduled receipt of the products as well as delivery terms. When receiving a product (S1.2), the products are checked against the Scheduled Receipts, and thereafter a Receipt Verification is made. Receipt Verification happens in S1.2 in order to verify quantity, in S1.3 to verify quality, and in S1.4 the products are finally put away in the appropriate stock location. A payment is made to the supplier after this.

When moving to the Deliver Retail Product process (D4), it starts with generating a stocking schedule based on replenishment requirements and shipping schedules. The scheduled receipts may be an input, if the product will go directly to the shelf. Then a pick sheet is created to enable the picking from the backroom. Once the shelves are stocked, a store shelf inventory count can be done to assist in planning. Finally, the checkout updates the POS data.

Table 16: Processes with input and output information

Process	*Input information*	*Output information*
P2.2 - Identify, Assess & Aggregate Product Resources	• Product availability	• Product Sources
P4.1 - Identify, Prioritize and Aggregate Delivery Requirements	(P) (Actual Shrinkage, Vendor Lead/Transit Time, EOQ. Markdown Plans, Merchandise Category, POS Data, Promotion Plans, Stock-out History, Store Shelf Inventory)	• Item Stocking Requirements
S1.1 - Schedule product deliveries	• Supplier information • Sourcing Plans (P)	• Order • Delivery Terms • Scheduled receipts (P)
S1.2 - Receive product	• Scheduled Receipts (P)	• Receipt Verification (P)
S1.3 - Verify Product	• Receipt Verification (P)	• Receipt Verification (P)
S1.4 - Transfer Product	• Receipt Verification (P) • Replenishment Signal (P)	• Daily Replenishment Requirements • Inventory Availability
S1.5 - Authorize Supplier Payment	• Supplier's invoice	• Payment Information
D4.1 - Generate Stocking Schedule	• Replenishment Requirements (P) • Shipping Schedules (P)	• Stocking Schedule (P)
D4.2 - Receive Product at Store	• Scheduled Receipts • Stocking Requirements(P)	• Inventory Availability • Item Pick Sheet for Stocking Schedule (P)
D4.3 - Pick Product from Backroom	• Inventory Availability • Item Pick Sheet for Stocking Schedule (P)	N/A
D4.4 - Stock Shelf	• Stocking Schedule (P)	• Store Shelf Inventory Counts (P)
D4.5 - Fill Shopping Cart	N/A	N/A
D4.6 - Checkout	• Customer profile/data	• POS Data (P)

(P)= Potential information

Some of the replenishment processes that can adopt best practices (denoted by alphanumeric code, like BP.020) defined by SCOR are presented in Table 17 below. For example, in scheduling product deliveries, some standard practices they can follow are, min-max replenishment, VMI and vendor collaboration. Before sending order to their suppliers, they should have defined a minimum inventory unit for different product SKUs, which creates need for ordering to meet back the maximum level. Similarly, VMI could be possible for scheduling product deliveries from the warehouse to the stores within their own operation. When they receive products from their suppliers or internally, the receipt goods should be verified if as per order or not. That will lead to the processes of payment.

Table 17: Processes with relevant practices

Process	***Relevant Best Practices***
P1 Plan Supply Chain	• Demand Management (BP.020)
P1.1 Identify, Prioritize and Aggregate SC Requirements	• Safety Stock Planning (BP.085)
P1.2 Identify, Prioritize and Aggregate SC Resources	• ABC Inventory Classification (BP.087)
D4 Deliver Retail Product	• Mobile Access of Information (BP.098)
S1.1 Schedule product deliveries	• Order-point system (BP.010) • VMI (BP.139) • Vendor Collaboration (BP.145)
S1.3 Verify Product	• Receiving goods inspection (BP.147)

5.2 Information Analysis

The information analysis of the case retailer's SC uses inputs from informational input/outputs from Section 5.1. It is done with the information quality dimension and the relevant utilization factors. Based on the informational issues found in the analysis, the IT requirements for have been generated.

5.2.1 Information Quality Dimensions

Different types of information from the case company are analyzed against the quality dimensions which are deemed relevant with some examples are presented in Table 18 below.

In the case of small suppliers, information exchange takes place often in an informal manner. Orders are sent to them via email, SMS, and social media. Mixing communication methods makes tracking orders and other types of information difficult. The completeness of information can also be problematic, such as when shipment notifications do not get sent.

Information from large scale suppliers is more in a standardized nature. The company enters their order information into the web portal hosted by the supplier. The timeliness, reliability, and consistency of information provided by large suppliers is high and does not lead to major problems. Overall, the level of information quality provided by large suppliers is high due to the standardized nature of the processes.

The contract brewers are mostly located outside of Norway, and can be considered similar to the import producers in terms of information sharing, once the initial recipe is established. These companies are contacted via email or phone. Many of these suppliers supply only few product variants but in high volumes. Thusly, the amount of information required is fairly low as the transactions are repeated regarding the same few products. Order quantities are based on information given by the warehouse to the group purchasing manager, thus the timeliness, and reliability can be affected.

Within the operations of the company, information is varied and can be considered of low consistency. The degree of understandability is high due to the simplistic nature of the information. The order and inventory level information can be difficult to find and access, as it is spread over multiple systems. Timeliness of information affects the operations, for example an excel file is used to convey inventory levels, but this is sent out once a week from the main warehouse. When multiple of their stores order the same variant, then the actual inventory will have been reduced. But the stores are not aware of the most recent inventory level at the main warehouse.

Table 18: Information Quality dimensions relevant to case company

IQ Dimensions	***Types of information***	***Example***
Timely	- Inventory Availability - Orders to suppliers	Inventory level is only sent once a week from warehouse, and can be quickly outdated if multiple stores are sending ordering same product.
Complete	- Scheduled Receipts	Information regarding receipt of goods and products, such as shipping information is not always sent
Consistent	- Orders	Orders are sent using multiple communication methods with little consistency.
Accessible	- Supplier information - Previous order information	Difficult to find previous contract information and order history.

