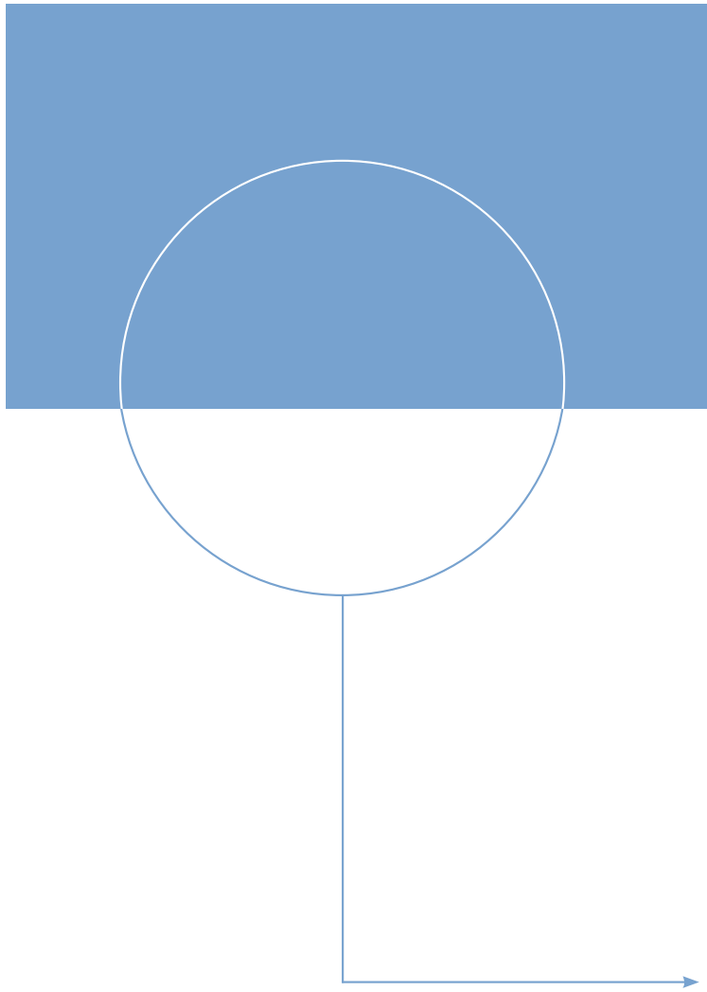

Master's thesis

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Investigation of the Consequences of Buy-Back Agreements in the Norwegian Snacks and Confectionery Supply Chain

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Investigation of the Consequences of Buy-Back Agreements in the Norwegian Snacks and Confectionery Supply Chain

Ingrid Rosshaug

Master of Science in Mechanical Engineering
Submission date: June 2019
Supervisor: Fabio Sgarbossa
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Preface

As a final hurdle in the Master of Science programs at the Norwegian University of Science and Technology (NTNU), a masters thesis was conducted during the spring semester of 2019. With a specialization in Production Management within the Department of Mechanical and Industrial Engineering, the thesis have a main focus on inventory management and demand forecasting. The thesis is conducted in collaboration with Brynild Gruppen AS.

I would like to thank my supervisors, Fabio Sgarbossa and Anita Romsdal, for guidance, valuable discussions and good advise during the process of the development and execution of the thesis. A special thanks to the representatives at the case company Brynild Gruppen AS for their collaboration and their valuable input. Mathias Holm, Haris Jasarevic and Janne Overvik at Brynild Gruppen AS have been great sources of information, data and input on the thesis and it has been a pleasure to collaborate with them. Also, I would like to thank professor Jan Ola Strandhagen for introducing the wonderful world of production management with inspiring lectures.

I want to thanks to my family and closest friends for their support. Lastly, but definitely not the least, I would like to thank my better half, Åsmund Holmås for the patience, continuous support and for always believing in me.

Ingrid Rosshaug
Trondheim, 11.06.19

Summary

The buy-back agreements within the snacks and confectionery supply chain is a result of the balance of bargaining powers within the supply chain. The agreements entail that the manufacturer can increase the visibility of their products by stimulating sale initiatives in the stores. In addition, by stimulating quantities on already existing orders of national promotions and activities it can increase the demand within the individual stores. These stimulated sales can increase the profit of the manufacturer. However, this can increase the probability of profit loss of the manufacturer due to food waste since the manufacturer needs to replace the value of the obsolete products. By investigating the consequences of the current buy-back agreement within the snacks and confectionery supply chain, the thesis gives suggestions of information the manufacturer can apply in order to adapt to the buy-back agreements.

The research objective is to increase the supply chain profit by reducing the amount of waste within the snacks and confectionery supply chain and as a result increase the profitability of the manufacturer. The objective of the thesis is to find patterns in the data material of the impact of shelf life, demand, COGS and order size of the obsolete products which is credited due to the buy-back agreements. In order to achieve the objective, two research questions are developed:

Research question 1:
What are the consequences of the current buy-back agreements within the snacks and confectionery supply chain?

Research question 2:
What information should the sale consultants have available in order to reduce the amount of crediting of obsolete products due to the buy-back agreements in the snacks and confectionery supply chain?

In the analysis, it is found a positive correlation of the amount of obsolete products, and multiple variables: demand of the products, variance in the monthly demand, variance in the monthly orders, average order size and the coverage of the average order size. However, the confidence interval of the different correlation analyses varied. By evaluating six of the most credited products in terms of profit and quantity it reduced the reliability of the findings in relation to all products. Divergent to the findings in the literature study, it was found that the products of medium to long shelf life and products of medium to high demand are the most credited products in terms of the quantity. With replacement of new products due to obsolete products, in comparison to replacement of the monetary value, it reduced the profit loss of the manufacturer. The analysis indicated that these products could be perceived as products of less risk and could lead to overestimation of these by the quantity of products or the amount of stimulated sales. As regards to what information could assist the sale consultants in the decision of stimulated sales, historical data of the previous stimulated sales of the products could potentially improve the decision making. The quantity, timing of the sale, the impact of demand and the amount of obsolete products due to stimulated sales, could be valuable input when evaluating the success of the stimulated sales and can create a foundation for decision making of the future stimulated sales.

Sammendrag

Tilbakekjøpsavtalen i nøtte- og sukkervare verdikjeden er et resultat av maktfordelingen innen verdikjeden. Avtalen innebærer at produsenten kan øke etterspørselen av produktene deres ved å stimulere salginitiativ i de individuelle butikkene. Ved å stimulere kvantitet av eksisterende ordre av nasjonale kampanjer og aktiviteter kan dette også resultere i en økning av etterspørselen av produktene i de individuelle butikkene. Disse stimulerte salgene kan potensielt øke profitten til produsenten. På den andre siden, kan stimulerte salg øke svinn av produkter i verdikjeden, som reduserer profitten til produsenten. Ved å undersøke konsekvensene av den gjeldende tilbakekjøpsavtalen innen nøtte- og sukkervare verdikjeden, gir masteroppgaven forlag for informasjon produsenten kan ta i bruk for å tilpasse seg tilbakekjøpsavtalen.

Forskningsmålet er å øke profitten i verdikjeden ved å redusere svinn innen nøtte- og sukkervare verdikjeden og som et resultat øke profitten for produsenten innen verdikjeden. Objektivet er å finne mønster i data materialet om hvordan holdbarheten, etterspørselen, COGS og ordrestørrelsen påvirker kvantiteten av produkter som blir kreditert grunnet utgåtte produkter, som et resultat av tilbakekjøpsavtalen.

Forskningsspørsmål 1: Hva er konsekvensene av den nåværende tilbakekjøpsavtalen innen nøtte- og sukkervare verdikjeden?

Forskningsspørsmål 2: Hvilken type informasjon burde salgskonsulentene ha tilgjengelig for å redusere krediteringen av utgåtte produkter som er et resultat av tilbakekjøpsavtalen i nøtte- og sukkervare verdikjeden?

I analysen er det funnet en positiv korrelasjon mellom antall krediterte produkter grunnet utgåtte produkter og fler variabler: etterspørsel av produkter, variansen av etterspørsel, variansen av ordre, gjennomsnittlig ordrestørrelse og dekning av den gjennomsnittlige ordrestørrelsen. Selv om konfidens intervallet av de ulike korrelasjonsanalysene varierte. I analysen ble seks av de mest krediterte produktene med tanke på profitt og kvantitet, likevel vil dette kunne redusere påliteligheten av resultantene ved å ikke evaluere alle krediterte produktene i korrelasjonene. Ulikt fra funnene i litteraturstudien, er det funnet i analysen at produkter med medium til lang holdbarhet og produkter med medium til høy etterspørsel er de mest utgåtte produktene med tanke på kvantitet. Ved kreditering, erstattes verdien i form av pengeverdi eller nye produkter. Med erstatning i form av nye produkter for de utgåtte varene, i forhold til erstatning av pengeverdien, reduserer dette profitt tapet for produsenten. Analysen indikerer at produktene som erstattes av nye produkter kan bli oppfattet som lav risiko produkter, som kan resultere i en overestimering i form av kvantitet eller antall stimulerte salg av disse produktene. Med tanke på hvilken type informasjon salgs konsulentene kan dra nytte av ved valg knyttet til stimulerte salg, kan historiske data av tidligere stimulerte salg av produktene potensielt forbedre beslutningstakingen. Kvantitet, timingen av salget, innvirkningen på etterspørselen og antall utgåtte produkter på grunn av stimulerte salg kan være verdifull informasjon når suksessen av tidligere stimulerte salg evalueres og som kan danne grunnlag for beslutningstaking av stimulerte salg.

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Abbreviations

COGS: Cost Of Goods Sold
FMCG: Fast Moving Consumer Goods

1 Introduction

The introduction will present the motivation of the thesis, then define and scope the problem to further present the objective and the related research questions. Lastly, an overview of the chapter content and an illustration of the relations between the chapters are presented.

1.1 Motivation

In the Norwegian food supply chain, which the Norwegian snacks and confectionery supply chain are a part of, the waste of products at store level in Norway resulted in a total profit loss of 3.21 billion NOK in 2015 (Stensgård and Hanssen, 2016). Waste at the individual stores, due to all products stored in the inventories, is the result of automatic replenishment, additional orders from the individual stores, stimulated sale initiatives and stimulated quantities of already existing orders of the sale consultants of the manufacturers. Further, the stimulated sale initiatives and the stimulated quantities are referred to as stimulated sales when both are addressed. The definition of food waste is products that are no longer within regulations of quality or qualifications for the customer to purchase the product. The result of food waste is loss of both resources and material which contributes to access environmental emissions (FAO, 2011).

The Norwegian snacks and confectionery supply chain is characterized as a competitive market where the global manufacturers have a large market share compared to the national manufacturers (NOU, 2011). Also, the negotiations between the grocery chains and manufacturers are on the terms of the grocery chains (NOU, 2011). In order to offer the customers the lowest price per item, the assortment within the grocery chains are reduced which also pushes the prices and the margins of the products (NOU, 2011) (Malhotra, 2014). For the national manufacturers to survive in the competitive market, a focus on the profitability of their operations and reducing their related waste of food are required.

1.2 Problem definition

As presented, the Norwegian snacks and confectionery supply chain is characterized as a highly competitive market where the manufacturers within the supply chain needs to evaluate their individual profitability to survive in the market (NOU, 2011). During the negotiations between the manufacturer and the grocery chains, the grocery chains decides what products are included in the assortment of the individual stores and at what terms (NOU, 2011).

Buy-back agreements between the manufacturer and the grocery chains within the snacks and confectionery supply chain, when stimulated sale initiatives and stimulated quantities of already existing orders are performed by the sale consultants, includes multiple categories of crediting. Where crediting implies that a replacement of value is conducted through replacement of monetary value or replacement of products (Wang and Webster, 2009). The sale consultants represent the manufacturers. If the stimulated sales are marked down, the manufacturer and the grocery chains share the risk of profit

loss, but if the products become obsolete the responsibility is on the manufacturer. Where obsolete products are defined as products which have exceeded the shelf life and therefore are not products that can be sold to the customer. Due to the uncertainty of demand of the products which are characterized as impulse-buy products, the demand can be affected by the visibility within the individual stores (Ailawadi and Neslin, 1998)(Ma et al., 2016). This agreement allows the manufacturers to increase the visibility of their products and potentially increase the profit, but also it presents the questions: "What products and at what quantity increases the profitability of the manufacturer and reduces the amount of waste related to stimulated sales?".

The relevance and the purpose of the research, is to contribute to insight into the snacks and confectionery supply chain and how the buy-back agreements affect the choices of the sale consultants and investigate if any advice to the sale consultants can be given in order to balance the profit loss and the profit gain of the stimulated sales by reducing the food waste.

1.3 Research scope

The research of the thesis is an investigation within the Norwegian snacks and confectionery supply chain, and the scope of the thesis include supply chain management with the focus of collaboration of the supply chain, inventory management and demand forecasting.

In order to further investigate the manufacturers and the grocery chains within the snacks and confectionery supply chain, the collaboration between Brynild Gruppen and NorgesGruppen are further researched in order to answer the research questions of the thesis. The buy-back agreements are the focus, and all the orders the sale consultants stimulate whether it is a sale initiative or quantity of already existing orders are included in the investigation.

The automatic orders of the individual stores are not included in the scope, since these orders are not stimulated by the sale consultants. Of the products included in the analysis of the data material, all of Brynilds products are investigated except for the pick and mix confectionery or the Nivea products they import. The products which was investigated, was based on the data material of the products of 2017.

Figure 1 illustrates the scope of the thesis within the snacks and confectionery supply chain. The area within the red lines are the focus of the supply chain.

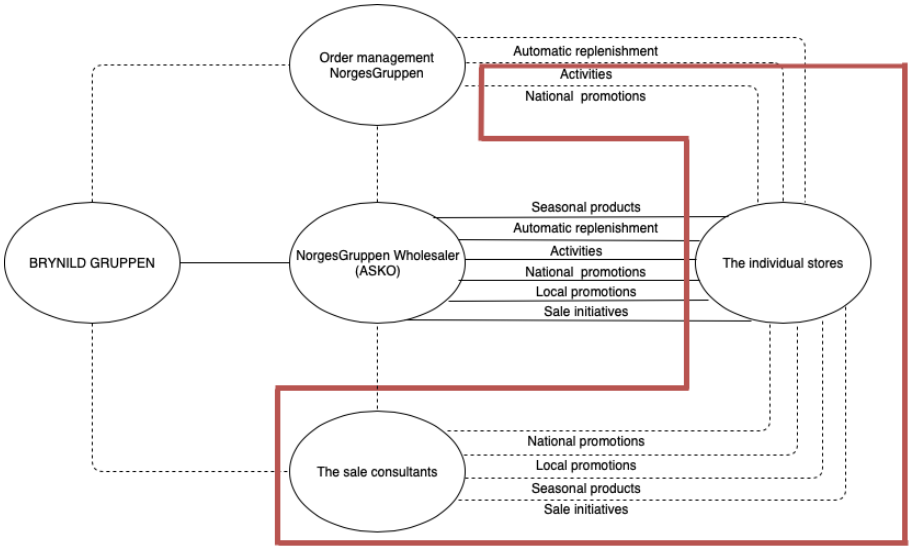

Figure 1: A simplified illustration of the supply chain

The relationship between the sale consultants and the individual stores are further investigated by evaluating what the sale consultant could stimulate in terms of what type of sales and what products in order to further scope the thesis. Of the already existing orders, the sale consultant could try to stimulate the quantity of the national promotions and activities, where the change of orders could be registered by the sale consultant or by the grocer of the individual store. The automatic replenishment of products, which is based on a forecast and the inventory level at the individual store, and seasonal products were not included in the scope. Automatic replenishment of products are decisions that the individual stores make and are therefore not included in the buy-back agreements. Both the local promotions, which rarely are stimulated due to the preferences of the grocery chains, and the sale initiatives are registered by the sale consultants. The seasonal products are included in the buy-back agreements and the crediting of these products are not registered through the sale consultants, but directly to Brynild Gruppen and are therefore not included in the thesis.

With the motivation to reduce the amount of food waste within the supply chain, the focus of the conducted analysis was on the products which was credited due to obsolete products. The definition of obsolete products are products that has reached the expiration date and can no longer be purchased by the customer. However, in the first sub-analysis all categories of crediting are also included to evaluate the extent of the obsolete products of the total crediting due to the buy-back agreements. Where all categories of crediting include for example markdowns, discounts and breakage of products.

1.4 Research objective

The main research objective is to increase the supply chain profit by reducing the amount of waste within the snacks and confectionery supply chain and thereby increasing the total profit of the manufacturer. By investigating patterns in the data material of the amount of obsolete products and both the product characteristics, of the shelf life, cost of goods sold and the order size, and market characteristic of the demand of the products.