5.2.2 Information Utilization Factors

Factors determining the degree of utilization of information within the case company are presented below (Table 19). Working in LFSC, the case company has relationships with many small suppliers, where they aim to have a win-win relationship. Therefore, the level of collaborative relationships is high with small suppliers because there is often communication between them, although informally. With the larger suppliers, the relationships are more often arm's length and, thusly, less collaborative.

Small suppliers that the case company deals with have a high dependency on certain information like; sales plan, promotional plans and sales data to plan production. This information can also be considered of high value to both of them, due to constrained resources. The high value of information regarding promotional plans, sales data etc. is also relevant for the case company when planning for products from larger suppliers. The company employees have more knowledge on the craft beer aspect of the business than skills regarding information systems and information sharing. The planning system functionality and process formality are also low, as expected in an SME. The accuracy of information that the company has access to is low. The information format varies with small suppliers and thus can inhibit the utilization of information.

Table 19: Information utilization factors and impact on case company

Factor	***Within Case Company***	***Impact***
Collaborative relationship	High level of collaboration with small suppliers, low level with large suppliers	Small suppliers could be willing to use information from Gulating to assist in planning production
Information dependency	Small suppliers are dependent on sales information and inventory level, provided by the case company	
Human skills and understanding	SME level of knowledge	Information is likely to be underutilized due to lower level of skills, planning system functionality and process formality
Planning system functionality	Low, the ability to use information for decisions is reduced	
Process formality and structure	Low level of formality, organic in nature	
Value of information	Value of information is high for small suppliers, due to constrained resources	Small suppliers will be willing to use information that is helpful for them
Accuracy of information	Accuracy is reduced mainly due to timeliness of communications	Poor accuracy reduces both willingness to use and the actual possible usage
Information format	No fixed format	The ability to use information is reduced when multiple formats are considered, and reduces actual usage

5.3 Suggested Improvements

An analysis covering which processes can be improved, as well as the information and IT prerequisites has been explained in this section, and presented in Table 20 below. Some of the processes can be achieved manually or by fully utilizing their current technology, whereas other processes may require new investments in IT.

The processes that are relevant to all the supplier types are D4, P1.2, and S1.3. For process D4, having access to information on a mobile device (handheld barcode scanner), will reduce amount of manual work related to checking inventories both for stocking shelves in-store and for ordering products. This could include creating item pick sheets, and a stocking schedule, which was found to be lacking as shown in Table 15. Integrating a mobile device with the cloud database of the store is necessary to enable this process.

Process P1.2 is suggested for implementation in order to have a better overview of suppliers and associated products. Classification of inventory like ABC classification will help them make targeted decision on the most important products. Information on POS data from their current system and annual turnover enables this process.

Receipt of every delivery should be verified as shown by process S1.3. The scheduled receipt verification was found to be lacking as shown in Table 15. This ensures that correct quantity and quality of products have been received based on the purchase order they have sent. It will help in better control of the inventory and makes suppliers payment smoother.

There exists high level of supply uncertainty with small suppliers as the delivery time varies largely. So, process P1.1 is suggested to maintain safety stock of the best-selling products to mitigate supply uncertainty and meet unexpected market demand. Demand information can be collected based on the inventory and sales information from the POS system they have.

Vendor collaboration with small suppliers would help in improving the supplier service level. Information necessary for this would be POS-data, and information which affects demand, to be able to calculate an accurate forecast which could be updated monthly. This would give suppliers

the ability to plan production better. Volatility of demand may hinder the effectiveness of this, though.

An order-point system for the products supplied from large suppliers (S1.1) could reduce manual workload, especially since these are not considered to be the critical items offered. This would require that an order-up-to level and safety stock be calculated based on desired service level, demand information and lead times.

VMI may be a possible practice (for process S1.1) to incorporate between the warehouse and store. The contract products are high volume products with a low number of variants, and therefore could orders could be triggered automatically to the warehouse by an order point at the stores. This requires that this information is accessible and integrated between all stores and the warehouse.

Implementing Process P1, and the relevant practice of demand management could improve the management of inventories, especially products that go through the warehouse. This could lead to both improved forecasts for the products, as well as better service level and reduced inventories. The enabler of this is cloud access of each store system by the purchasing lead, in order to access current on-hand inventory levels at the warehouse and stores.

The suggested improvements, and their prerequisites have been explained above. Their current system has been found to have most of the necessary functionality, but is currently underutilized. The improvements mainly have two necessary technology changes. The first is internal integration of the system by giving cloud-access to the purchasing lead and warehouse. The second is mobile technology, such as a handheld barcode scanner, to improve operations at the store level.

Therefore, it is necessary to analyze the organizational readiness, and technology availability for the technology to be implemented. The organization has a strong strategic vision to grow, and fairly robust application infrastructure and are willing to improve their processes. This means that the organization can be seen as ready to implement a new technology, especially if it is of low cost and the vendor can support ease of implementation.

Table 20: List of suggested improvements on processes and information

Process	*Best Practice*	*Expected Result*	*Informational and IT Prerequisites*
Relevant to all supplier types			
D4 Deliver Retail Product	Mobile Access of Information (BP.098)	Reduced manual work, more accurate records	Integration of systems (cloud-based access). Mobile technology (handheld device, mobile phone)
P1.2 Identify, Prioritize and Aggregate SC Resources	ABC Inventory Classification (BP.087)	More focused decision making	POS-data, annual turnover
S1.3 Verify Product	Receiving goods inspection (BP.147)	More accurate payments and inventory	Purchase orders accessible in system
Small Suppliers			
P1.1 Identify, Prioritize and Aggregate SC Requirement.	Safety Stock Planning (BP.085)	Increased Service Level at store by covering unexpected demand and uncertain supply	Demand information based on POS-data
S1.1 Schedule Product Deliveries	Vendor Collaboration (BP.145)	Improved service level from supplier	Forecast sent to supplier
Large Suppliers			
S1.1 Schedule Product Deliveries	Order-point system (BP.010)	Reduced manual work	IT functionality, information accuracy by good routines, safety stock and order quantity
Contract Products			
S1.1 Schedule Product Deliveries (at store)	VMI (BP.139)	Reduced manual work	Warehouse can see individual store inventory levels (cloud-based), based on order-point
P1 Plan Supply Chain	Demand Management (BP.020)	More accurate forecasting, reduced inventories, improved service level	Integration of internal systems

The technology availability has been presented for SMEs in Section 3.3.3. A cloud-based solution is necessary for some of the process changes. This could include a SaaS or cloud-based ERP system. Although, their current system may support cloud-based access and it should be further investigated.

Based on these aspects, the process improvements should be implemented and the technology adoption process initiated. This will help better balance supply and demand by improving quality of information, as well as utilization in the planning and control processes. In this way, the company can both improve service levels, reduce inventory as well as the large amount of manual work.

5.4 Summary

The detailed supply chain analysis of the replenishment process from different suppliers was done using SCOR model. In essence, the company should implement best practices and the corresponding processes as listed in Table 20. These practices, and their associated processes, are largely supported by the current technology they have. Though, two types of technology needs were found which include, integration of current POS-systems as well as mobile scanner technology. This will enable better planning and control of material and information flow in the company and with suppliers

6. Discussion

The previous chapter features analysis of the case information in light of theory. This chapter will show how the research questions have been answered and the research objectives fulfilled.

Research Question 1: What is the role of information in an SME in LFSC?

The role of information in SMEs has been discussed from an inventory management and replenishment point of view in this thesis. This can be explained in an SME supply chain by first arguing the importance of information in a supply chain. Types of information shared in SC in order to improve performance are discussed. Next, information quality and utilization are discussed in light of theory and data collected from the case company. Finally, the importance of information system to facilitate information use along with its benefits is argued. A summary of the findings are presented in Table 21 below.

Success of a SC depends on the availability and utilization of information to make good decisions. Better utilization of information increase values for all the members of SMEs SC. For this, sharing of information between SC actors is beneficial. Information sharing has been linked to control inventory level at different stages along a SC and reduce bullwhip effect while increasing SC responsiveness.

Different types of information are shared between different SC actors. This information can range from operational to strategic. The types depend upon the needs and nature of firms. Information types include, but are not limited to; Inventory level, order status, production schedules, planning information etc. Sharing planning information, like forecasts, from a downstream actor was found to reduce inventory level in the supply chain by improving the supplier's forecast accuracy. Information on previous sales history and forecasts help inventory management. The information can be used to calculate required safety stock to attain a certain service level, quantity to order, as well as frequency to order. This reduces costs related to inventory.

Information sharing is significant to improve SC performance, but the level of information sharing was found to be low in SMEs. A major reason behind this was found to be their organic and informal nature, where most of the decision are made by the owner himself. The case company ordered goods based on intuition, and whenever an order was deemed necessary. This shows that the case company does not use information internally, such as sales history or forecasts to plan orders. They also do not share information regarding future demand with suppliers. The suppliers are expected to have goods on hand and ready to be delivered. Some form of the bullwhip effect can be present when the orders are done in a reactive way. However, sharing too much information could lead to higher costs in processing than the achieved benefits.

Information should be of a certain quality in order to be utilized, which includes elements such as timely, reliable, complete etc. (Jonsson 2008, pp.421–423). A list of quality dimensions from literature have been shown in Table 6. From these, it was found that the relevant dimensions to the case company were especially; Timely, Complete, Consistent and Accessible. Inventory level sent from the warehouse to the stores should be timely, to facilitate a more accurate representation. Accessibility of previous contract information, as well as order history, is important and found difficult to track in the case company. A description of other information quality dimensions relevant to the case company have been shown in Table 18.

Utilizing information is connected both to the company's intention to use it, and the actual use in the processes. Factors affecting usage include information quality, as discussed previously, but also include inter- and intra-organizational factors (see Table 7). For example, collaborative relationships between actors is an inter-organizational factor, which affects their willingness to share and use information. While, planning system functionality is an intra-organizational factor which affects the ability to use information.

While relating these factors with the case company, it was found that there was a high level of collaboration with small suppliers. This increases the willingness to use information. The company, for example, communicates how well certain products are being sold. Although, this type of information is of an informal nature. It was found that there was a low level of planning system functionality. It means that a clear strategy regarding which information to use, and how to

use it was not present. Therefore, the ability to use information was found to be low. This contributes often to poor performance. With already constrained resources, a better use of information can help combat this issue. It can be done with defined process routines, where all appropriate information is recorded in the appropriate place. Table 19 shows other information utilization factors in relation to the case company.

An enabler of information sharing is information systems, which includes both IT and processes. Information systems allow for the capturing, analyzing, and communicating of data to other actors and internally. The case company inconsistently uses communication methods, like SMS, telephone and email to place orders. It has been found that information is often misplaced and difficult to track again as a result. From this, it can be deduced that both the technology and the processes involved in ordering contribute to a low level of information availability in the company.

Table 21: Summary of information roles in SMEs

Information Aspect	***In relation to SMEs***
Information sharing	Found to be low, in part to lack of systematic information capturing
Information types	Often operational, only orders and simple inventory level information.
Information quality	Low, and affected by timeliness, completeness, accessibility and consistency
Information utilization	Intended usage often unclear, therefore actual usage is low as a result
Inter- and intra-organizational factor	Collaborative relationships and information dependency seen to be motivating factors for improving information. Low process formality and structure, as well as planning system functionality hindered information use.
Benefits of Information system	Reduced operational costs, improved competitiveness, better communication with suppliers and customers etc.

The information systems for SMEs are usually not well defined, and therefore the degree of information sharing is low, internally and with suppliers. Increasing the level of information systems within a SME allows for intra-organizational sharing. This can be considered a prerequisite to inter-organizational sharing. Although, the integration of systems between SMEs is often not high. Therefore, sharing of information might be done through more informal or simple communication methods like email, telephone and face-to-face contact.