In order to be more specific of the objective, the objective is to find patterns in the data material of the above mentioned market and product characteristics in order to give indications of patterns of the obsolete products and valuable information in order to adjust to the current requirements of the buy-back agreements within the supply chain.

1.5 Research questions

In order to complete the research objective, the research questions are a structured way of achieving the objective.

Research question 1: What are the consequences of the current buy-back agreements within the snacks and confectionery supply chain?

The consequences will be addressed thorough interviews with actors within the supply chain and an analysis of data material. How does the buy-back agreements impact what products and the quantity the sale consultants stimulate? The correlation of amount of products credited of obsolete products due to the buy-back agreements and, shelf life, demand and order size are researched. In addition, the impact of the buy-back agreements in terms of the demand and the characteristics of the obsolete products are researched.

Research question 2: What information should the sale consultants have available in order to reduce the amount of crediting due to buy-back agreements in the snacks and confectionery supply chain?

As concluding marks of the analysis, what information would be valuable for the sale consultants in order to minimize the profit loss and food waste are evaluated. Where valuable information relates to what data material to have available and patterns of current stimulated sales of the sale consultants in order to reduce the amount of waste due to obsolete products.

1.6 Thesis structure

The thesis structure is presented in table 1 in order to give an overview of the content of the individual chapters and the links between the chapters are presented in figure 2.

Chapter content	Description
Chapter 1: Introduction	The problem statement and motivation of the problem is firstly described. Then, a description of the scope and the objective of the thesis is presented in order to further present the research questions which is answered throughout the thesis. Finally, the overview of the thesis structure is presented in order to give an outline of the following chapters and the link between the chapters are also presented.
Chapter 2: Research methodology	This chapter is dedicated to the description of how the research was conducted, what the strategy of the research was and detailed descriptions of the literature study and the case study, with both the interviews and the quantitative analysis of the data.
Chapter 3: Empirical background	It describes the food supply chain by presenting the characteristics and requirements in the food supply chain and further describing the snacks and confectionery supply chain with the specific characteristics and requirements of this supply chain. An introduction to the concept of a buy-back agreement is also provided.
Chapter 4: Theoretical background	The theoretical background highlights important topics and information which is applied in the case study of the research. These topics include inventory management, demand forecasting, collaboration and sustainability of the supply chain. The most central theory, which laid the foundation to the hypotheses developed for the analyses, are based on the sources of waste within the supply chain.
Chapter 5: Case study	A case description is applied where presentations of both Brynild Gruppen and NorgesGruppen are supplied and a description of the material and information flow of the supply chain with these two actors. Also, a description of the buy-back agreements between the actors are supplied. Research question 1 of the consequences of buy-back agreements are researched through the use of the previous literature study and a quantitative analysis. Then, research question 2 are researched through the literature study and the results of research question 1 is interpreted by evaluating indications of patterns of the obsolete products and valuable information for the sale consultants of the manufacturer in order to adapt to the current buy-back agreements.
Chapter 6: Discussion	A discussion of limitations and the findings of the research questions are conducted. For a systematic approach, a summary of the discussion is supplied.
Chapter 7: Conclusion	In the conclusion, the relevance of the study are discussed and key findings are presented. For further research, it is suggested development and further work.

Table 1: The structure of the thesis with description of the chapters

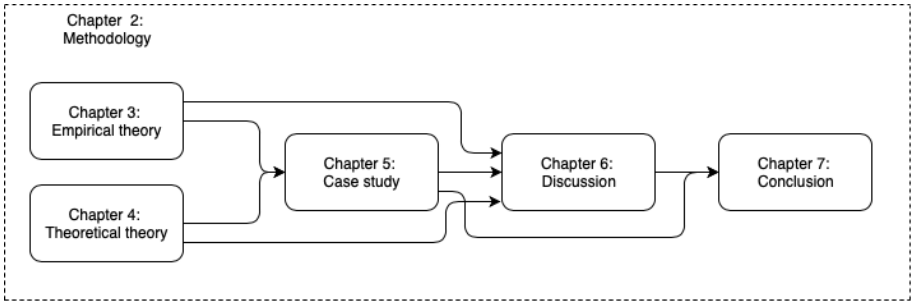

Figure 2: An overview of the relations between the chapters

In figure 2, it presents the links of the chapters in the thesis. Firstly, chapter 2 which contains the methodology applied during the research describes how the research was conducted and research methods applied in the chapters. Both chapter 3 and chapter 4, describe the theory and the literature applied in chapter 5. The case study and the analysis were further discussed and evaluated in chapter 6 in terms of the literature study, the results and the indications of the analyses. In chapter 7, the discussion from chapter 6 and the results of chapter 5 was concluded.

2 Research methodology

This chapter firstly explains the theory behind research methodology and then what methods are applied in this thesis, in order to defend the choices of methods applied. The general philosophy of the thesis is indirectly expressed through the choices and the use of the methods in the thesis.

Research methodology is defined as a structured and systematic way of solving a problem with the use of methods through academic and logic reasoning (Kothari, 2004). Since research of science are often an overflow of information and an iterative process, it is necessary to set a course by developing a semi-structure to the research and how to attack the problem (Croom, 2008). The methods include gathering and analyzing information and data, and are applied in order to solve the defined problem. The nature of the problem must first be assessed in order to apply the suitable method to solve the problem. The methods are characterized as either qualitative or quantitative. Where the qualitative are defined as a method that is descriptive and explanatory, while quantitative is defined as a conclusive and numerical method (Rajasekar et al., 2006).

2.1 Research strategy

In order to have an systematically structured research, to provide guidance and secure progress of the research, a strategy of how to execute the research was planned. The reseach design of the thesis is further explained in this sub chapter. The nature of the problem investigated, should be considered when choosing the methods to apply in the research (Noor, 2008). A multi-methodological research suited the objective of the thesis. The approach provides multiple dimensions of the problem which can improve the outcome, although it carries additional risk regarding to the balancing of the time spend on the different methods (Choi et al., 2016).

A simplified illustration of the research design of the thesis is given in figure 3. It was an iterative process where both the objective and the research questions adapted to changes of findings of the analysis of data and the limitations in the data material during of the research.

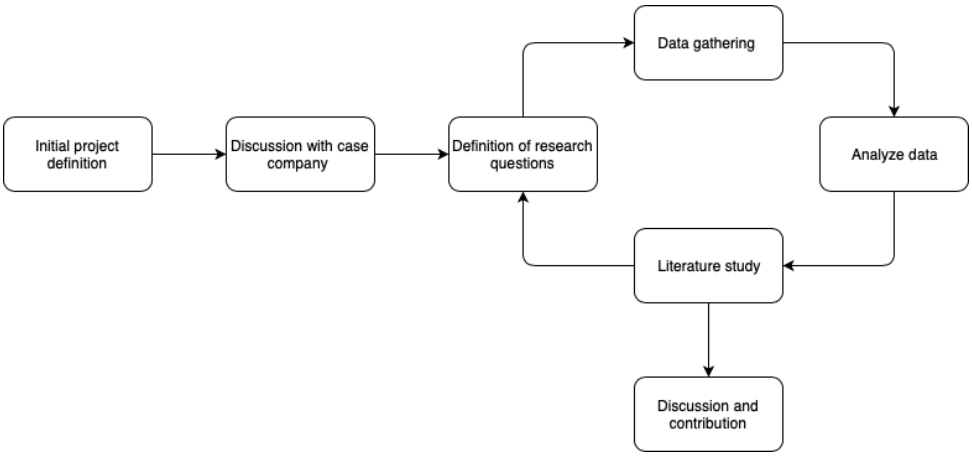

Figure 3: The research design

A definition of the project was constructed at the beginning of the thesis, as a starting point. This starting point was based on the specialization project within the course TPK4530 of last semester. The objective of the specialization was to evaluate the holding cost rate of the products of the manufacturer. Where the holding cost rate is defined as the percentage of the total cost of products are related to keeping the item in inventory. After a few meetings with the supervisors and the representative from Brynild Gruppen, the issue of the holding cost rate related to the profit loss due to buy-back agreements were discussed. After the investigation of the impact of the buy-back agreements within the supply chain and the lack of guidance of the sale consultants to make decisions in regard to what products, the quantity and the timing to stimulate sales, the objective of the thesis changed.

The iterative process of definition of research questions, collection of data material, analysis of data and the development of the literature study, was necessary in terms of the multi-methodological research approach. As a result of this approach, all of the components within the research required adjustments in order to adapt to the change of direction of the research. Because of the lack of research regarding the buy-back agreements, the literature study needed to adapt to the findings of the quantitative analysis.

2.2 Theoretical study

In order to investigate previous findings in the literature, a literature study was conducted. Where literature study is a less comprehensive method than the literature review, and was chosen due to the multi-methodology approach. The literature study is described in chapter 3 and 4.

At the beginning of the research, the literature study and the related areas of interest was defined by the developed problem statement and the defined research questions. In the progress of the development of the research questions and definition of the scope of the thesis, the areas of interest also developed during the research. Prior and during the literature search, secondary key words was developed. In table 2, the primary key words are the areas of interest while the secondary key words are synonyms, topics within the areas of interest and key words applied in the combination within the areas of interest. When conducting the literature search, the primary key words was used in a combination to find literature which build the foundation of the research.

Primary keywords	**Secondary key words**
Food supply chain	Characteristics Requirements Perishable commodities Shelf life Demand Fast moving consumer goods Product margins Cost of products
Snacks and confectionery supply chain	Characteristics Fast moving consumer goods
Buy-back agreements	Return policy Take-back agreements Mark downs Take-back contracts Buy-back contracts Revenue-sharing contracts Shelf life Order size Demand Consequence Sales effort
Food waste	Obsolete products Sustainability Variability of demand Variability of orders Coverage of order Order size
Demand forecasting and demand management	Promotions Available data Information Demand Uncertainty of demand Variability of demand Variability of orders Order size Pattern change Customer pattern Consumer activity
Inventory management	Inventory decisions Demand Automatic replenishment

Table 2: The applied key words during the literature search

During the development of the thesis, random searches as regard to the terms applied in the literature search, block searches based on the current areas of interest and, forward and backward searches if the articles found by the other literature search methods were included in the current areas of interest.

The search engines that were applied, consisted of Google Scholar, Web of Science and Scopus. Since the search engines provided different results with the same search, the use of multiple search engines increased the probability of finding literature that was of interest. To secure quality of the literature found, an investigation of the peer-views, the publishing journal and the publishing year was in a greater or lesser extent applied. Firstly, the searches were conducted, and if the title and the abstract of the article was satisfactory relating to the main areas of interest, the literature was added to EndNote. Since the thesis was written in Overleaf, EndNote was not utilized to its greatest potential of applying the references directly into the reference list. It was mainly applied as a collector of the literature.

The literature was reviewed based on the technique of skimming of the literature (Purugganan and Hewitt, 2004). During the skimming of the papers, the introduction, discussions and conclusions was evaluated if the articles was to be applied in the literature study of the thesis. If the references were of interest an evaluation process was conducted. In the evaluation process, an overview of the references the was constructed in Evernote. Where Evernote is an app constructed for notes. The autor(s), title, year, publishing journal, key words, purpose, methodology, results and findings, conclusion, summary, additional comments and the amount of citation was noted in EverNote. It made the information easily accessible, when applying the references during the development of the thesis. Also, a record of the search history was logged, in order to have an overview of the searches completed to makes the literature search more efficient. Hence, avoiding identical searches and evaluation of the amount of results of the search phrase to evaluate if a more specific search was necessary.

The search periods during the research happened mainly within two time periods. The first established search took place when the search questions and project objective was at an early stage of the development. While, the last established search was conducted during the last stages of the research after the quantitative analysis was applied.

In addition to the search engines, the technology library at NTNU was examined for books relating to the starting point of the thesis. The books covered areas of topic like operations management, supply chain management, supply chain logistics management and inventory management. These books acted as a supporting material during the thesis.

2.3 The case study

The research strategy of including a case study match the theory-building activity of mapping and relationship building where the objective of the thesis is to contribute to knowledge by identifying and describing the critical contributors (Stuart et al., 2002). The case study consists of both a quantitative analysis of the data material received by the case company and qualitative interviews were conducted which have an developed interview guide for support in the interviews. The interview guides are supplied in the appendices in A.1 and A.2. By including both of a qualitative and a quantitative method within the case study, the case study contributes to a research which is conclusive, explanatory and descriptive (Rajasekar et al., 2006). The case study consisted of two semi-structured interviews, mail correspondence with multiple representatives from the case company and quantitative analysis of data material received from the case company.

2.3.1 Interviews

In order to provide information of the case company and the status of the Norwegian snacks and confectionery supply chain, interviews with both a sale consultant of the case company and a grocer within NorgesGruppen were interviewed. As interviews are a decent way of providing answers to the *how* and *why* within a case study (Voss, 2010). The two interviews were conducted in late February after the direction of the buy-back agreements within the snacks and confectionery supply chain was chosen to go forward with. The results of these interviews gave an insight into the supply chain, the job of the sale consultants, the relationship between the grocer and the sale consultant, and the complexity of the buy-back agreement. These findings from the interviews can be read in chapter 5. For the general information of NorgesGruppen, which was not asked in detail during the interview with the grocer of a grocery store of NorgesGruppen, was extracted through web pages and trustworthy references.

The approach of the interviews were semi-structured interviews with interview guides which were developed previous to the interviews. By developing interview guides, the results of the interviews had the ability to be more trustworthy as it at the same time do not restrict the flow of the interview (Kallio et al., 2016). The questions developed for both interview guides were related to different areas of interest of the interviewees, to have the ability to add questions during the interview without breaking the flow of the conversation. The questions were developed with the knowledge of the case company and previous conversations of the buy-back agreements with the case company representative.

The execution of both interviews with the interview guides, was executed in one day. The semi-structured interview with the sale consultant lasted for 2 hours, but a continuous conversation continued when the sale consultant showed the regional inventory and two grocery stores in order to conduct the interview the grocers. Because of the circumstances, recordings of the interviews were not performed and instead detailed notes were made. To secure the quality of outcome of the interviews, the notes were sent to the sale consultant for feedback. Prior to the feedback, multiple phone conversation laid the groundwork for the final result of the interviews with both the grocer and the sale consultant. The final result of the interviews can be found in A.1 and A.2 in the appendices which presents the interview guides.

2.3.2 Quantitative analysis of data

A quantitative analysis of a case study should match the objective of the thesis (Rowley, 2002). Therefore, the analysis conducted had the objective to find correlations and evaluate the obsolete products, to evaluate the consequences of the buy-back agreements.

Voss (2010) suggested the steps of documentation, coding and analysis when conducting a quantitative analysis in a case study. Where documentation relates to collecting the information and data material in order to complete the analysis (Voss, 2010). The documentation of the data material was collected continuously during the development of the analysis. The representatives at Brynild Gruppen, supplied the data material that was requested. In order to keep track of the material that was received it was stored

into various folders. In addition, as the final outline of the analysis was developed, an overview of the data material of interest was constructed. The main data material that was received is listed in table 3.

Data material	**Further definition**
Amount of crediting	Per product per store per transaction within NorgesGruppen in 2017
Orders shipped from wholesaler	Per product per transaction per store within NorgesGruppen in 2017
The demand	Per product per month per store within NorgesGruppen in 2017
Value of the crediting	Per product within NorgesGruppen in 2017
Shelf life of the products	Per product
The COGS of the products	Per product in units

Table 3: An overview of the primary data material collected

The coding relates to categorizing the data material with the chosen limitations, combining quantitative and qualitative observations, and understanding the data material (Voss, 2010). In table 3, the data material was filtered into the scope of the thesis. As a result of the received data material, 2017 was the only year that consistently had data material available and NorgesGruppen was the only grocery chain with consistent data material. Therefore, the scope of data material shaped was shaped due to the available data material.

While the analysis, suggested by Voss (2010), consisted of comparisons of the different data material with illustrations. Illustrations of the comparison were provided in the thesis, in order to discover patterns in the data material. The decision of what product and market characteristics to investigate in correlation to the obsolete products was based on the findings in chapter 3. Since the characteristics of shelf life and demand can impact the amount of obsolete products depending on the decisions of the stimulated sales, these characteristics were chosen. While the COGS have an impact on the potential profit loss if the products become obsolete and was therefore of interest to include. Where COGS defines the cost of the manufacturer to produce the products.

In the analysis the product and market characteristics were categorized in order to further characterize the products and evaluate the findings. The categorizations of the product and market characteristics were provided in figure 6. All of the characteristics were evaluated in terms of the range of the values within the different characteristics.

The analysis was further separated into two sub analysis: sub analysis 1 and sub analysis 2. In sub analysis 1 the consequences of the buy-back agreements were firstly analyzed by investigating the characteristics of the obsolete products which were credited. By investigating the shelf life and the demand of these products, it gave an indication of the consequences of the buy-back agreement. Both the crediting of obsolete and all the categories of crediting was applied to evaluate the impact of the obsolete products of all crediting. In sub analysis 1, all products were analyzed, since the demand of products was easy to aggregate and the shelf life of all of the products was available in the data material of the shelf life.

Sub analysis 2, evaluated the correlation of six selected products of obsolete products of four variables that were hypothesized they could impact the amount of obsolete products. These variables were the variance of demand, variance of order, average order size and coverage of the average order size. These products were selected by investigating the six products which was had a high score of multiple criteria. These criteria were profit loss per product due to all categories of crediting, profit loss per product due to replacement of products, profit loss per products due to replacement of monetary value, the amount of products credited and the amount of products credited due to obsolete products. Based on the five criteria, six products which reappeared within the six most credited of the criteria was chosen to further investigate. The criteria were selected, because of the need to reduce both waste of material and value due to obsolete products within the supply chain. This was a result of the objective to increase the supply chain profit and reduce the amount of waste within the supply chain due to the buy-back agreements. However it would be preferable to investigate all products, but it was proven difficult to extract the orders without manually extracting the average order size above automated replenishment and therefore also the coverage.

Further, the variables in sub analysis 2 was due to the findings in chapter 4 and the impact of the variables on obsolete products within the food supply chain included in the analysis. The objective of the sub analysis was to further evaluate the consequences of the buy-back agreements and investigate the characteristics of the products which are the most credited due to obsolete products in units and the products which contributes to profit loss due to the buy-back agreement. Also, by evaluating the product and market characteristics of the selected products, it increased the insight into the consequences and valuable information to include when the stimulated sales on the individual stores were evaluated. To evaluate the impact of the buy-back agreements in terms of demand, the monthly orders in relation to the monthly demand were assessed. By evaluating separately, the monthly demand and the monthly orders, and the correlation of obsolete products a further perspective of the impact of the orders on the demand were further assessed.

As the amount of orders, the order size and the coverage, were found difficult to execute across all products, because it was difficult to differentiate the order size based on the automated replenishment and the order sizes of products related to the stimulated sales of the sale consultants. Since, the orders related to national promotions and activities, which is not stimulated by the sale consultant, all order sizes above the automatic replenishment order size was assumed to be stimulated by the sale consultants. An additional challenge was the different order sizes of the automated replenishment of the same products across all individual stores. Therefore, the automated replenishment was defined by the median of the order sizes of the selected product across the individual stores. The order size was investigated in order to check if it was a correlation of the average order size of the products of all the stores and the average amount of obsolete products per order. Since the order size of the products could benefit from evaluating the demand of the products, the coverage of the average orders further broadened the perspective of the impact of both order size and demand. Therefore, the correlation of average coverage of the average demand across the stores and the average amount of obsolete products per order.

In the second research question, which is related to what information the sale consultants should take into consideration when stimulating sales or stimulating quantity, tangible

information of the most credited due to obsolete products due to the current buy-back agreement was investigated. By assessing the results of the analysis and the findings in the literature, it provided an input of how the sale consultants could potentially reduce the amount of obsolete products and increase the profitability. Here, the results from research question 1 were assessed and it was supplied of additional findings in the literature study.

The analysis was executed by the use of R, which is a free statistical computing and graphics software. R was used, as an alternative to Microsoft Excel, to be able to handle the size of the data sets which was received. The use of the tool was a learning process, where the time-consuming process of learning the programming language prevented the analysis to be further developed in for example including all the products in sub analysis 2.

3 Empirical background

The empirical theory presented in this thesis, which is derived by recurrent observations found in literature, are describing the research environment. In this chapter the food supply chain is presented with characteristics of the supply chain and the grocery chains requirements of the manufacturers are described. Also, the product and market characteristics of the products within the snacks and confectionery are further elaborated with the buy-back agreements which describes the grocery chains specific requirements of the snacks and confectionery manufacturers.

3.1 The food supply chain

To supply to the context of the thesis a definition of supply chains and in particular the food supply chain are presented. The actors within the supply chain and the flow of the materials and flow of the information are introduced. Also, the product and market characteristics are presented with the requirements of the grocery chains.

3.1.1 The structure of the food supply chain

Chopra and Meindl (2016) describes the supply chain as the network of actors, and functions and activities, like material and information flows. These actors directly or indirectly delivers products or services to the final customer by supplying value to the products or services (Chopra and Meindl, 2016). In the food supply chain, the delivery is in products and it is further in the thesis addressed as products. Figure 4 illustrates a simplified material flow of the products, and the actors that is often present in a supply chain. Still, the actors included in the supply chain and the material flows can differ from the presented figure.

Figure 4: Examples of actors within the supply chain

In the food supply chain the actors within the supply chain are similar to figure 4, but has multiple representatives of the different actors and the material flow represented by the arrows which can have multiple channels of material flow. As mentioned by Van der Vorst et al. (2005), the supply chain is illustrated through multiple levels to show the relation between the actors. Depending on the products the supply chain produce, the food supply chain has multiple suppliers that supply the manufacturers the raw material in order to produce the end product. These manufacturers sell their product to multiple distributors, also called the wholesalers. Then, the material flow continues from the wholesalers to the retailers, which later referred to as the individual stores. Romsdal (2014) addressed the changes over the past decades of the structure of how the actors within the Norwegian food supply chain are organized. The wholesalers and the retailers

have merged into a umbrella organizations, in order to further increase the effect of the economies of scale of the volume and improve the bargaining power within the supply chain (Romsdal, 2014). Further in the thesis the retailers are addressed as the individual stores.

The individual stores, which is organized with one grocery chain and one wholesaler which provides products to the stores, sell the products to the final customer. In figure 5 different levels represent the actors of the supply chain, but the levels are not representing the power of the actors, but the flow of the material and the relations between the actors.

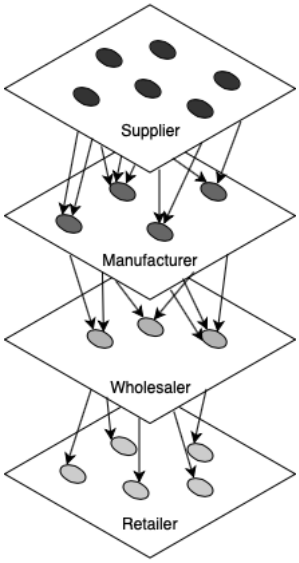

Figure 5: The actors in the food supply chain and the relation between the actors

The actors within the food supply chain conducts multiple processes and activities in order to supply the final customer with the final product. In the perspective of the manufacturer, the manufacturer has multiple suppliers and delivers to multiple wholesalers. In figure 6, Romsdal (2014) illustrated the food supply chain and the processes and activities that each actor performs.

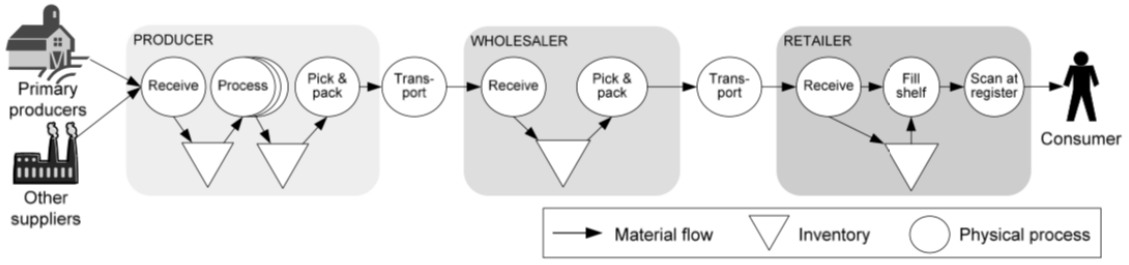

Figure 6: An industrial view on the food supply chain (Romsdal, 2014)

The manufacturer, which are presented in figure 6 as the producer, mainly conducts several processes to manufacture the final product, until it is transported to the wholesaler. The wholesaler stores the products and repacks the products based on

the individual orders from the individual stores, which is defined as the retailer in the illustration. It is repacked since the products often arrive as full pallets of a product from the manufacturer, since the wholesalers supply the individual stores and orders larger scales of each product of the manufacturer. The individual stores receive the products and refills the shelf of the products, and additionally keep an inventory to reduce the probability of stock-out. When the final customer purchase the product, it is scanned at the register and registered to keep a record of the inventory level (Oghazi et al., 2018).

Since the food supply chain is complex with global networks, the manufacturers needs to fulfill requirements from the actors downstream in the supply chain (Yu and Nagurney, 2013) (Romsdal, 2014). To put it in context, the Norwegian food industry is an industry in growth and in 2016 the total revenue within the industry was 244 billions NOK, which was an 8% increase over the five previous years (NIBIO, 2018). In order to ensure continuation of the growth of the industry, the requirements are of importance to fulfill. Therefore, the characteristics and the requirements will be presented to give an overview of the mechanisms and to further illustrate the complexity of the supply chain.

3.1.2 The requirements and the characteristics of the food supply chain

An overview of characteristics of the food supply chain, which the literature suggests, are presented. It is of importance to state that depending on the products produced within the food supply chain and the segment of the market it serves, the characteristics of the products and market segment varies (Dennis and Meredith, 2000). However, when evaluating the food supply chain, two key categories of characteristics are presented in terms of the products and the market. As the requirements of the market and the customer are tightly connected to the characteristics of the industry, it is presented with the characteristics of the market. The requirements give a further dimension to the description of the food supply chain.

The product characteristics

Romsdal et al. (2014) presented perishability as a dominant product characteristic of the products within the supply chain. Where perishability describes the characteristic of continuous decreasing quality until inedible. The perishability characteristic, in addition to the market expectations, contribute to the need for characterizing the products as Fast Moving Consumer Goods *(FMCG)* (Sharma, 2017). With the perishable characteristics of the products, products are ordered more frequently than other products and large volumes are produced to the demand (Romsdal et al., 2014). Because the quality of the product are vital when perishable products are discussed, continuous improvements within the supply chain are necessary (Romsdal et al., 2014)(van Donk et al., 2008).

According to Romsdal et al. (2014) the products provided within the food supply chain are characterized by a low degree of complexity, but a high level of innovations of the products. The supply chain is highly affected by the requirements of the market and the need to satisfy the customers in order to survive in the supply chain. The high level of innovation is a result of the increasing demand for variety (van Donk et al., 2008). As a result of the high level of innovation, a high percentage of the products are slow moving items which indicate that the products has a low turnover rate due to a low demand (Romsdal et al., 2014).

The requirements and the characteristics of the market

Since the characteristics of the market within the food supply chain also describes the requirements of the food supply chain, they are simultaneously presented. In order for the manufacturer to be competitive, the supply chain needs to adapt to the requirements and modify the product characteristics.

The supply chain is affected by uncertainty of demand, which is caused by promotions, advertising, seasonality and trends within the supply chain (Chopra and Meindl, 2016). Taylor and Fearne (2006) suggested that promotional policies had more impact on the the variability and the uncertainty of demand than the seasonality of the products. van Donk et al. (2008) stated that the uncertainty of demand can be a result from the low level of supply chain integration in terms of collaboration between the actors. This will be further addressed in sub chapter 4.3. Also, the uncertainty of demand depends on the characteristics of the products. Whether the products are innovative or functional, Fisher (1997) theorized that these characteristics were decisive of what degree of uncertainty the product would experience. Still, Romsdal (2014) substantiated that this categorization did not include all variations of the products and that all functional products do not have a low degree of uncertainty of demand. Where a functional product was described by Fisher (1997) as a product which had a predictable demand, low margin of products dedicated to the manufacturer and a low variety of products within the category of the product.

The market has changed into being customer driven (van Donk et al., 2008). Pauls-Worm et al. (2013), mentioned that a high service level is expected and both the wholesaler and the individual stores has an expectation of a given number of days of remaining shelf life when the products are received. Standards of the qualities of the products are set not only by the grocery chains, but also national regulations are put in place to ensure food safety for the final customer. Also, the final customer demands high product variety and to increase the options available (van Donk et al., 2008)(Romsdal, 2014). Still, the grocery chains reduces the assortment, to meet the customer demand of reduced prices of the products (NOU, 2011).

The bargaining power integrated in the relationship between the grocery chains and the manufacturer is an important characteristic to further investigate. Hanssen (1996) described the increasing power of the grocery chains in terms of bargaining power between the manufacturers which results in reducing of the prices of the products and thereby reducing the margins of the products of the manufacturer. NOU (2011) described the Norwegian food supply chain as affected by the merging between the wholesalers and the individual stores within the supply chain, which gave them greater bargaining power thereby a larger influence within the supply chain than the other actors present in the supply chain.

As a result of the bargaining power of the grocery chains within the supply chain, the manufacturers need to adapt to the needs of the wholesalers, the individual stores and the customers in order to stay competitive. The grocery chains are in charge in the negotiations with the manufacturers, and decides largely on the content of the contracts (NOU, 2011). Wang and Webster (2009) introduced the markdown money contracts, which describes both buy-back contracts or percent/quantity markdown money, as a consequence of the bargaining power of the grocery chains. The markdown money

contract apply to products of high uncertainty of demand in order to reduce the additional risk of the grocery chains and individual stores, and increases the quantity and visibility of the products within the individual stores (Wang and Webster, 2009) (Eriksson et al., 2017). In the thesis, the markdown money contracts are also referred to as buy-back agreements. In the case study described by Ghosh and Eriksson (2019), when the individual stores had the responsibility of ordering, but no risk in terms of obsolete products as a result of the order quantity, it resulted in a waste of products of 50%. The bargaining power and the buy-back agreements are further discussed in 3.2.2.

In order to extract the essence of the characteristics and the requirements of the food supply chain, the table 4 provides the characteristics of the food supply chain.

Categories	**Characteristics and requirements**
Product	Perishability
	Low degree of complexity
	High level of innovation
	High variety of products
Market	High uncertainty of demand
	Variability of demand
	Customer driven
	Bargaining power of the grocery chains
	High variety of products

Table 4: Categories of the characteristics

3.2 The snacks and confectionery supply chain

3.2.1 Characteristics of the snacks and confectionery supply chain

The supply chain of snacks and confectionery share similar characteristics with the food supply chain. Simultaneously, multiple characteristics are more or less prominent in the snack and confectionery supply chain compared the food supply chain.

Since the products within the snacks and confectionery supply chain are products that are not staple products, but impulse-buy product, the margins of the products are low and the products are defined as fast-moving consumer goods (FMCG)(Malhotra, 2014). According to Malhotra (2014), the products are low margin products are produced in large quantities.

Within the snacks and confectionery supply chain, bargaining power of the grocery chains dominates, because of the characteristics of the products within the supply chain as impulse-buy products. Buyer dominance within the supply chain, where the buyer are the grocery chains, contributes to the buy-back agreements.

3.2.2 The buy-back agreement

The buy-back agreements have multiple names of the equal arrangement, which is for example take-back agreements, return policy and buy-back contracts.

The buy-back agreements are also common in the book publishing supply chain and the fashion supply chain (Wang et al., 2016) (Lee and Liang, 2018). In these supply chains, the assumptions in the literature are that the buy-back agreement are the only replenishment policy that supply the demand of the products (Wang and Ren, 2012) (Yan et al., 2016). In comparison of the use of the buy-back agreement and the wholesaler price contract, Wang et al. (2016), Das (2015) and Wang and Ren (2012) indicated that the wholesaler price contracts resulted in reduced amounts of orders quantities and as a result reduced the profit of both the manufacturer and the grocery chain. Where the wholesaler price contract which is the definition of a replenishment policy where the grocery chain are responsible for the ordering of products and but does not reduce the profit due to obsolete product (Wang and Ren, 2012)

As mentioned in 3.2.1, the snacks and confectionery supply chain is defined by buyer dominance, because of the bargaining power of the grocery chains. With the buy-back agreements it addresses the responsibility of products and sets terms which benefit both the manufacturer and the grocery chains. With characteristics as described as low margin products and impulse-buy products, the grocery chains put in motion the buy-back agreements to allow the manufacturers to increase visibility of the products in stores but also reduces the risk of the individual stores (Canbulut and Torun, 2019). This can result in increase of the profit within the supply chain by allowing the manufacturers to stimulate more sales within the stores (Tavakoli and Mirzaee, 2014). In a sustainability perspective, an evaluation of the environmental aspect of overstimulating products in store which can result in waste if the order size does not match the actual demand.

Still, the terms of the contracts and agreements between the actors in the supply chain are individual from agreement to agreement. In the contracts the order responsibility and the waste responsibility are decided upon. Das (2015) indicated that return of products are common in the book publishing supply chain. Markdowns of products prior to obsolescence of the products or the end of season of other products, can occur in the terms of the agreements. When this occurs, a split of the cost during markdowns based on a percentage rate between the two actors and thereby sharing the risk of a reduction of the price of the products during mark downs (Wang and Webster, 2009).