The prerequisite to information sharing is a clearly defined information system at the downstream actor. For example, the case company is in direct contact with the consumers and thusly, has a better view of demand. This demand-related information should be communicated with suppliers to facilitate better forecasting and production planning. This was found to be important especially due to the constrained resources of the small suppliers and demand variability/seasonality at the retail store. If the internal operations of the case company cannot systematically collect and analyze information regarding demand, then the ability to transmit information upstream will be hindered and could lead to increased costs.

Therefore, the role of information in SMEs can be explained in relation to its support in good decision making which improves performance and reduces costs. Types of information, quality and factors that affect utilization have an impact on information use in SMEs.

Research Question 2: How can IT support use of information in an SME in LFSC?

Information technology (IT) consists of wide range of technology, both hardware and software, to support capturing, storing, processing, analyzing and sharing information. IT can support information in a SC ranging from transactional level to strategic level. Transactional level includes functionality like, order management, inventory management and pricing/invoicing. More tactical and strategic functionally includes productivity measurement, quality measurement up to strategic alliance formulation. These functions can span from Supplier Relationship Management (SRM), Internal SC Management (ISCM) to Customer relationship management (CRM). IT is therefore an enabler of a complete information system along a SC. Effect of IT on different informational aspects have been shown in Table 22 below.

Adopting of certain IT leads to several benefits for SMEs, which was found to be discussed extensively in the literature. Some of the major benefits include; improved communication with suppliers and customers, increased competitiveness, reduced operational costs and increased productivity as mentioned in Table 9.

It was found in the case company, that IT can support the upstream processes like, sourcing, buying and supply collaboration. Different information types like, suppliers information, product details, ordering details, sharing of sales forecasts and promotion plans are enabled by the use of IT at the upstream level. While, IT can also support ISCM processes of demand and supply planning by facilitating information on current inventory level, sales history and order status. Similarly, information in downstream processes, like order management from customers, include customer details, order status etc. are supported by the use of IT.

From an SME retailer perspective, different technology was found to be used to communicate with suppliers. Normally, more informal ways of communication, like SMS, email, and telephone, are used in the replenishment process with the small suppliers. While, the replenishment process is more systematic and formal with the large suppliers. Large supplies had their own web-based portals to order and a periodic delivery routine. The case company was found not using information on sales history to forecast future demand. Information was also not used to calculate order quantities or frequency of orders. Information on sales history can be extracted from their current POS-system. This information can be processed and analyzed using simple tools, like Microsoft Excel or other free and open source software, and therefore contribute to better planning. The POS-system (cash register system) can also assist in sending orders in a standardized way, as well as triggering orders (when items go below ROP, for example). While, technologies like, barcode, RFID help in capturing inventory information to have better control over material flow within the company.

The case company is in the state of growth. Increasing in number of stores makes planning and control more complex. Having available information from all stores to assist in decision making is therefore vital, yet difficult with the low level of internal system integration. This situation might

make an ERP system especially suited for SMEs an appropriate choice. There are cloud based (web-enabled) ERP services like, SAP for SMEs, Dynamics NAV specially tailored for SMEs. This will also facilitate in improved control over material, which goes through their internal warehouse.

Table 22: IT effect on information aspects in SMEs

Information Aspects	***IT effect on SMEs***
Information sharing	Improve information sharing by making more information available internally, although integration of systems is found to be impractical.
Information types	More information types are made available from IT, such as POS-data, forecasts, and order quantities/frequency. Capturing inventory data is assisted by certain technologies.
Information quality	IT can potentially improve timeliness, completeness, accessibility and consistency of information in SMEs
Information utilization	Intended usage can be more clear, and allow for a greater actual usage in SMEs
Inter- and intra-organizational factors	Implementing IT affects process formality positively, improves planning system functionality and information quality, thereby improving information sharing and usage in SMEs

Research Question 3: How can IT assessment be carried out in an SME to fulfill the role of information?

The importance of an IT assessment is to help SMEs when their business objectives are not being fulfilled by the current processes and technology. Since they have constrained resources, the primary aim for them is to use low cost solutions and technology only where necessary.

IT assessment should be guided by the overarching IS strategy, which many SMEs do not have clearly defined. They also lack the ability to assess if their current processes and IT can fulfill business objectives. Owners of the business play key role in management and decision making in

SMEs. Their business strategy is mostly the owner's vision, which highly depends upon his characteristics and perception. Although, SME owner/managers are often not sure on the role of information and IT to support their business, though they acknowledge the need. An IT assessment will therefore assist in solving the issues related to information and the use of IT in SMEs.

IT is just a platform for capturing, analyzing and communicating information, so the processes built around this technology directly affect how well information is utilized. Thus, it is not solely the information technology that is the root cause of issues in SMEs. Although, many SMEs do not try to invest in a new technology until they are pressured to, from external pressures. It has been found from the literature that many SMEs are unwilling to change, even when they have poor performance. Reason for this could be linked with the different inhibiting factors like, the perceived high cost of implementation, uncertainties on ROI etc. as mentioned in Table 10.

An IT assessment process flow for SMEs (Figure 8 from Section 3.4) has been proposed adapting knowledge from relevant literature. From the literature, it was found that the aim of an IT assessment was mostly directed only to determine if a company needs to adopt new IT or not. After it is decided, the requirements of the new technology should be found. But, from the case, we found two important points to be covered by an IT assessment, which were not clearly covered by literature. These include:

- Need to improve processes
- Need to better utilize the current technology

In an SME environment, these two points cover cost effective ways to improve operations without implementation of new IT. It may not always be necessary to invest in a new technology. For example, if an issue is of timeliness is found in certain information, the systematization of the process and increase in frequency of information sharing may solve the issue. This instead of adopting a new technology could be a solution. While, in certain cases, adopting a new technology may be the only solution. Thusly, the proposed IT assessment process flow has been updated to include these points and partly implemented in the case company (Figure 18).