4 Theoretical background

In this theory section, central subjects are presented with explanations of terms, frameworks and earlier research to be able to achieve the research objective. This chapter aims at creating an understanding of the scope of the thesis and addressing the complexity of the research questions, which will be assessed in chapter 5 through evaluation of the findings of the analyses. The content of this chapter, is the second part of literature study which includes inventory decisions and replenishment policies, demand forecasting and demand management with forecasting techniques and the impact of promotions, sustainability and collaboration of supply chain, and causation of waste within the supply chain.

4.1 Inventory management

By introducing inventory management, the purpose of keeping inventory and the different inventory decisions will be presented to give insight into the ordering process during replenishment of the individual stores. When the buy-back agreements apply, when the sale consultants stimulate sales, the decision making regarding the inventory are the manufacturers responsibility in collaboration with the individual stores. The introduction of inventory management and how the individual stores replenish the inventories gives a general understanding of the replenishment process and what the sale consultants must take into consideration, when they stimulate sale initiatives or stimulate quantity of national promotions or activities.

4.1.1 Impact of inventory

Keeping an inventory is important when the demand are uncertain and to prevent stock-out of the products, but keeping excessive quantities in inventory can result in obsolete products and thereby create waste within the inventory before the product have reached the customer (Stevenson, 2007). Where stock-out indicate that the products are no longer in the individual stores and cannot be purchased by the customer. Kiil et al. (2018) addressed it as a balancing act, between the availability of the products and the risk of obsolete products which are critical to evaluate when choosing a replenishment policy. Where a replenishment policy includes the following decisions: what products, at what quantity and at what time.

In a review conducted by Bakker et al. (2012), it was stated that when making decisions regarding the inventory, the decisions of what characteristics to include defined inventory models. However, the characteristics of shelf life and demand of the products were repeating characteristics that were included in the various inventory models (Bakker et al., 2012). Therefore, the product and market characteristics presented in chapter 3 of the characteristics of the products and the market, should be evaluated when making inventory decisions.

The flow of the material should be determined by the demand that the individual store experiences, in order to reduce the amount of waste within the inventory (Waters, 2008). Consequently, the inventory decisions within the supply chain should be adapted to

the demand to provide products to the final customer at a satisfactory level (Stevenson, 2007). Dreyer et al. (2015) suggested that the planning of the production, inventory and replenishment to be integrated, in order to make the supply chain respond to the demand of the products.

4.1.2 Inventory decisions

In the food industry the characteristic of perishability of the products and the customer requirements of variety of products, it is important to make inventory decisions that reduces the food waste and only keep the necessary inventory in order to supply the demand. The decisions of replenishment, which includes the decision of order size and the order frequency, are further described.

As to when an order should be placed depends on the size of the order, since the decision of order size and frequency are interdependent when supplying to the demand within the individual stores. The optimal frequency of the orders was according to (Chabada et al., 2015) dependent on the shelf life of the products and the additional product and market characteristics. In the case study conducted by Chabada et al. (2015) it was performed on chilled products which decreased the amount of waste due to an increased frequency of orders. As the actual demand of the final customer uncertain in the food supply chain where the degree of uncertainty depends on the products, the frequency of orders can regulate the risk of storing large amounts of products in inventory by increasing the frequency. In figure 7, the relation between the order size and the order frequency are illustrated when the demand are predictable and known. With more frequent deliveries, the average inventory are less than the average inventory of the lower frequency of order.

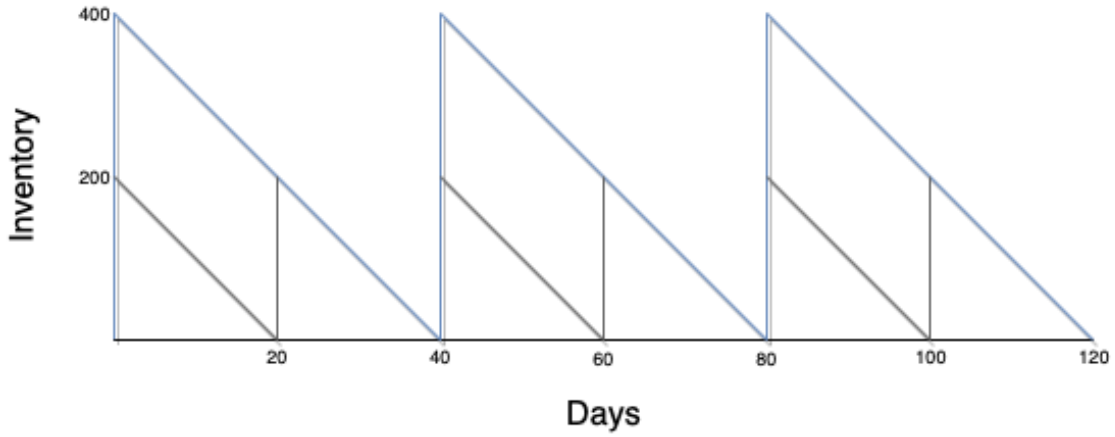

Figure 7: An illustration of the dependency of the order size and the order frequency

The size of the order should cover the actual demand until the next order is placed, in order to avoid stock out. As seen in figure 7 the order size, must cover the demand during a period to be able to provide products to the final customer. A fixed period-ordering which seeks to cover the expected demand for a given period, can be applied if the demand is evaluated over a longer period by forecasting the demand (Stevenson, 2007). With a forecast of the demand and available data of the inventory level, an automatic replenishment of products can be implemented and as a result it can reduce the amount

of waste (Kiil et al., 2018). As previously mentioned, the planning of order frequency and order size of the products should depend on the characteristics of the products and the planning should be differentiated for the products (Kaipia and Holmström, 2007).

4.2 Demand forecasting and demand management

In order to make optimal inventory decisions, a forecasting of the demand is a prerequisite when the demand are not given and uncertain. As a result of this, demand management and the promotional impact on demand, forecasting techniques and information in order to forecast demand and, sustainability and collaboration of the supply chain are presented.

A demand forecasting sets a prediction of the future demand to be able to supply the products to the customers, while the demand management attempt to influence the demand through both promotions and pricing (Stevenson, 2007)(Swink et al., 2017). Consequently, the demand forecasting and demand management constitutes the process of demand planning (Swink et al., 2017). To illustrate these activities, it is further investigated.

The demand management influence the demand forecasts and an integration of these activities improves the forecasts by supplying information. The demand forecasting are referred to as forecasting throughout the thesis. Contextual, Waters (2008) illustrated how the forecasts support the decision within management and how the forecast is improved with input. Figure 8 shows how operations management ultimately make decisions based on the forecasts, objectives and constraints. By supplying information of the demand, the performance of the supply chain and external factors, the forecasts adapts to the market demand (Waters, 2008). Chopra and Meindl (2016) stated that the following affects the forecast: "Past demand, lead time of product replenishment, planned advertising or marketing efforts, planned price discount, state of the economy and actions taken by competitors". The demand can be affected by seasonality, trends or promotions, which can be reflected in the forecast depending on the forecasting techniques applied.

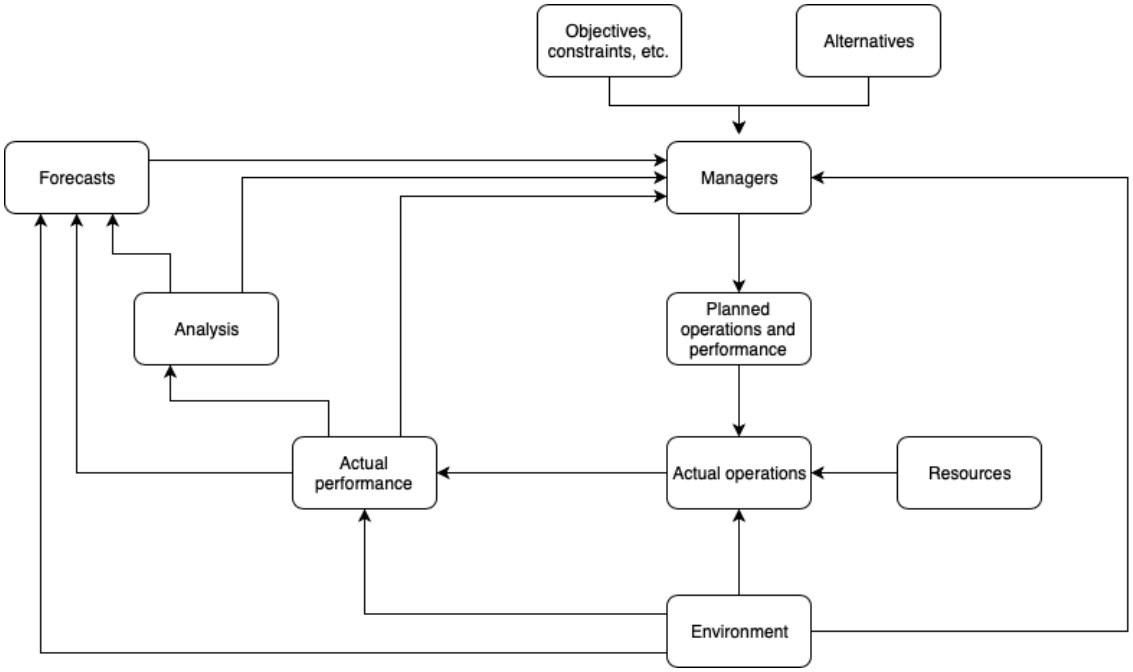

Figure 8: The context of forecasts and management (Waters, 2008)

4.2.1 Forecasting techniques and data material

The forecasting techniques can be categorized as judgment based forecasting, statistical model-based forecasting and simulation models (Swink et al., 2017). Different forecast techniques offer advantages and disadvantages, therefore the situation which are forecasted needs to be assessed in terms of the requirements of the forecasting. Among, the necessary accuracy, the data material and the data availability needs to be assessed (Waters, 2008) (Ma et al., 2016).

The time series analysis models, includes adaptive forecast models like moving average models, exponential smoothing, Holts model and Winters model, but also static models which does not include the forecasts developed prior like the adaptive models (Chopra and Meindl, 2016)(Swink et al., 2017). The combination of the presence and absence of seasonality and trend in the forecast models differ, where the moving average and the exponential smoothing does not include seasonality or trend, and the Holts model include trend, but excludes seasonality. While, the Winters model includes both seasonality and trend (Chopra and Meindl, 2016). The seasonality and trend are included and are linked to the timing of the demand and further patterns in the demand. Depending on the accuracy of forecasting and of the demand, the forecasting accuracy reflects the ability of the forecasting to predict the actual demand. While the forecasting technique categorization of judgment based forecasting, includes for example sale force opinions to utilize tacit knowledge (Waters, 2008).

In terms with valuable information to include when applying, the literature suggested various inputs to improve the forecasting. By supplying true and detailed information of the customer, when the buy-back agreement are the only replenishment policy within the supply chain, it could improve the forecast accuracy (Lee and Liang, 2018). With the same

terms of replenishment policy, Wang et al. (2017) implied that sharing of true information would increase the profit of both actors and thereby the total profit of the supply chain. Das (2015) suggested that previous patterns of demand of the diverse products, the volume of obsolete products and trends across product categories could improve the forecasting in terms of reducing the waste within the supply chain. Ramanathan (2012) suggested, that an improvement in the forecast accuracy can be accomplished by sharing of data related to the forecasting of the demand. Where, the information of demand in the individual stores, inventory level and the success of the previous promotions are information that could improve both forecasting of standard sales and promotional sales (**?**). Where the definition of standard sales are the demands during periods which do not include promotions or an increased visibility of the products.

4.2.2 Impact of promotions and exposure of products on demand

The demand of the products during promotions varies from the standard demand of the products and therefore, the effect of the promotions on the demand of the products are further researched. Ailawadi and Neslin (1998) explained the impact of promotions on consumption by a higher inventory level of the products which results in less stock-outs in the individual stores which also creates a change in the customer consumption pattern.

According to Fassnacht and Königsfeld (2015), a more accurate estimation of the demand during the promotions, can be achieved through monitoring both the impact of previous promotions on both a level of short-term and the level of long-term. So, the performance of previous promotions could give information when evaluating a promotion of a product. Furthermore, Fassnacht and Königsfeld (2015) stated that the cannibalization effect, where the demand of a product decreases as a result of a new product offered by the same company in the market, has an impact on the demand of the products and during promotions it can impact the rate of success. Also, Ma et al. (2016) describes the occurrence of substitutions which changes of the product preference during promotions of a product and therefore a promotion of a product can impact the demand of other products in store. In regards to FMCG products which are impulse-buy products, substituting the products are more common (Malhotra, 2014).

4.3 Collaboration and sustainability of the supply chain

A collaboration between the actors within the supply chain of information sharing or decision making, can improve the availability of products, improvement of the relationship between the actors and advancement of the sustainability of the supply chain (Chopra and Meindl, 2016)(Ashby et al., 2012). Therefore, the collaboration of the supply chain and the information to share in order to increase the sustainability of the supply chain. Further, characteristics of products related to food waste are investigated.

4.3.1 The three pillars and collaboration in the supply chain

The term sustainability relates to the ability to develop the world with both the needs of the present and future generations in mind when making decisions (Brundtland et al.,

1987). Sustainability can be divided into three categories, later referred to as the three pillars, consisting of economic sustainability, environmental sustainability and social sustainability (Chopra and Meindl, 2016). In the thesis, sustainability relating to the pillars of economy and environment are in focus.

Collaboration within the supply chain with sharing of information can improve the sustainability of the supply chain (Blome et al., 2014). As a result of the expectations of the stakeholders, a collaboration within the supply chain are necessary to achieve sustainability that is expected of the stakeholders (Ashby et al., 2012). Where stakeholders in the food supply chain, represent for example customers, government policy makers and scientific community. (Touboulic et al., 2014) addressed the fact that bargaining power within the supply chain, which the snacks and confectionery supply chain experiences, can work as a tool to promote sustainability to the supply chain by choosing the suppliers based on their goals of sustainability. Both flow of material and information should be investigated to be able to achieve sustainability in the supply chain and be able to reduce food waste (Seuring et al., 2008)(Göbel et al., 2015). To focus on the complete supply chain when making decisions, instead of optimizing decisions of the individual actors of the supply chain, it has the ability to increase the sustainability in a holistic perspective both in regards to the environmental and the economic pillar (Chopra and Meindl, 2016).

As ways of achieving sustainability within the supply chain, information sharing is the focus in academic research. By sharing information of the waste of products then the improvement measurements in a supply chain perspective can be achieved (Göbel et al., 2015). Concretely, the food supply chain has the possibility to improve the sustainability and reduction of waste by sharing information, since it has the ability to reduce the uncertainty of demand (Kaipia et al., 2013)(Mena et al., 2014). Related to the environmental pillar, the waste of products are the main contributor to reduction of the sustainability and are related to absence of collaboration and lack of coordination of the supply chain (Ashby et al., 2012)(Halloran et al., 2014). In addition to lack of information sharing, product characteristics are investigated in terms of the relation to waste.

4.3.2 Waste within the supply chain

Firstly, it is important to note that the reasons for waste of food varies depending on the category of the type of food product (Göbel et al., 2015). Where the contributors to waste can be due to shelf life of the products, inventory decision of order size and the customer demand (Halloran et al., 2014). An increase of the demand can be a result of promotions or increased visibility of the products within the individual stores (Halloran et al., 2014) (Malhotra, 2014). However, the order size of the products, demand of the products and their respective shelf life are researched.

Order size

As previously mentioned in 4.1.2, the order size and the frequency are dependent on each other and the order size should match the amount of demand in order to reduce the probability of a product to become obsolete. Eriksson et al. (2014) suggested that a decreased order size of perishable products, which holds short shelf life, could decrease the amount of waste generated. The products in the study developed by Eriksson

et al. (2014), was products within the meat and dairy departments of the Swedish supermarkets. In addition the impact of the order size of the products, depend on the demand of the products and the shelf life (Eriksson et al., 2014).

In term of the variability of orders, Kiil et al. (2018) indicated that products which is ordered through automatic replenishment reduce the amount of obsolete products. As the automatic replenishment policy adapt to the demand, amount of obsolete products and the preferred order sizes (Kiil et al., 2018). This reduces the variability of orders and can potentially decrease the amount of obsolete products.

Demand

The demand of the product, which defines the turnover rate of the product, should be a defining factor of the order size and possible frequency the products can be delivered. The environmental pillar of sustainability should be evaluated in terms of the potential waste through an overestimation of the order size and the total emission during transportation related to the frequency of the products (Chopra and Meindl, 2016). Products defined as low-runners, which has a low turnover rate, are associated with a higher percentage of waste of the total amount of products ordered (Eriksson, 2012)(Eriksson et al., 2014). In order to decrease the effect of low turnover rate on the amount of waste, the initial response would be to either increase the turnover the product, or increase the shelf life or decrease the related order size of the product (Eriksson et al., 2014). Stevenson (2007) suggested that the uncertainty of demand increases with an increasing variability of the demand. Where the uncertainly of demand increases the probability of obsolete products (Stevenson, 2007).

Shelf life

The shelf life of a product defines the potential time of the product to spend in the shelves before the products no longer can be sold to the customer. Amani and Gadde (2015) identified the complexity of both the food supply chain and the demand patterns of the customer as a barrier to establish the correlation of an extended shelf life and the waste related to the products. Here, the objective of the study of Amani and Gadde (2015) was to research if a product could decrease the related waste and not an investigation of individual products with different shelf life. Similarly, Spada et al. (2018) studied the impact of short shelf life products with shelf life of 30-50 days, and concluded that an increase of the shelf life would decrease the waste related to the products. Eriksson et al. (2014) stated that an increased shelf life of a product, not an extended shelf life, would result in a decrease of waste related to the product. Still, the products of low turnover rate had a significant impact of a high shelf life in relation to the generated waste, while the products of higher turnover was less affected by the shelf life of the products (Eriksson et al., 2014).

5 Case study

In this chapter a description of the case with the two companies, Brynild Gruppen AS and NorgesGruppen, are presented. The information of the companies is extracted from the literature study in addition to interviews representatives within both companies. The two research questions are investigated through a quantitative analysis and a literature study, where the patterns in the data material are investigated and key findings are summarized.

5.1 Case description

Firstly, the Norwegian snacks and confectionery supply chain are presented in order to have an overview of the supply chain as a whole. Further, Brynild Gruppen AS and NorgesGruppen ASA are described and the relationship between the grocery chain and the manufacturer are investigated and illustrated.

5.1.1 The Norwegian snacks and confectionery supply chain

The Norwegian snacks and confectionery supply chain, is as mentioned in figure 3.2.1, characterized by high variety of products, highly focused on new products, high volumes and low margins. In the supply chain, brand building in relation to their customers, are in particular important because of the products as impulse-buy products. Where impulse-buy products are sensitive to price of the products, and therefore the demand during promotions can greatly differ from the average demand. In order for the manufacturers to increase market share, the manufacturers need to adapt to the requirements and limitations within the supply chain.

The Norwegian snacks and confectionery supply chain consist of multiple international manufacturers, like Orkla, Mondolez and Cloetta, in addition to smaller manufacturers. The market for snacks and confectionery products, had a growth of 5% in 2016 in terms of profit, but it is a competitive market, where four of the grocery chains control what products are allowed into 99% if the market (NIBIO, 2017) (NOU, 2011). Where four of the grocery chains consist of NorgesGruppen ASA, Coop Norge SA, Bunnpris and REMA 1000. As the grocery chains was organized into umbrella organizations, their bargaining power with the manufacturers has increased (NOU, 2011).

5.1.2 Brynild Gruppen AS

Brynild Gruppen AS is a confectionery manufacturer located in Norway, which was first established, and still is, owned by the Brynild family. In a competitive market, Brynild had a total turnover of 770 MNOK and had 232 employees in 2017. As of 2018, their products are sold in Norway, Sweden, Denmark and Finland. Their different brands consist of Brynild, Dent, Den Lille Nøttefabrikken, St. Michaels and Minde Sjokolade. In addition, they distribute Nivea and together all of the brands make up Brynild Gruppen AS. In Norway they supply the grocery sector in addition to convenient stores.

The sale consultants

In order to increase the sales of their products, sale consultants are the manufacturers initiative to aggregate sales in the individual stores. In Brynild, all of the individual stores that shelf their products, are assigned a sale consultant. The job of the sale consultants are to stimulate sales at the individual stores where an increase of products will either increase the visibility of their products and as a result increase the demand of their products, or stimulate sales of national promotions or activities that the sale consultant estimates will have a greater demand than the initial assumptions of the individual stores. However, the final decision maker of what products and the quantity of products the stores are receiving are the grocer, which is the main manager of the individual stores, therefore the stimulated sales need to be accepted by the grocers.

The sale consultants stimulate sales on multiple product types and different types of promotions. The procedures of how the sale consultants handle the individual stores within different grocery chains differ and the procedures are determined by the individual grocery chain. The sale consultant either stimulate sale by sale initiatives or of existing orders. A sale initiative is a description of a stimulated sale of a non-existing order which can include a reduction of price per customer package for the individual stores. The sale initiatives are initiated in order to increase the visibility of the products. In addition, a simulated sale is primarily initiated by the sale consultants, but the grocer can present opportunities of stimulated sales for the sale consultants.

The types of products that the sale consultants simulate sale on are presented. Firstly, the standard products and the automated replenishment of these products, which are implemented by the grocery chain, are rarely stimulated by the sale consultants. Where standard products are products that is not defined as seasonal or new products. As forecasting of the individual stores determines the estimated demand, through analysis information like historic data of previous demand. Also, because of the circulation of the standard products included in national promotions, where a price discount per consumer package is given to the individual stores, it is a less attractive deal for the grocer. In addition, purchase of additional products of standard products which is placed into the shelves without additional visibility to the customer can increase the waste of the products. Therefore, standard products are often a part of a sale initiative to increase the demand of the customer through increased visibility. Secondly, new products are also products that is promoted through sale initiatives. The new products are like the standard products and has automatic replenishment of the products. Still, the sale consultants stimulate sales on new products through sale initiatives to increase the exposure of the products to the customers. Thirdly, the seasonal products, where the assortment of the individual grocery chain are determined during the negotiations, have divergent procedures within the different grocery chains. Where the seasonal products are products that are explicitly produced in context with for example Christmas, Easter or summer. As an example, in Coop Norge SA the quantities of the seasonal products are decided centrally within the organization of Coop Norge SA. While in NorgesGruppen AS it is job of the sale consultants to present the assortment of seasonal products, which is also decided centrally in the grocery chain, to the individual stores and together with the grocer decide the quantity of the seasonal products. However, the seasonal products are not within the scope of the thesis and will not be further described.

As for the types of promotions that the sale consultant can stimulate sale are by

stimulating additional sale quantity of national promotions, conducting a sale initiative through local promotions decided by the sale consultant and the grocer, or initiating sale initiatives by the set focus periods centrally decided in Brynild. As for national promotions, the grocery chains centrally decide the quantity of the individual stores. However, if the sale consultants with their local knowledge of the individual stores estimates a larger demand of the national promotions, they stimulate quantity of the national promotions. The definition of local promotions are promotions that are specified for an individual store. Since local promotions are seen as unacceptable in the grocery chains except for special occasions since this creates individuality of the stores, but there are some exceptions. For example, Coop Obs are known for local promotions and the promotions are decided between the grocer and the sale consultant. Lastly, Brynild has focus periods for their sale consultants which specifies which products the sale consultants should stimulate sale through sale initiatives. Based on the collected information of an increase in demand of products during specific the times during year, the focus period includes seasonal products, new products, limited edition products and standard products.

When the sale consultant was not measured on the profitability and the resulting waste, a focus on the total amount of quantity of products the sale consultants managed to stimulate resulted in an overstocking of the products within the individual stores. As a solution of this, the performance of the sale consultants is measured in terms of both the total amount of stimulated sale and the amount of products credited. With this in mind, the case study is focusing on the product and market characteristics of the products and a investigation of the causes of obsolete products due to the buy-back agreements.

5.1.3 NorgesGruppen ASA

The grocery chain NorgesGruppen ASA, is an umbrella organization, which consist of stores like Kiwi, Meny, Joker, Spar, Jacobs and Nærbutikken. Together they held a marked share of 43,1 % in 2017, which was an increase of 0.8 % of the previous year (Nielsen, 2018). In 2017, NorgesGruppen ASA within the grocery sector, consisted of 1835 individual stores, where 1021 of the stores was owned by local grocers (SNL, 2019). NorgesGruppen ASA also consist of the wholesaler ASKO, which in addition to supplying the individual stores within NorgesGruppen also supplies other companies outside of the umbrella organization.

As the NorgesGruppen holds the largest market share in the grocery sector and promotes loyalty within the umbrella organization relating to the centrally decided national promotions, they have bargaining power over the manufacturers. The quantity of the order in regard to the national promotions are set centrally for the individual stores. In addition, "NG flyt" is an automatic replenishment system which provides an automatic replenishment of the products based on the shelf space in the stores, historic demand and the inventory level in the individual stores. By joint marketing, the manufacturers pays an admission to be able to supply their products to NorgesGruppen and it covers both marketing fees and it contributes to loyal individual stores as the stores are rewarded by conducting national promotions and activities, like sale solutions.

5.1.4 The relationship between Brynild Gruppen and NorgesGruppen

During the autumn, a negotiation between the largest manufacturers, which includes Brynild Gruppen, and NorgesGruppen happens. The negotiation decides what products that are allowed into the shelves in the individual stores and at what terms (NOU, 2011). For example, price of the products for the grocery chains and, size and placement of shelf space are negotiated. Still, there are multiple negotiations during the year, to decide the national promotions and sale solutions in the individual stores where it is three launch windows during the year (NOU, 2011). According to NOU (2011) the manufacturers experience of the negotiations as strenuous since the impact of the outcome of the negotiations impact the profit of the manufacturer.

The bargaining power of the grocery chains affects the relationship between the sale consultants that represent Brynild Gruppen and the individual stores, since both parties are aware of this. Also, the final decision of what products that are placed in the store due by stimulated sale of the sale consultant, is of the grocer. The reputation of sale consultants that represent the manufacturers are a significant factor of success of the manufacturer and influence what sale initiatives and quantities of already existing orders the sale consultants manage to impact.

Sharing of information are not uncommon between the individual stores and the sale consultant, but the sale consultants do not have unattended access to the demand of the products in stores. Knowledge of demand or national promotions of the products of the competitive products are not accessible for the sale consultants.

The material and information flow

Figure 9 illustrates a simplified supply chain, which involves Brynild Gruppen and NorgesGruppen, and the respective information flow and material flow are supplied. The dotted lines represent the information flow within the supply chain, while the solid line with arrows represent the material flow.

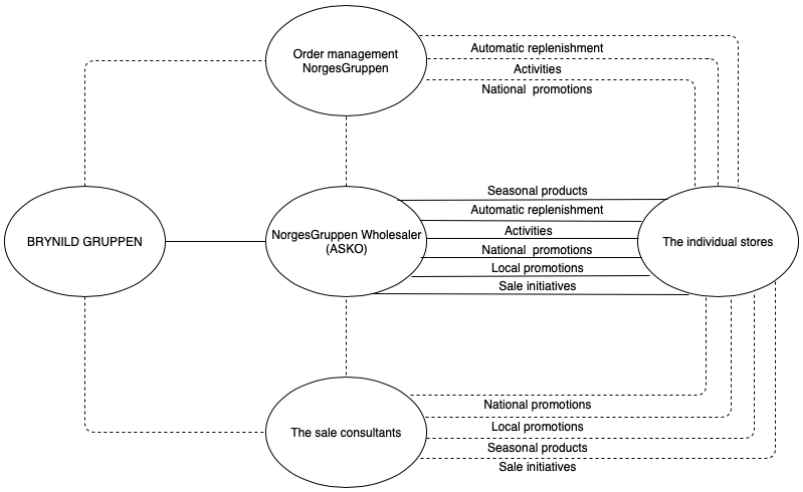

Figure 9: Information and material flow in the supply chain

In addition to the sale initiatives, local promotions and seasonal products, the sale

consultants often stimulate quantity on national promotions and activities of already existing orders. The national promotions and activities go through both the sale consultants and the order management of NorgesGruppen. There is no standardization if the stimulated quantity order goes through the sale consultants or the order management.

The buy-back agreement

The buy-back agreement is an agreement between the individual stores within NorgesGruppen and the sale consultants of Brynild Gruppen. If products that the sale consultants have stimulated sale on, either on the quantity of an already existing orders or a sale initiative become obsolete, the manufacturer replaced the value. Through replacement of monetary value, which is the purchase price of the individual store, or replacement of products. Where a replacement of products are reduces the profit loss of Brynild of 70% in comparison to returning the value of the products. If the products are replaced by new products, it is not given that the products must be replaced by the identical products, but often it is replaced by products of high demand that the grocers accept as a replacement. This is an attractive deal for the individual stores, since the products are a simplified method of receiving refunds where products that are easily sold to the final customer and an thereby an quick return of value and profit.

Within the buy-back agreements, an agreement of risk sharing between the manufacturer and the individual stores when the products, which are a result of a stimulated sale, approaches their end of shelf life. The profit loss of markdowns of 50% and unspecified markdowns are shared equal between the manufacturer and the individual store. In addition to reasons of crediting as markdowns and obsolete products, there are multiple of categories of reasons of crediting. Where crediting indicates a return of value through an agreement between the grocers in the individual stores and the sale consultants. The manufacturers do return value of products which experience breakage ("Brekkasje"), if pick and mix products are left out in the stores by the customers ("Svinn DLN-stativ") or if the products has manufacturing defects ("Tilbaketrekning"). The remaining four categories are related to a reduction of the initial price of the products, of either reduction due to stock depletion ("Grossisttømming" and "Restsalg eget BG lager") or reduction of price due to a sale initiative ("Kampanjerabatt" and "Spesialrabatt"). Where the return of value is conducted through a reduced price per unit or through additional products for the same price. It is a various character of crediting, where for example a promotion discount is necessary to be able to stimulate sale. On the other hand, the category of breakage, where products which becomes this is out of control of the sale consultant by breakage of the products within the stores. However, all categories demonstrate the bargaining power of the grocery chains and individual stores. Since these categories are of dissimilar character, in terms of the influence of the sale consultant these are not evaluated in the analyses.

As previously stated, the final decision of the quantity of products and what sale initiatives to accept are the grocers within the individual stores. The buy-back agreement allows the manufacturer to increase the visibility of their products in the stores and has the potential to increase the demand of their products. But, the risk of crediting of products needs to be evaluated in order to achieve the goal of increased profit and reduced waste due to the buy-back agreement.

5.2 Consequences of buy-back agreements

As the case description has been presented, an analysis of the received data material and the consequences of the buy-back agreements within the snacks and confectionery supply chain are further investigated. The analysis is the project objective of the first research question, which seeks to substantiate the consequences of the current buy-back agreements in the snacks and confectionery supply chain.

Total profit loss for Brynild Gruppen due to the buy-back agreements was in 2017, 5.6 MNOK within all grocery chains. While, the profit loss due to the buy-back agreements within NorgesGruppen in 2017 was 2.1 MNOK. Where all of the categories of crediting are included. This value is again divided into subcategories of profit loss as a result of replaced products and as the result of replaced monetary value. Here, the total loss of profit due to the returned monetary value of the products within all categories of crediting was 1.4 MNOK whereas the profit loss due to replaced products which are registered as was 1.3 MNOK. Of the profit loss by replacing the products, replacement products can be given of multiple reasons, for example the replacement of the value of markdowns can be replaced by products or promotional discounts can also be given in products.

However, when products are given as replacement of obsolete products, the total profit of the manufacturer is defined by the income of the price purchased by the individual stores minus two times the COGS, since the products are produced twice in order to replace the products. The total cost of replacing the obsolete products, according to Brynild Gruppen, are on average 70% of the value of returning the value of the products purchased by the individual stores. The cost of the manufacturer by returning the value of the obsolete products is defined by no income minus the cost of producing the products. Since the category of replaced value does not only include the category of crediting due to obsolete products, but also the additional categories of reasons of crediting. For example, the returned value due to discounts given of sale initiatives.

As a result of all of categories of crediting in both the category of returned monetary value and returned new products, the profit loss due to the value of the replacement goods, are estimated as 50% of the value of when products are replaced by the monetary value. Therefore, the cost of replaced products within NorgesGruppen in 2017, are reduced from 1.4 MNOK to 0.7 MNOK. As a result, the percent of the profit loss due to returned products are 31 % of the total profit loss. Which is a lower percentage compared to the total of all grocery chains, where the profit loss due to returned products are 41%. However, if the returned products were the equal cost of replacing the monetary value, the respective percentages would be 47% and 58%. A further investigation of how the replacement of products by obsolete product affect what products are included in stimulated sale initiatives and stimulated quantity during national promotions and activities will be conducted.

The structure of the analysis is the divided into two sub analyses which seeks to investigate four hypotheses. Where the analysis entails to seek the correlation between the amount of crediting and, shelf life, demand of products, variance of demand and average order size, and coverage of the average order size. Also, the impact of the stimulates sales are evaluated. In sub analysis 1 the evaluation of hypothesis 1, where the correlation of obsolete products due to the buy-back agreements and the shelf life, and

the demand are conducted. In addition, the correlation of all categories of crediting are supplied. While in sub analysis 2 hypothesis 2,3 and 4 are investigated, which includes the impact of promotions and correlation of obsolete products due to the buy-back agreements, and the variance of demand, variance of orders, average order size, and coverage of the average orders. In sub analysis 2, a selection of products is investigated.