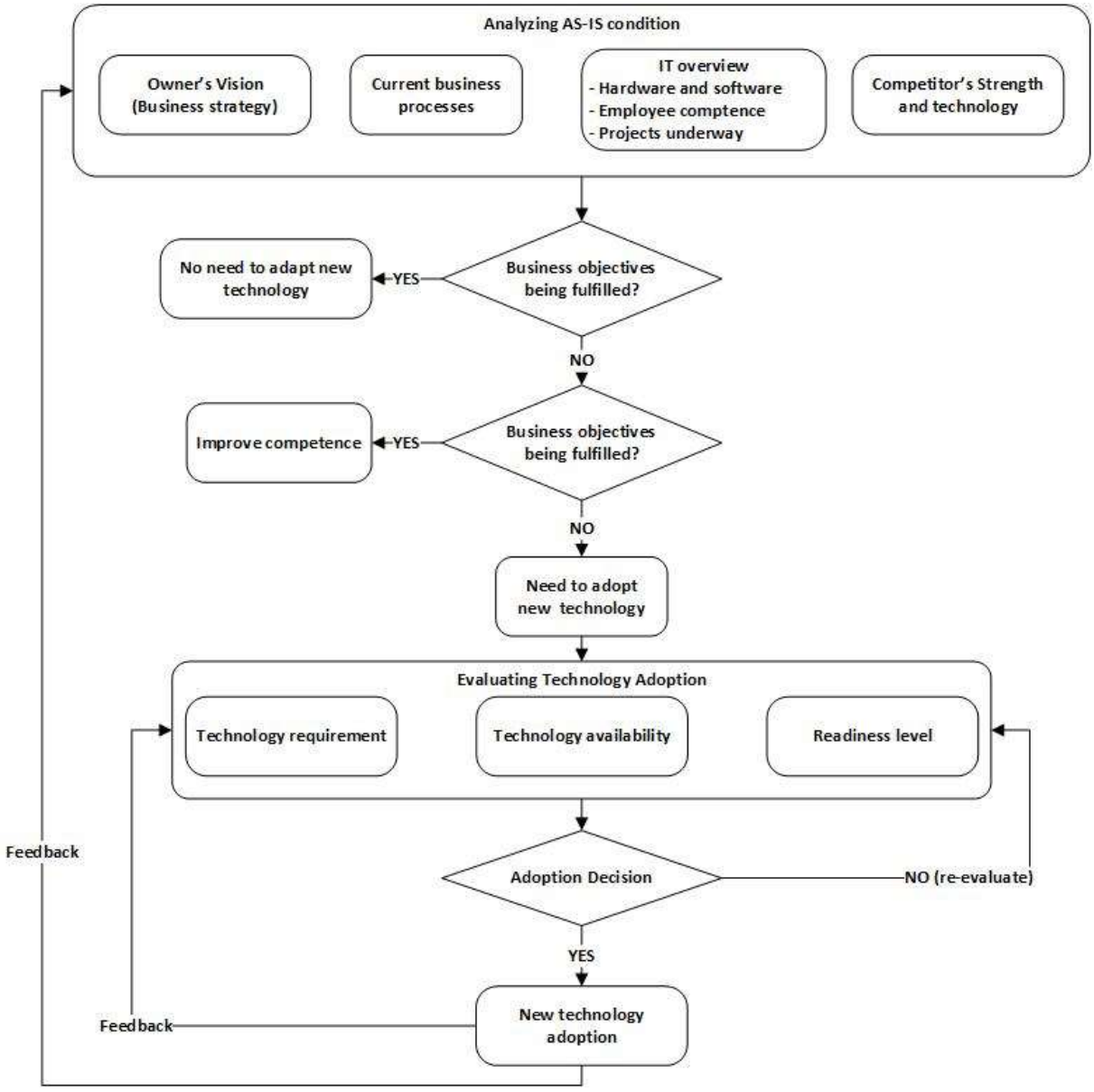


Figure 18: Modified IT assessment process flow

The AS-IS condition of the case company was analyzed through data collected from interviews, workshops and observation. The current supply chain and business processes of the company has been studied and mapped using Control Model and SCOR methodology in chapters 4 and 5 respectively. Their current IT was also studied and has been shown in Chapter 4. They were found to have a unique business model with few similar competitors, but have some competition from grocery stores and Vinmonopolet.

After going through the AS-IS analysis for the case company, the findings suggested that the current IT may be adequate and that a restructuring of the processes within the company could be a solution. They had certain features in the current technology that were not being utilized. For example, their cash register system provided them information on inventory level, which could help them in determining order quantities while placing orders. But they were not using these information to control their inventory and assist in ordering. Their current system could have other functionality that is underutilized. This may be due to the fact that they are often busy in carrying out their day to day business activities.

It was also found from the study of the processes with SCOR methodology that certain information and best practices were not being used in the company. A feasibility of implementing new practices, such as VMI between their warehouse and stores could be done for automatic replenishment. So, improving their competence can help in order to fully utilize their current technology and improve their processes.

The long term vision of the company was to expand their business with more suppliers. They also were in the state of opening new stores. This shows that more complex requirements like, a centralized database need to be supported. Their current level of IT will not be able to support them. So, they should eventually make a decision to adopt new technology. The readiness level of the company, and the availability of technology will determine if their technology requirements can be fulfilled as per the vision of the company. If feasible, the company can adopt a new technology, where after a constant feedback and evaluation should be done to ensure that the technology does in fact give the desired performance.

7. Conclusion

This chapter concludes the thesis work. It starts with the relevance of the study and the key findings. Then, the achievement of the objectives are discussed. It is followed by the contribution to knowledge and the practical implications, for both the case company and other industries. Finally, the research limitations and further work are presented.

7.1 Relevance of study and Key findings

The local food industry, which are mostly SMEs, has challenges related to balancing supply and demand, though its popularity is increasing. Therefore, the ability to improve performance of LFSC is extremely important. Specifically, an efficient SCM and information sharing are found to be vital in improving performance of a SC which is enabled by IT. This necessitates the study of actors in LFSC in regards to information and IT practices.