5.2.1 Crediting, shelf life and demand of all products

In sub analysis 1, the relationship between crediting, shelf life and demand of the products are investigated, by firstly introducing a hypothesis of the expected result.

Hypothesis 1: Products of short shelf life and low demand result in the most amount of obsolete products.

According to Amani and Gadde (2015), products within the dairy supply chain, which had higher demand also resulted in lower waste of the products than the lower demand products with the same shelf life. In the same dairy supply chain, a significant decrease of food waste occured when the shelf life of the products was increased by three times. Still, Amani and Gadde (2015) noted that it was not clear that the shelf life of the products affected the amount of waste due to a change in attitude of the higher shelf life products and the complexity of the food supply chain. In addition, Eriksson (2012) suggested that products of short shelf life and low demand were more disposed to becoming obsolete.

The crediting of obsolete products and shelf life

As the most obsolete products indicate that the products have expired before reaching the customer, the hypothesis imply that the majority of the products which becomes obsolete are products of short shelf life. The shelf life ranges from 180 to 730 days. Therefore, the shelf life is categorized as short shelf life if the products are lower or equal to 240 days, while above 240 days indicate a medium to long shelf life. The two categories that are considered as obsolete products, are the products which is credited and categorized as expired ("BB Utgått") and replaced products of obsolete products ("Erstatning").Where the category of expired replaces the obsolete products by monetary value, while the category of replaced, replace the obsolete products by products.

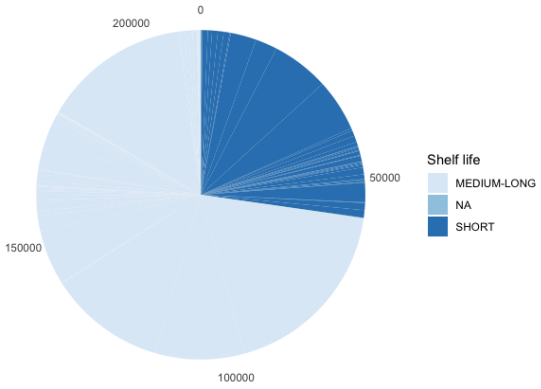

Figure 10: The amount of crediting of obsolete products related to the shelf life of all products

Around 30% of the obsolete products, have a short shelf life. This does not match the hypothesis that short shelf life result in the most amount of obsolete products. Therefore, further research of the differences of the two categories of expired and replaced, which is sub categories of obsolete products, by investigating the distribution of shelf life and crediting of the category of expired products.

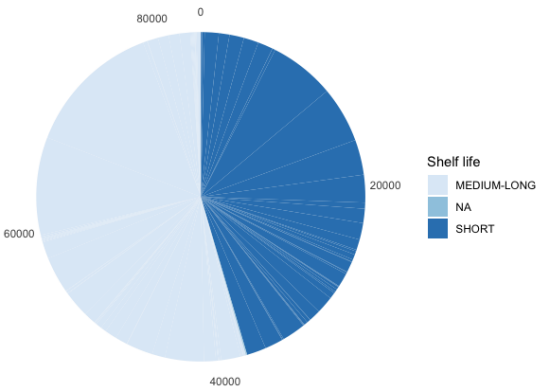

Figure 11: The amount of crediting of expired products related to the shelf life of all products

Figure 11 shows an increase of the amount of obsolete products with short shelf life, but it still constitutes less than half of the amount of obsolete products which is replaced by monetary value.

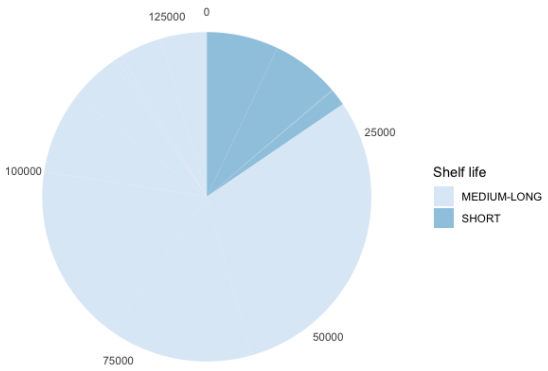

Figure 12: The amount of crediting of replaced products related to the shelf life of all products

In figure 12, it illustrates the amount of crediting of the replaced products in terms of their respective shelf life. It suggests the products that is replaced by new products are products of medium to long shelf life. However, it does not indicate what products it is replaced by, as the products can be replaced by the identical product or other products that is available at the inventories of the sale consultants.

In figures 10, 11 and 12, it suggests that the products of medium to high shelf life, are overestimated in terms of the quantity stimulated by the sale consultants.

Distribution of categories of crediting and the shelf life

By showcasing the different categories of crediting it gives a broader perspective of the crediting of the products and the shelf life of these products. However, the scope of the thesis is evaluating the obsolete products, which includes the categories of expired ("BB Utgått") and replaced("Erstatning").

As seen in figure 10, where the medium to high shelf life products represent the most amount of obsolete products due to the buy-back agreements. In figure 13, it shows that the amount of obsolete products are mostly due to the dominating volume of products of 540 days shelf life, which has become obsolete and are replaced by other products.

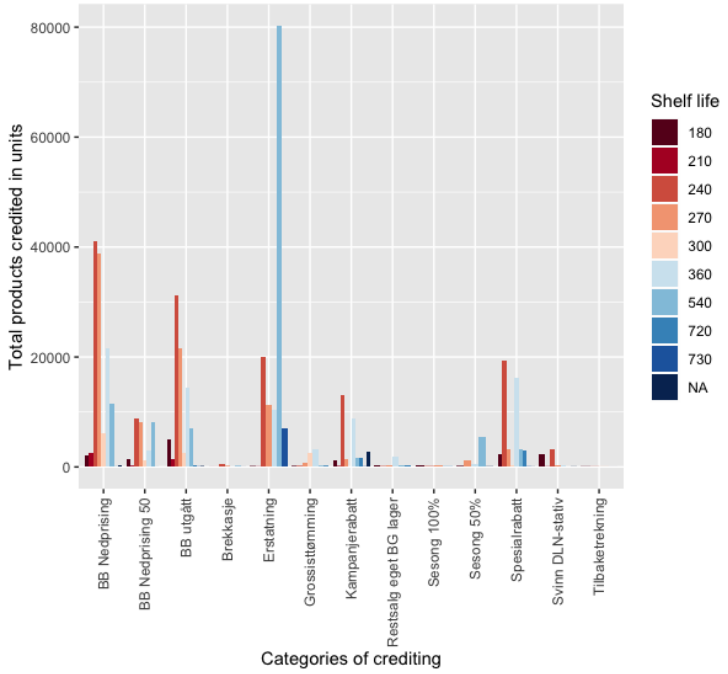

Figure 13: Categories of crediting and the amount of products credited of all products

In terms of markdowns and obsolete products which is replaced by the monetary value, the shelf life of the products which is the largest contributor to these categories are products of shelf life of 240 days. However, the aggregated amount of crediting due to obsolete products which are replaced by products are medium to high shelf life products.

The crediting of obsolete products and demand of the products

The demand of the products is an indicator of the average turnover of the products in inventory depending on the average inventory level. Where the demand is categorized based on the aggregated demand across the individual stores. The same conditions apply to the investigation of the obsolete products due to the buy-back agreement and the demand of the products as the shelf life and the crediting, where the hypothesis imply that the majority of the products that becomes obsolete are products of low demand. These products are defined as low-runners. For a product to be considered as a low-runner, the demand of the products is set as lower or equal to 125 000 sold units during the year, while the products which has an demand above 125 000 are considered as a medium- to high-runner. The products that have not sold any units during the year but is credited during 2017, are marked as NA.

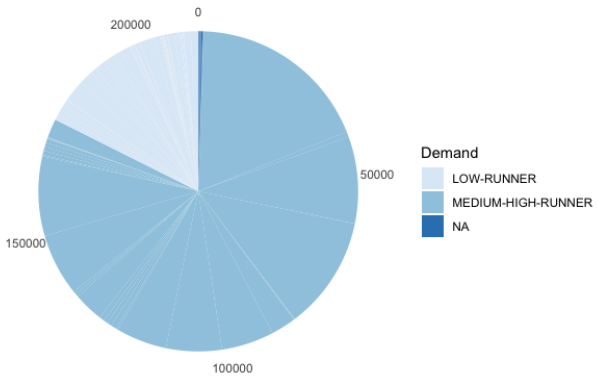

Figure 14: The amount of crediting of obsolete products related to the demand of all products

According to figure 14 the low-runners are less credited due to obsolete products, than the products which is defined as medium- to high-runners. Compared to the percentage of short self life, the low-runner products constitute even less of the amount of obsolete products. To investigate further, the category of expired products alone is compared with the demand of the products.

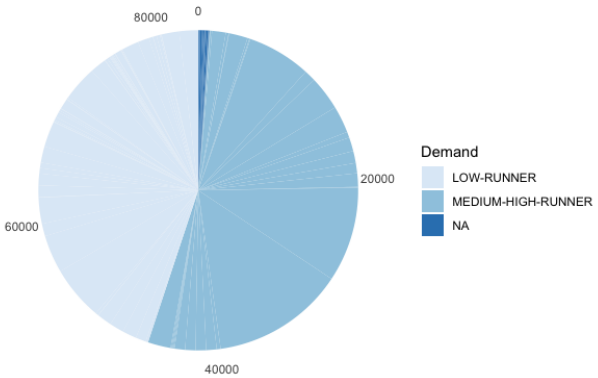

Figure 15: The amount of crediting of expired products related to the demand of all products

In figure 15 it gives the same results as the investigation of the shelf life and the expired products, which is replaced by its monetary value, the percentage of low runners increases.

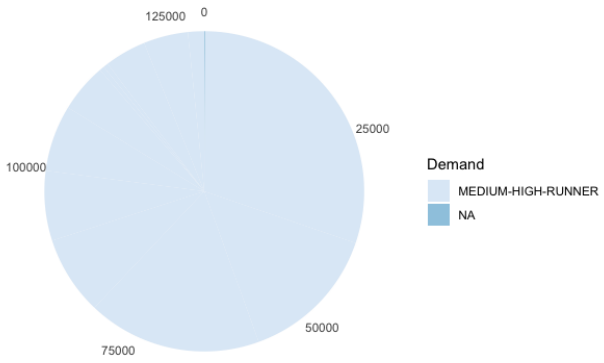

Figure 16: The amount of crediting of replaced products related to the demand of all products

Figure 16 illustrates that no obsolete products of low demand are replaced by products. Although products which are replaced, it does not specify what products it should be replaced with, but figure 16 suggests that low demand products are preferred to be replaced by monetary value oppose to replacement by products of or other products of higher demand.

The correlation of crediting and the demand of the products

It is important to mention that the correlation, does not directly reveal causation, but rather association of the two variables related in the correlation. To support the assumption that products of medium to high demand are more prone to become obsolete due to the stimulated sales initiatives and the stimulated quantities of the sale consultants, research of the correlation of crediting and the demand of the products are conducted.

In figure 17 the correlation of the crediting and the demand of the products, all products and all crediting categories are included. This do not only register the obsolete products which is either replaced by monetary value or products, but also includes markdowns, discounts and retraction of products.

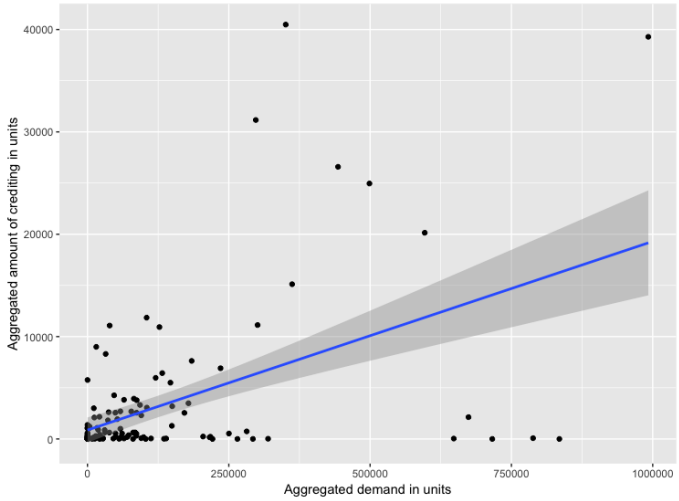

Figure 17: The correlation of all categories of crediting and the demand of all products

The products of 0 in demand are products which is not sold in 2017, but are products that are credited in 2017 due to stimulated sales. Figure 17 show that a higher demand of the products relates to an increase of the amount of crediting, regardless of the categories of crediting. This is a positive correlation. Still, the demand can be affected by the stimulates sales or stimulated quantities of the products by the sale consultants. However, this context is not further investigated.

To separate the crediting categories, the focus of figure 18 is all products that has become obsolete due to the stimulated sales initiatives or stimulated quantities of the products which is either replaced by monetary value or by products. In figure 18 it shows a correlation of the same incline as figure 17 but with a narrower confidence interval. This indicates that it is more likely that an new observation appear near the regression line in figure 18, which indicates a positive correlation between the demand of the products and the amount of products becoming obsolete.

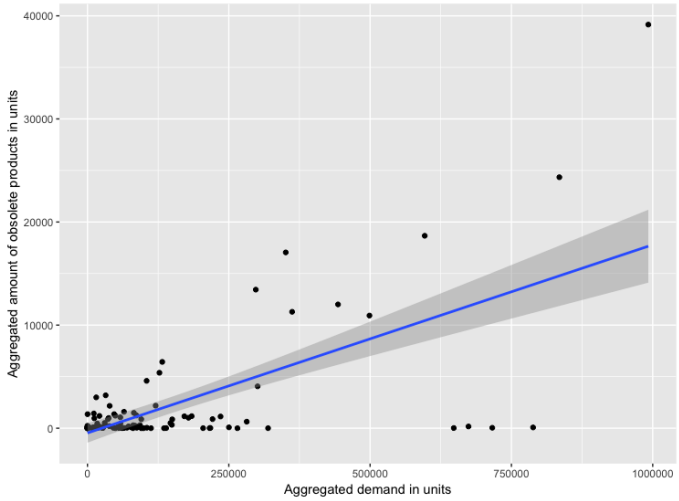

Figure 18: The correlation of the amount of obsolete products and the demand of all products

The products of 0 in demand, are products which is not sold in 2017, but are credited due to obsolete products. As mentioned relating to figure 17 the demand of the products can be affected by the quantity of the products the sale consultant has stimulated and therefore further increase the demand of the products and create a less steeper incline than the credited products of all categories of crediting.

Correlation of crediting, shelf life and demand of the products

In order to combine the shelf life and the demand of the products, and correlate it both to all categories of crediting and crediting due to obsolete products are investigated.

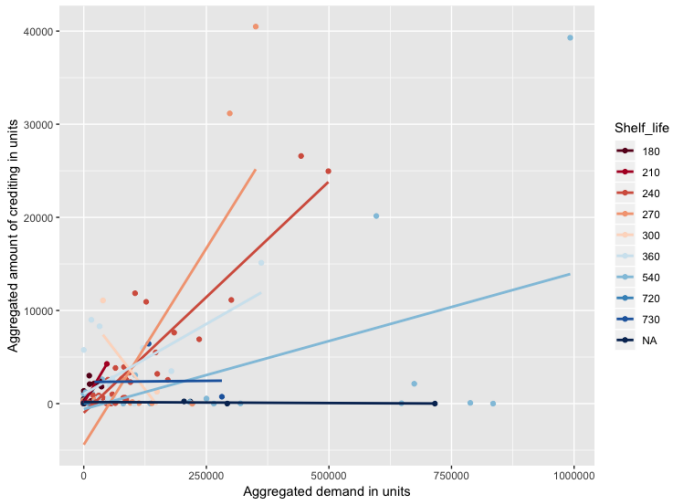

Figure 19: The correlation of the amount of crediting of all categories, the shelf life and the demand of all products

When all categories of crediting are included, the steepest regression line is the products of 270 days shelf life, while the products of shelf life of 300 days have a negative correlation. This indicates that the products which has 270 days shelf life are more prone to all categories of crediting in relation to their demand. All of the products except have a positive correlation except from products of unknown shelf life, 720, and 300 days shelf life, has an decreased amount of crediting related to the products of the respective shelf lives with an increased demand. So, high-runners of the rest of the shelf lives are increasingly more prone to crediting. A further evaluation of all categories of crediting and the aggregated demand is not carried out, but it is provided in order to compare figures 19 and 20. To showcase the impact of the obsolete products in comparison to all categories of crediting on the demand of the products.

In order to investigate the products which is replaced by monetary value or products due to obsolete products, figure 20 illustrates the amount of obsolete products relating to the shelf life and their demand during 2017.