The findings show that SMEs in the LFSC have low levels of information sharing, as well as low levels of IT usage. SCM practices are often organic and informal, which leaves room for improvement. Information is available to assist in planning and control LFSC, and can be coupled with simple IT to improve performance. Assessing the information technology in a systematic way can increase the chances of successful use of information. This could lead to improving processes and increasing utilization of technology, or the adoption of a new technology depending on the operations environment.

7.2 Achievement of objectives

The study has been done in order to find how information and IT can improve SME retailers' replenishment process. Three objectives were formulated in section 1.3, and have been fulfilled to answer the overall aim of the study.

The first objective was to study the role and benefits of information in an SME SC, and was met by RQ1. This has been done by finding literature on SCM and information, as well as studying

SCM practices in an SME retailer. This led to understanding the potential benefits and factors for information use in SMEs.

The second objective was to study how IT can fulfill the role information in an SME SC, and was covered by RQ2. It was done by studying the functionality of IT in different levels of SC, and the information relevant to functionalities found in literature. The current information technology, and future vision of the case SME retailer was also studied to show practical usage of IT. This gave the basis for understanding how IT assists in utilizing information in an SME SC.

The third objective was to study IT assessment and adoption processes for SMEs. This was done by answering RQ3. The literature related to IT adoption in SMEs was studied, including implementation models, affecting factors and benefits. This led to a proposed process flow for IT assessment in SMEs (Figure 8). After studying the case, an update to the process flow was made to reflect the insights (Figure 18).

Studies on SCM practices and role of information and IT in SMEs is lacking. The limited amount of research found, often grouped SMEs together and fails to study a specific SME in depth. This study contributes with a specific, in-depth case study of an SME retailer working in a LFSC. Information practice issues in SMEs have been highlighted in the discussion of RQ1 and RQ2. The proposed IT assessment process flow is developed from literature and improved with insights from a specific industry, but can be valid for SMEs working in other industries.

7.3 Practical implications

The study implication for practice can be presented referring to the case company, The Gulating Group and to other SME industries. The Gulating Group was the main case company in the study, and therefore focus was given to improving their operations. Understanding their current SC and mapping their processes against a reference model gave insights into which information and processes could be improved. In addition, an overview of Norwegian beer industry (Figure 9) and market share has been presented to give a deeper understanding of the competitive environment.

Firstly, the implications to the company are related to their processes. Clearly defining processes will ensure better information flow and use within the company and with suppliers. Also, additional information, such as POS-data for ordering and forecasting, could be used both in existing processes, and in some identified best practices which are not currently in use by the company (shown in Table 17). Some of the process improvements are more related to their future vision.

In addition, the IT and related practices at the company has been studied. The current IT in use was found to be underutilized, and therefore exploring these could be beneficial. The improvement suggestions have been shown in Section 5.3. These requirement could be presented to an IT vendor, when they are adopting a new technology.

Although, this study was based on an SME retailer working with craft beers, the results and implications could be applicable to other SME industries too. The specific improvement areas found in the case company are likely to be found in other SMEs. Therefore, both the process improvements and IT implication can be relevant. As well, utilizing the IT assessment process flow could be beneficial.

7.4 Research limitations and further work

As the case company has an informal practices mostly based on intuition and experiences, interpreting the data collected was a challenge. The limitations of this study are largely related to that it is a single case study. The study only considered a retailer, while other actors, like the suppliers and customers, are not focused. Typical food product characteristics like, perishability, traceability etc. have not been considered in the study. Besides, it has considered only qualitative data from the case, while including quantitative data could give more validity to the results. An in-depth study of IT functionality was not carried out for the case company, and therefore all specific underutilized functions were not uncovered. Also, limited amount of time proved to be an issue in data collection and analysis as well.

Future work should consider more in-depth case studies of other actors in LFSC and in other SMEs. The proposed IT assessment process flow was modified with experiences from the case.

Utilizing information from several cases could increase the validity and robustness of the process flow. The information aspects, such as quality dimensions and utilization factors, should further be studied in other SMEs to gain better understanding of the most important issues.

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9. Appendices

Appendix 1: Replenishment Process with Suppliers

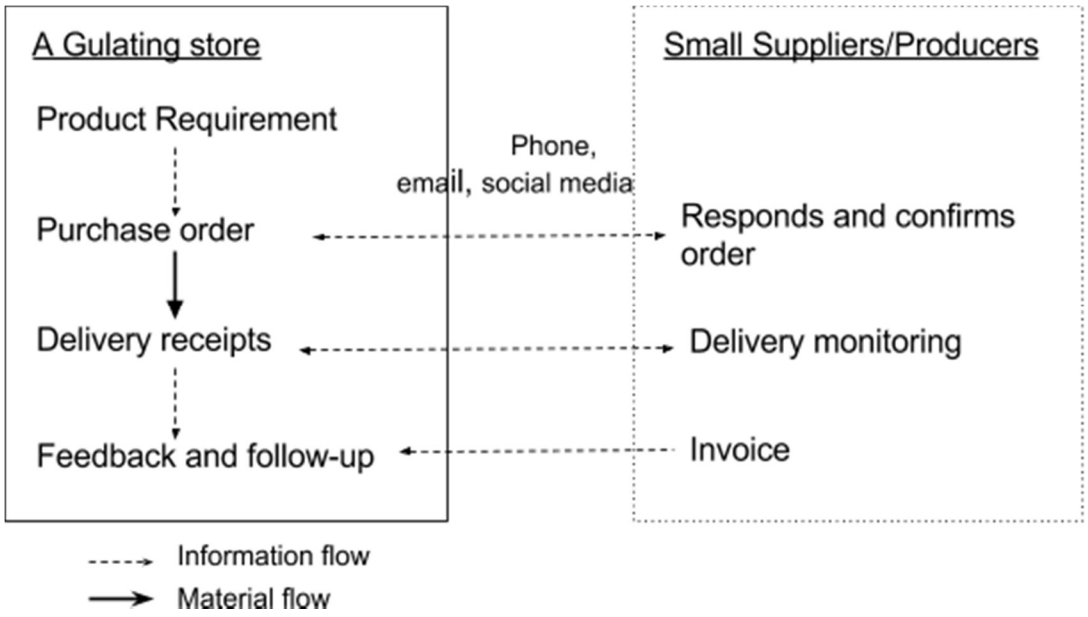

Figure 19: Simplified view of replenishment process (small breweries)