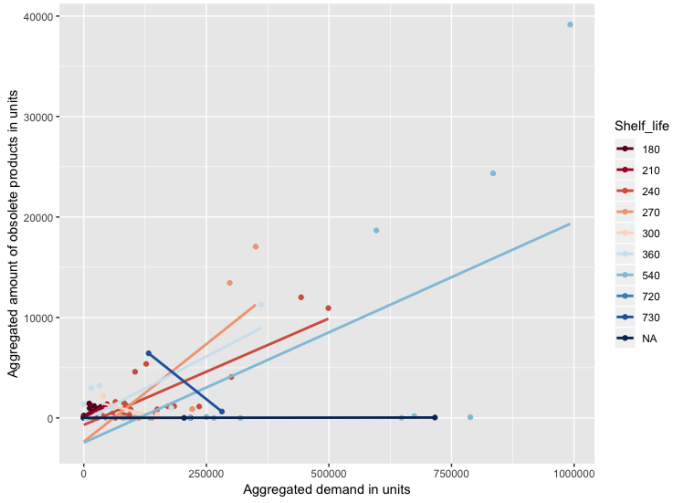

Figure 20: The correlation of the amount of crediting of obsolete products, the shelf life and the demand of all products

In figure 20 the products of shelf life of 520 has kept the incline of the regression line in comparison to figure 19, which indicates that the products of shelf life of 520 days are mostly credited due to obsolete products. However, products of 270 days shelf life reduced the incline of the regression line, where it has a higher average amount of all categories of crediting compared to the average amount of obsolete products.

Figure 19 and figure 20 indicate that both the amount of products credited and the amount of obsolete products is higher for products between the shelf life of 180 days to 360 days, in relation to their demand than for the high shelf life products.

5.2.2 Obsolete products, demand, order and coverage of selected products

Firstly, in the second sub analysis six products are selected to further investigate. In table 5, the products are further described and the choice of the selected products is the result of an investigation of the different aspects of the products and specified criteria.

	Product A	**Product F**	**Product E**	**Product C**	**Product B**	**Product D**
Shelf life in days	540	270	270	240	540	240
Demand in units	992 134	350 735	297 759	443 211	596 629	498 813
COGS in NOK per unit	0,27	1,15	1,33	5,44	1,78	2,4
Amount of total orders in units	1 039 200	359 756	305 657	436 476	576 990	499 054
Stimulated sale/quantity in units	411 480	234 952	201 784	217 494	290 070	245 283
Amount of crediting in units	39 287	40 484	31 161	26 587	20 146	24 957
Amount of obsolete products in units	39 151	17 052	13 441	12 008	18 666	10 927

Table 5: The selected products and their respective product characteristics and the related crediting

For simplification of the characteristics of the products in order to evaluate the different aspects of the products, these are categorized in table 6.

	Shelf life in days	Demand in units	COGS in NOK
Low/short	$x \leq 240$	$x < 125\,000$	$x < 1$
Medium	$270 \leq x \leq 510$	$125\,000 \leq x \leq 350\,000$	$1 \leq x \leq 2$
High/long	$x \geq 540$	$x > 350\,000$	$x > 2$

Table 6: The categorizations of the product and market characteristics

When the products are investigated relation to the impact of the orders on the demand, the variance of the demand, the variance of the order, the average order size and the average coverage of the demand, the products are evaluated in terms of the categorization of the characteristics found in table 7 in order to simplify the comparison of the products in the correlation.

	Product A	Product B	Product C	Product D	Product E	Product F
Shelf life in days	LONG	LONG	SHORT	SHORT	MEDIUM	MEDIUM
Demand in units	HIGH	HIGH	HIGH	HIGH	MEDIUM	HIGH
COGS in NOK	LOW	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM

Table 7: The categorizations of the characteristics of the selected products

Further, hypothesis 2, 3 and 4 are presented and the literature which creates the foundation of the the separate hypotheses are introduced. In these hypotheses, the six selected products are investigated. The impact of the promotions and visibility in the individual stores are researched. Also, the correlation of obsolete products and, the variance on both the demand and the orders are provided. Further, the correlation of the variance of both demand and orders on the crediting are researched. Lastly, the correlation between average amount of obsolete products, average order size and the average coverage of the products are researched.

The impact of the promotions and visibility of products in the individual stores on the aggregated demand

This analysis does not indicate the profitability of the stimulated sales, but an investigation of the impact of stimulated sale on the total demand of the products. A hypothesis is provided in order to substantiate what the literature indicates of the impact.

Hypothesis 2: Promotions and increased visibility within the stores increases the demand.

Lee and Brown (2001) suggested that an increased visibility of products in individual stores increase the sales and profits. However, Teller et al. (2018) recognize that the products increase the sales, but stated the root cause of obsolete products is by increasing the total inventory level in the individual stores. As the products are impulse-buy products, an increased visibility of the products can result in an increase in total demand are the expected outcome of stimulated sales.

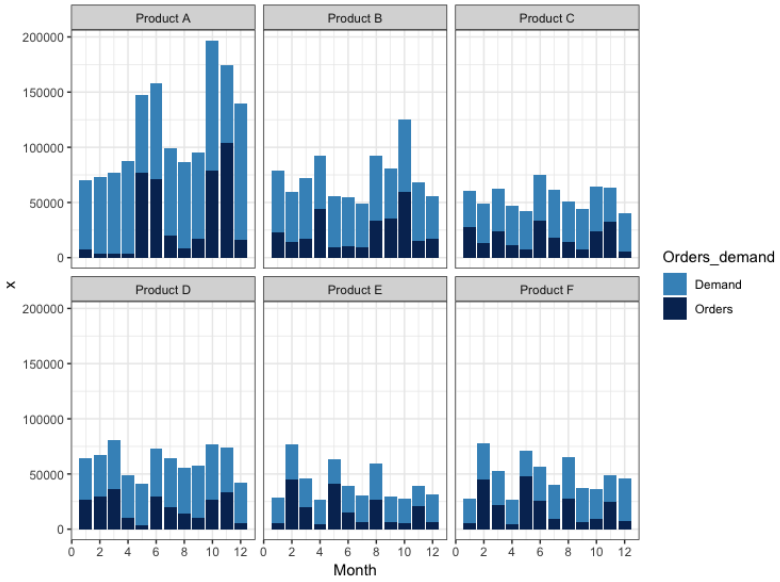

Figure 21: The comparison of the monthly demand and the monthly orders of the selected products

Figure 21 indicated different variability of the monthly demand and the monthly orders. The monthly demands of the selected products are relatively even. However, the demand of product A and product B show a more variable demand per month, where several months excels from the demand of the other months. When evaluating the orders of the products, the variability of the months is evident. Here in particular the variance of the amount of orders in certain months of product A are evident.

When comparing the results of the monthly orders and the monthly demand, the variance of the orders was greater than the variance of the demand. However, the amount of orders of stimulated sales has consistently an impact on an increased demand in comparison to the other demands. When comparing the relatively similar months in terms of the amount of orders, it does not directly show an increase the demand of the products in relation to the size of the order. For example, comparing the order quantity of month 10 and 11 of product A, the demand in month 10 are larger than month 11, even if the stimulated order quantity are larger for month 11.

Variance of the demand and orders, and obsolete products

The variance in the demand and orders are is an indication of variability of given variables. Therefore, the variance of the demand and the orders in correlation to obsolete products are further investigated.

Hypothesis 3: A high variance of the demand and the orders separately increases the amount of obsolete products.

Since variability of the demand increases the uncertainty of demand, Stevenson (2007) indicate that a decreased variability of the demand can decrease the amount of obsolete

products. Where, the variability is measured with the use of variance. In a study of Kiil et al. (2018) it suggests by facilitating automatic replenishment of products, which reduces the variability of the order sizes, it can decrease the amount of obsolete products.

The structure of the analysis of hypothesis 2, is to first evaluate the variability of demand of the products in terms of the variance and then evaluate the correlation of the variance of the amount of obsolete products. The same structure is applied to the monthly order quantities of the products.

The variance of the demand

Firstly, a box plot of the demand showcases the maximum, minimum, mean, first percentile, third percentile and outliers of the monthly demand. These are measures of variance of the demand in the context of the value of the demand.

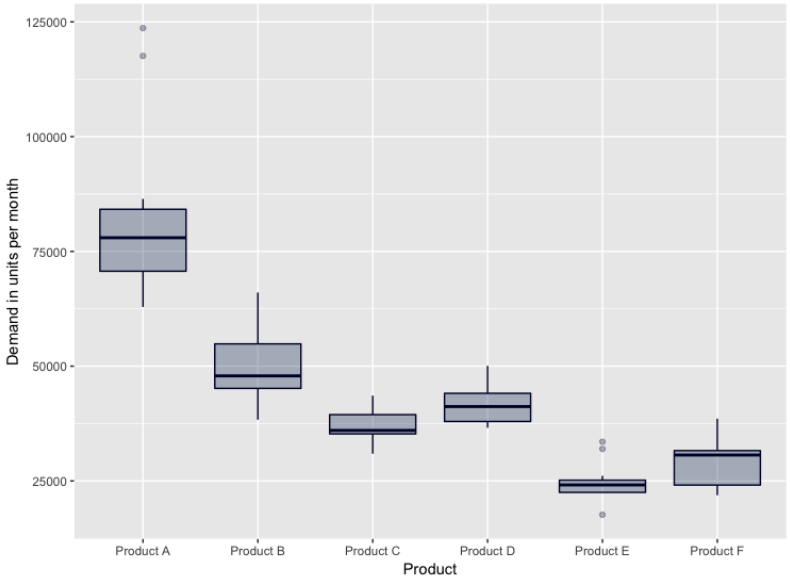

Figure 22: A box plot of the demand of the selected products

In figure 22 product A are the largest box, with additional outliers, which indicate that it is high variance of the monthly demands. Another interesting observation is the insignificant variance of the demand of product E.

When evaluating simply the variance of the demand, it includes all of the months and does not differentiate between the outliers and the products which is between the first and third percentile of the variables of monthly demands.

The variance expresses the spread of the monthly demands during 2017. However, when the spread of the monthly demand increase, the variance of the monthly demand increases exponentially. In the evaluation of the variance of the demand, figure 23 illustrates the variance of the demand of the products. In comparison the trend of the products, Product A and B stands out in terms of the variance of demand. In the comparison of the product of the variance and the product of the highest variance of demand, product C represents 4% of the variance of the demand of product A.

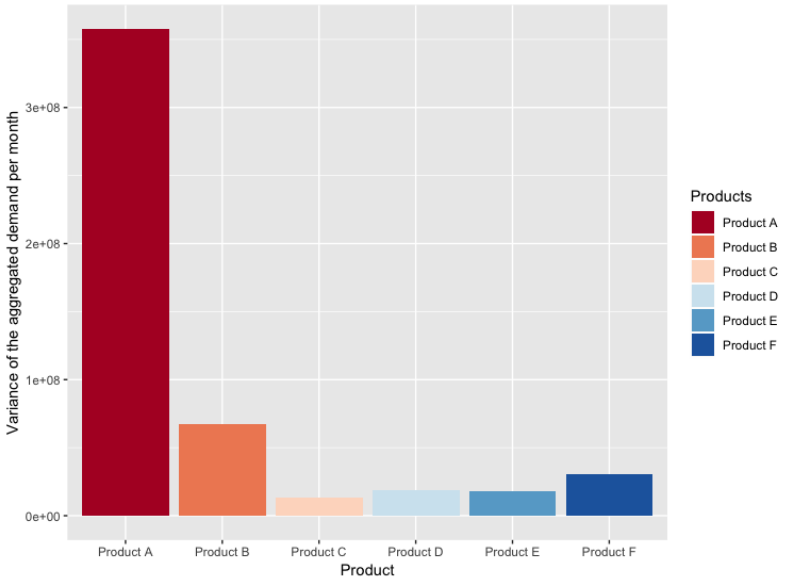

Figure 23: The variance of the demand of the selected products

Correlation of variance of the demand and obsolete products

In order to investigate the relationship of the amount of obsolete products and the variance of the products, an analysis of correlation are conducted. In figure 24, a regression line is provided with a confidence interval to evaluate the trend of the selected products in terms of the variance of demand and the resulting amount of obsolete products due to the buy-back agreements. Figure 24 shows a positive correlation. However, the confidence interval of the regressions line is wide, which indicate a low precision in the regression line. In brief, it shows a positive correlation which indicate that a larger variance of the demand are associated with more amounts of obsolete products.

An interesting finding in figure 24 are that products E and F have less amount of obsolete products related to them, than products C and D despite the approximately same variance of the demand. The difference of these products are that products C and D are products of short self life, while products E and F has a medium shelf life. In terms of the demand of the products, products C and D have a high demand of both of the products, while product E and F has the respective demand as medium and high. However, the total COGS of products C and D are higher of products E and F. The variance of demand can be affected by the amount of stimulated sales, but an estimation of the effect of the stimulated sales are difficult to predict based on the demand of the products. Therefore, an investigation of the variance of the orders are conducted.

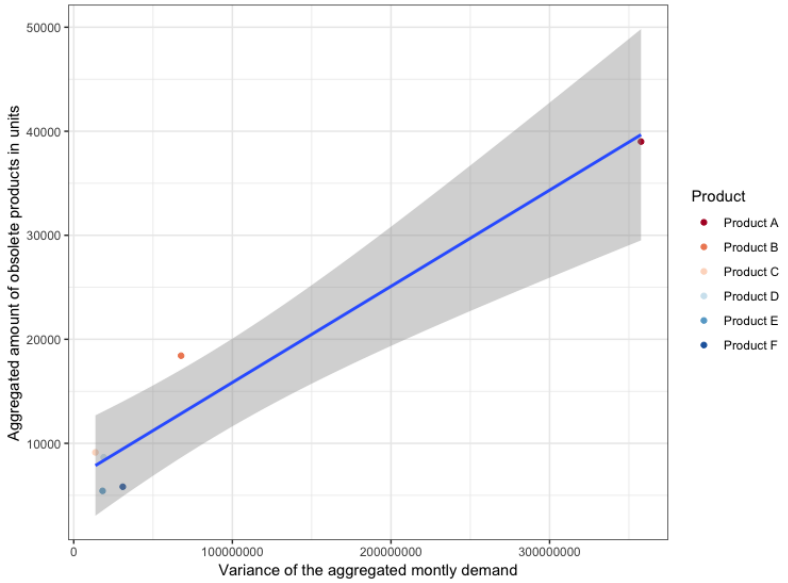

Figure 24: The correlation of variance of the monthly demand and amount of obsolete products of the selected products

The variance of the orders

As the a box plot of the demand, the box plot of the orders showcases the maximum, minimum, mean, first percentile, third percentile and outliers of the monthly orders.

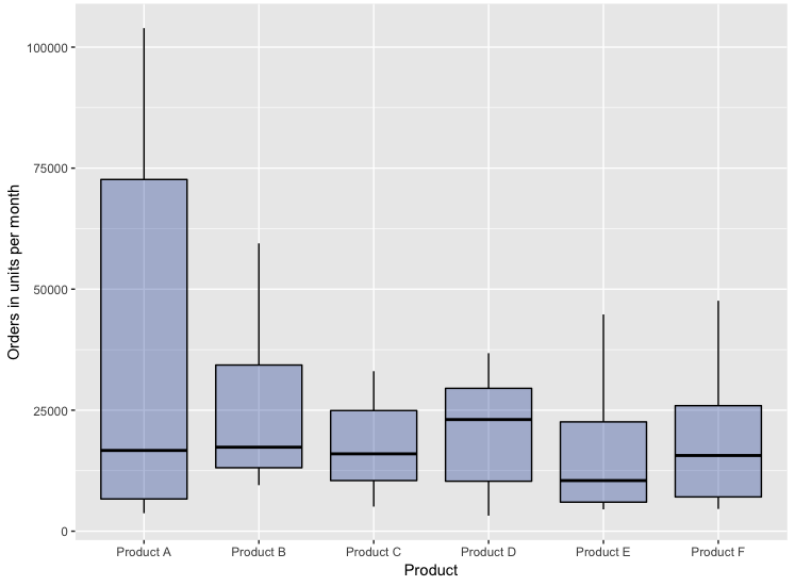

Figure 25: A box plot of the orders of the selected products

In comparison to figure 22, figure 25 show an larger variation of the monthly orders than the monthly demand. However, the mean of the monthly orders is more similar between the selected products than in the the monthly demand. Also, the differences of the variances of the smallest variance (product C) and the highest variance (product A)

are less than the differences of the products in terms of the variance of monthly demand. So, the monthly orders has a larger variance in comparison to the monthly demand, but a smaller difference between the products of the highest and smallest variance and their the monthly orders. However, this is not the case of all of the products.