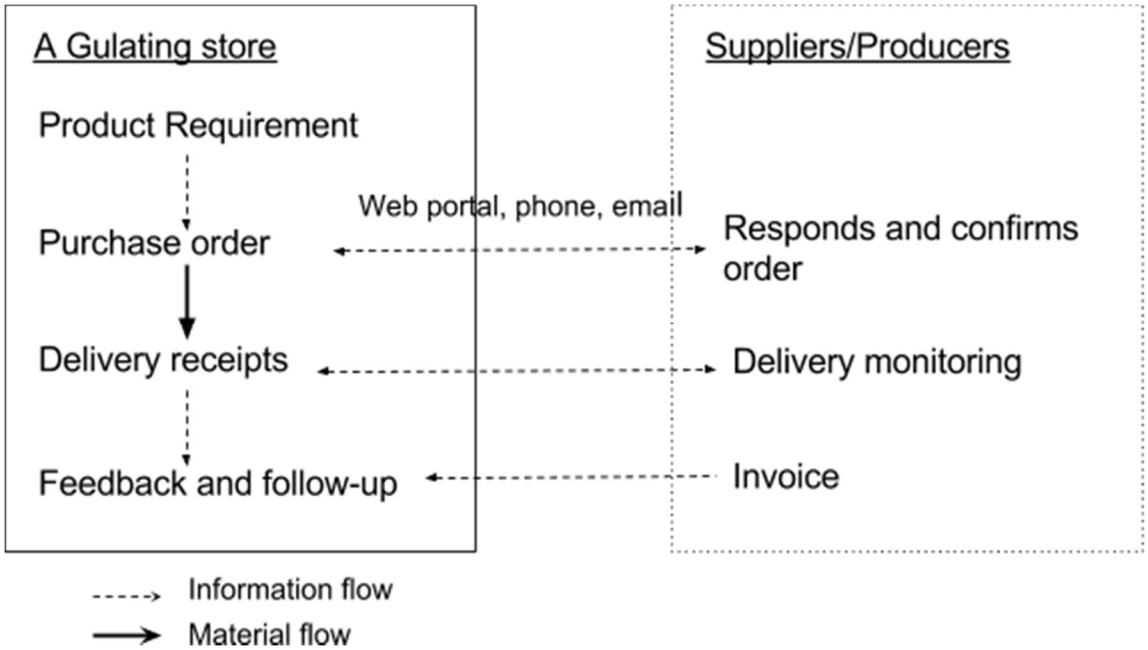

Figure 20: Simplified view of replenishment process (large suppliers)

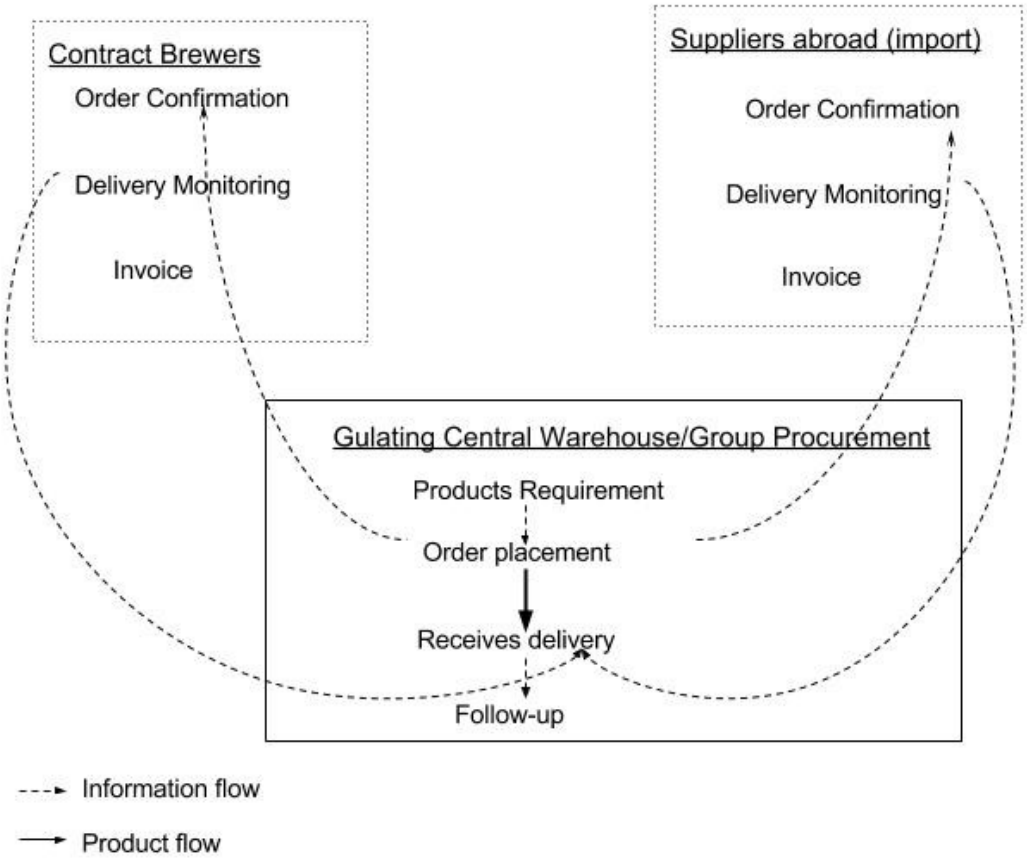

Figure 21: Simplified view of replenishment process (imports and contract brewers)

Appendix 2: SCOR Processes

Table 23: SCOR Plan Processes

P - Plan			
P1 - Plan Supply Chain	***P2 - Plan Source***	***P3 - Plan Make***	***P4 - Plan Delivery***
P1.1 - Identify, Prioritize and Aggregate Supply Chain Requirements	P2.1 - Identify, Prioritize and Aggregate Product Requirements	P3.1 - Identify, Prioritize and Aggregate Production Requirements	P4.1 - Identify, Prioritize and Aggregate Delivery Requirements
P1.2 - Identify, Prioritize and Aggregate Supply Chain Resources	P2.2 - Identify, Assess and Aggregate Product Resources	P3.2 - Identify, Assess and Aggregate Production Resources	P4.2 - Identify, Assess and Aggregate Delivery Resources
P1.3 - Balance Supply Chain Resources with SC Requirements	P2.3 - Balance Product Resources with Product Requirements	P3.3 - Balance Production Resources with Production Requirements	P4.3 - Balance Delivery Resources with Delivery Requirements
P1.4 - Establish and Communicate Supply Chain Plans	P2.4 - Establish Sourcing Plans	P3.4 - Establish Production Plans	P4.4 - Establish Delivery Plans

Table 24: SCOR Source Processes

S - Source	
S1 - Source Stocked Product	***S2 - Source Make to Order Product***
S1.1 - Schedule Product Deliveries	S2.1 - Schedule Product Deliveries
S1.2 - Receive Product	S2.2 - Receive Product
S1.3 - Verify Product	S2.3 - Verify Product
S1.4 - Transfer Product	S2.4 - Transfer Product
S1.5 - Authorize Supplier Payment	S2.5 - Authorize Supplier Payment

Table 25: SCOR Make Processes

M - Make	
M1 - Make-to-Stock	***M2 - Make-to-Order***
M1.1 - Schedule Production Activities	M1.1 - Schedule Production Activities
M1.2 - Issue Material	M1.2 - Issue Sourced/In-Process Product
M1.3 - Product and Test	M1.3 - Product and Test
M1.4 - Package	M1.4 - Package
M1.5 - Stage Product	M1.5 - Stage Product
M1.6 - Release Product to Deliver	M1.6 - Release Product to Deliver
M1.7 - Waste Disposal	M1.7 - Waste Disposal

Table 26: SCOR Deliver Processes

D - Deliver		
D1 - Deliver Stocked Product	***D2 - Deliver Stocked Product***	***D4 - Deliver Retail Product***
D1.1 - Process Inquiry and Quote	D2.1 - Process Inquiry and Quote	D4.1 - Generate Stocking Schedule
D1.2 - Receive, Enter and Validate Order	D2.2 - Receive, Enter and Validate Order	D4.2 - Receive Product at Store
D1.3 - Reserve Inventory and Determine Delivery Date	D2.3 - Reserve Inventory and Determine Delivery Date	D4.3 - Pick Product from backroom
D1.4 - Consolidate Orders	D2.4 - Consolidate Orders	D4.4 - Stock Shelf
D1.5 - Build Loads	D2.5 - Build Loads	D4.5 - Fill Shopping Cart
D1.6 - Route Shipments	D2.6 - Route Shipments	D4.6 - Checkout
D1.7 - Select Carriers and Rate Shipments	D2.7 - Select Carriers and Rate Shipments	D4.7 - Deliver and/or install
D1.8 - Receive Product from Source or Make	D2.8 - Receive Product from Source or Make	
D1.9 - Pick Product	D2.9 - Pick Product	
D1.10 - Pack Product	D2.10 - Pack Product	
D1.11 - Load Product and Generate Shipping Documents	D2.11 - Load Product and Generate Shipping Documents	
D1.12 - Ship Product	D2.12 - Ship Product	
D1.13 - Receive and verify Product by Customer	D2.13 - Receive and verify Product by Customer	
D1.14 - Install Product	D2.14 - Install Product	
D1.15 - Invoice	D2.15 - Invoice	

Appendix 3: Interview Guide

Table 27: Interview Guide

Topics	***Question Guide***
	Supply Chain Mapping *(Stabell & Fjeldstad 1998; Hübner et al. 2013)*
Procurement	● How do you select suppliers? (Quality, volume, variety, reliability, etc.) ● How many suppliers do you have? ● Have you categorized suppliers based on supply volume, sales etc.? ● What type of supplier relationships/contracts do you have? ● How do you plan orders? (Forecast in excel, based on stock level?) ● How do you send orders? (email, call, any software) ● What is the order frequency and size? ● How do you manage inbound logistics? (Delivery 3pl?) ● How to handle pricing and invoicing for each supplier? ● Major challenges?
Contract Brewing (outsourced production)	● How do you select contract brewers? ● How many contract brewers do you have? ● How many products and what type are contracted? ● How do you coordinate with them? (method of communication, frequency, quantity) ● Major challenges?
Warehousing	● Where are the products stored now? (no. of warehouses, retail stores etc)? ● How do you manage inventory level? (excel spreadsheet, count stock level every day, etc?) ● How do you communicate and coordinate between warehouses and stores? ● Major challenges?
Distribution	● How do you plan distribution? (daily/ weekly dispatch, order aggregation) ● How do you fulfill orders from the stores, and other customers?(prioritize own stores or other customers?) ● What type of 3PL (logistics/transport) service do you use, what type of contract do you have? ● How do you communicate with the 3PL? ● Major challenges?
Sales	● How do you handle customer orders? (frequency, volume, method of contact, etc) ● What is your sales % through your stores vs. other customers? ● How do you plan sales, short term and long term? ● Pricing strategies? Promotion? ● How do you handle invoicing? ● What is your service level? ● Major challenges?

Information Technology *(Levy & Powell 2000; Ghobakhloo et al. 2012)*	
Current practice	● How do you capture, record and store information related to: ○ Procurement ○ Contract brewing ○ Warehousing ○ Distribution ○ Sales ● Are there any particular softwares and technology you use in these processes? ○ Functionality covered (inventory management, sales order processing, customer databases, sales forecasting, performance measuring etc)
Future targets	● Present challenges? How would IT help the business? ● Need of new IT? Requirements (functions)? ● Software/technology (ERP, CRM, RFID, etc)? ● Employee, Investment readiness