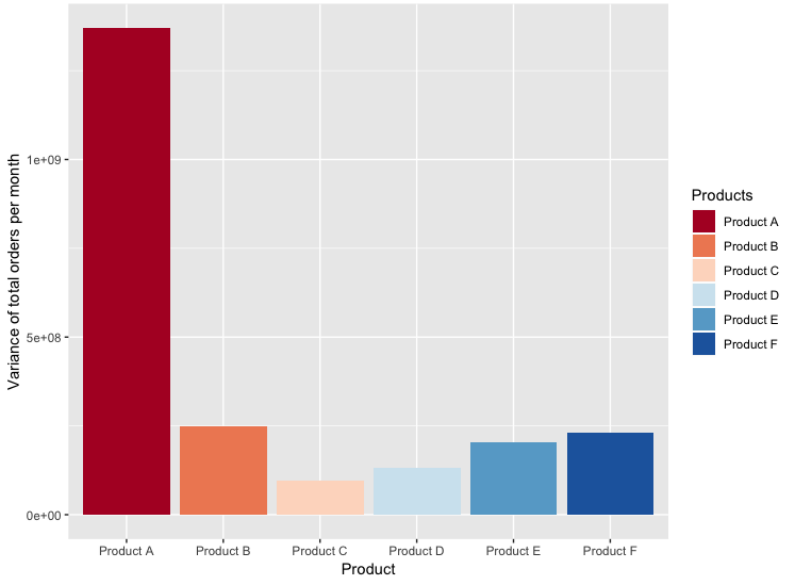

Figure 26: The variance of the monthly orders of the selected products

Correlation of variance of the orders and crediting

The correlation is evaluated in order to be able to investigate the impact of the relationship between the variance of the amount of monthly orders and the amount of obsolete products due to the buy-back agreements.

Product B and product F have approximately the same variance of the aggregated monthly orders. The product and market characteristics of the products are identical except for the shelf life of the products, where product B has a long shelf life while product F has a medium shelf life. In comparison to figure 24, the distance between product group 1 consisting of C and D and product group 2 consisting of B and F are larger in figure 27. However, the orders due to stimulated sales are more even throughout the year of product C and D, it has a larger amount of obsolete products due to the stimulated sales. Therefore, the variance of the aggregated monthly orders have a large confidence interval, but the trend in the analysis show that an increased variance in the aggregated monthly orders have a positive correlation with the amount of products becoming obsolete.

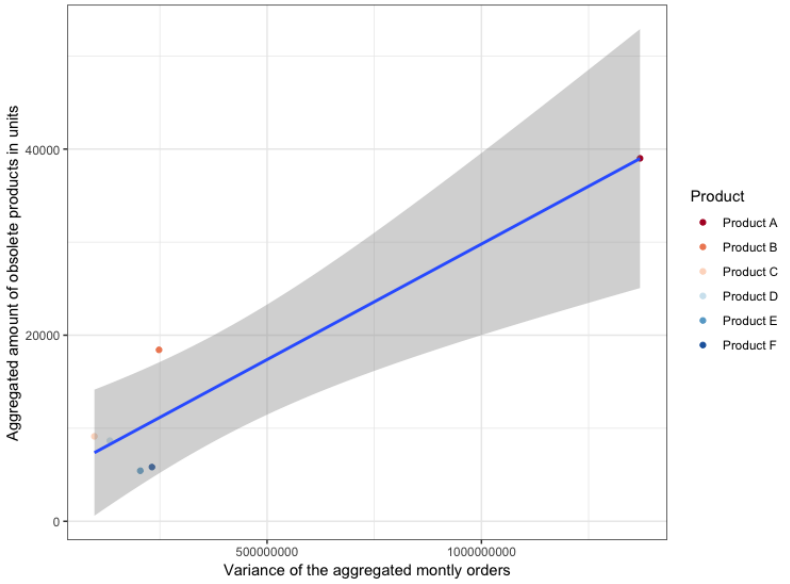

Figure 27: The correlation of variance of the monthly orders and amount of obsolete products of the selected products

Average crediting, average order size and average coverage of orders

The final part of the second sub analysis, where the six selected products are further investigated by researching the average crediting of obsolete products, the average order size and the average coverage of orders.

Hypothesis 4: The correlation of average crediting of obsolete products and average order size depends on the demand and shelf life of the products. Products of short shelf life decrease the amount of credited product with a decreased order size. Also, products of lower demand have a larger amount of obsolete products per order. In terms of the impact of the coverage of the average order size on the amount of obsolete products, which includes both the demand of the products and the average order size, a decreased demand and a decreased order size reduces the amount of obsolete products.

According to Eriksson (2012) a high order size in correlation with short shelf life and low demand was more prone to become obsolete products. Also, by increasing the shelf life of the products and decreasing the order size, it was found that these measures reduced the amount of obsolete products. Still, Eriksson et al. (2014) also suggested that the influence between high order size, short shelf life and low demand needed more research in order to conclude the impact on the amount of obsolete products. Regarding the coverage of the average order size, a gap in the literature was found. Therefore, an assumption of the study of Eriksson et al. (2014), and a combination of low demand and a high order size results in obsolete products. Which results to the assumption that a higher coverage results in a higher amount of obsolete products.

To further investigate this, an analysis of the average order size and the average coverage of the products, in relation to the average amount of crediting of obsolete products per order is conducted.

Correlation of average crediting per order and average order size

The average crediting of obsolete products per order are evaluated across all individual stores of the selected products. In this analysis the average amount of obsolete products is represented by the quantity of obsolete product of an average order, which is stimulated by the sale consultants. By dividing the amount of the obsolete products by the amount of stimulated sales this represents the average amount of products that has become obsolete per average order of stimulated sales. The automatic replenishment orders are not included when evaluating the average order size. The different automatic replenishment order sizes of the individual stores vary, but the median of the order sizes across the individual stores was applied to extract the stimulated sales.

The correlation with the average amount of crediting of obsolete products are illustrated in figure 28.

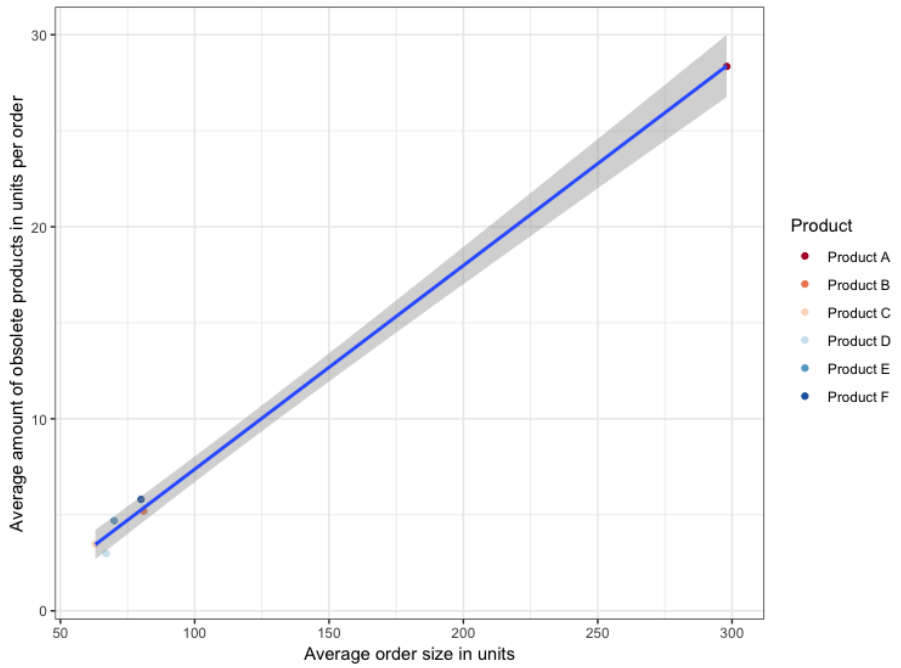

Figure 28: Correlation of the average amount of crediting of obsolete products and the average order size of the selected products

The regression line show that the two variables has a positive correlation, where an increased average order size are associated with increased amount of average crediting due to obsolete products. The confidence interval of the two variables are narrow, which indicates that a new observation is highly likely to end up near the regression line. The correlation indicate that a higher average order size increases the average amount of crediting of obsolete product. Due to the narrow confidence interval, it indicates that despite of the different characteristics of the selected products the order size impact the amount of obsolete products per order.

However, further investigation of the shelf life, the demand, COGS of the products, and the percentage of the orders, which is stimulated sales initiatives or stimulated quantities of the national promotions and activities, are evaluated in terms of the results.

In a comparison of the product of the lowest average order size (Product C) and the product of the highest average order size (Product A), the demand of the products are high, but the shelf life are low and high of the respective products and the COGS are high and low of the respective products. However, product A has a far greater value of both the average order size and the average amount of obsolete products. The two products of the lowest amount of obsolete products of the chosen products are products D and E. These products also have the lowest value of average order size. These products are categorized with the same characteristics: low shelf life, high demand and high COGS. Product F and product B has approximately the same average order size and the average amount credited, but product B has a slightly higher average order size, but a slightly lower average amount of credited and this can be a result of the high shelf life of product B compared to the medium shelf life of product F.

Correlation of average crediting per order and average coverage of the demand of the orders

Similar to the correlation of average crediting of obsolete products per order and the average order size, it is evaluated across all individual stores. Also, the amount of crediting of obsolete products are divided by the amount of orders which is stimulated by the sale consultants. The coverage of the average order size are evaluated in terms of the average monthly demand across all individual stores.

The correlation with the average amount of obsolete products due to the buy-back agreements are illustrated in figure 29.

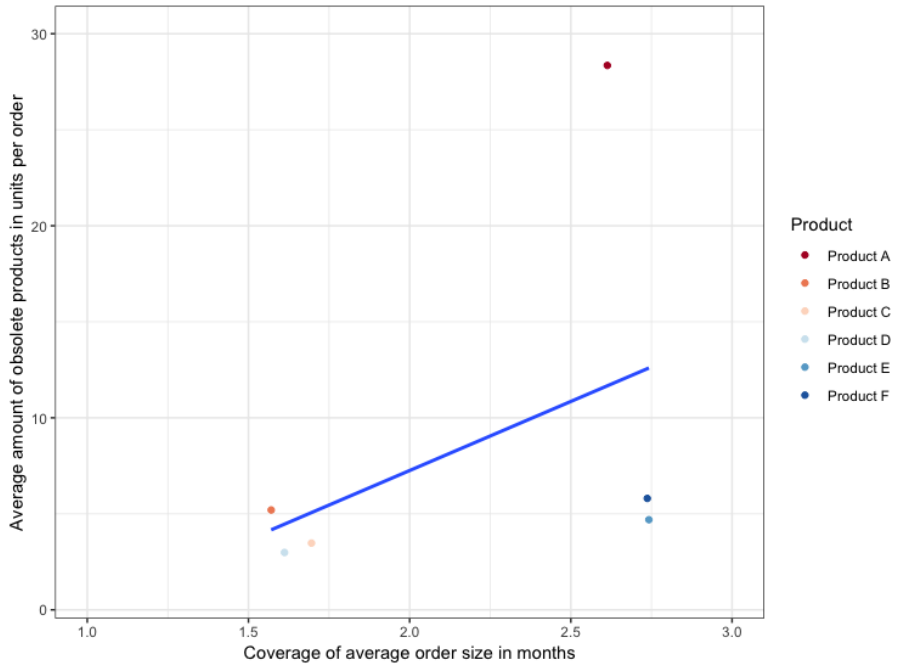

Figure 29: Correlation of the average amount of crediting of obsolete products and the coverage of the average order size of the selected products

The correlation of the six selected products are positive, but based on the selected products it has a wide confidence interval where an illustration of the confidence interval

does not appear as a result of the wide confidence interval of average amount of obsolete products and coverage of the average order size.

Product F and product E has an average order size which has a coverage of 2,5 months, but product E has a lower average amount of credited products per order. With similar categorization of shelf life and the value of products, the demand of product E are higher than product F which is has a higher average amount credited per order. This indicates that product F can be overstimulated in terms of the coverage of the average order size. Because of the high demand, the perception of the coverage of the product are stimulated more than what the actual demand are affected by the stimulated sales. Also, the demand of product E can experience a larger increase of the demand by stimulating sale initiatives by increasing the visibility of the products or as a result of a decreed price per item by national promotions. Also, an interesting finding is that product E and F has a higher coverage than product A, but the resulting amount of average amount of obsolete products are almost 15 times higher in product A. Even if product E and F have a medium shelf life, compared to a high shelf life of product A. However, the COGS of product A is low compared to the medium COGS of product E and F.

5.3 Suggestions of valuable information for the sale consultants

As an answer of research question 2, this sub chapter interpret and discusses what the previous analyses in sub chapter 5.2 can indicate in terms of information of the products could be helpful in order to reduce the amount of obsolete products. Further, an investigation of what data material would be beneficial for the sale consultants to have available in order to make choices of what products and at what quantities would result in less profit loss due to obsolete products. To adapt to the buy-back agreements in the supply chain and evolve the decision making to systematic decision making, instead of judgment based forecasting based on tacit knowledge.

In the analyses of the correlation of aggregated demand and the aggregated amount of credited of all categories and obsolete products in figure 17 and figure 18 indicated that the products of demand between the interval of 350 000 and 600 000 are the products furthest above the regression line. Where the regression line indicates the trend of the observations. In relation to the demand, the products above aggregated demand of 350 000 are defined as products with high demand. Either this indicates that the products of high demand are overestimated in terms of stimulated sales or the demand of these products increase significantly due to the stimulated sales. Therefore, an evaluation of the percentage of obsolete products can be effective in terms of the total profit of the product for the manufacturer. So, the total demand of the product needs to be evaluated in terms of the impact of the sale initiatives on the total profit and demand in addition to the contribution of food waste within the supply chain. A balance of both the cost and food waste of obsolete product in terms of the probability of profit gain through stimulated sales need to be obtained.

In the analysis of correlation of crediting, demand and shelf life in figure 19 and 20 indicated that products with a shelf life of 240 was more impacted of an increase in the demand of the products which again increases the aggregated crediting of all categories and obsolete products. The indication was that low shelf life products had a steeper increase of the amount of credited products of both all categories and obsolete products.

The resulting advice is to be evaluate short shelf life products more cautiously than the products of high shelf life. However, there is also a tendency that products with medium to high shelf life have a high percentage of obsolete products. Therefore, an evaluation of the shelf life in terms of the demand of the individual store are valuable.

The analysis of the impact in the demand by the stimulated sales, which was illustrated in figure 21, a clear indication showed that increased amount of stimulated sales increase the demand of the products. Still, the rate of increase in demand does not equal to the rate of increase in the orders. Therefore, an overview of previous stimulated sales could be valuable in terms of deciding the timing of the stimulated sales and the previous demand during the increased visibility or national promotions.

The analysis of the correlation of variance of the demand and the orders in terms of aggregated amount of obsolete products, indicated that it could be an correlation of the variance of both the demand and the orders of the stimulated sales. Products of a high variance of demand, could benefit from evaluating when deciding the timing of a stimulated sale initiative or what national promotions or activities of already planned orders to stimulate quantity. The impact of the variance of orders had a larger confidence interval, but it could indicate that by decreasing the amount of stimulated sales of the products could reduce the amount of obsolete products.

Regarding the average order size of the products, average coverage of the average order size, the correlation was strong of the average order size and average amount of crediting due to obsolete products. The analysis indicates that a lower order size results in lower amount of obsolete per average order. The suggestion would be to decrease the amount of order size during a sale imitative or stimulated quantity. Still, it is important to note that a decreased order size can result in lost sales and the potential profit could be lost. Also, the stimulated quantity must create a significant increased amount, so that the potential profit gain out weights the potential profit loss due to crediting of either markdowns or obsolete products. The sale consultants must include this in the evaluation to stimulate quantity or refrain on an already existing order. In terms of the correlation of the average coverage and the average crediting due to all categories or obsolete products it is a weak correlation. It seems like the sale consultants evaluate the COGS when making decisions, and here an evaluation of the COGS and the sustainability perspective needs to be evaluated by the sale consultants.

To compare the analyses of correlation of average crediting due to obsolete products, the variance of demand and orders, the average order size and coverage of average order size, table 8 attempt to investigate patterns of the different characteristics of the products and their respective results across the correlation in figure 24, 27, 28 and 29.

	Product A	**Product F**	**Product E**	**Product C**	**Product B**	**Product D**
Variance of demand	Center	Below	Below	Above	Above	Center
Variance of orders	Center	Below	Below	Above	Above	Center
Average order size	Center	Center	Center	Center	Center	Center
Coverage of average order size	Above	Below	Below	Below	Above	Below

Table 8: An overview of the placement relative to the regression line of the selected products

The indicator refers if the product are placed the below, above or in the center of the regression line, which indicate the trend between the variables of the six products. Since the characteristics of shelf life, demand and COGS are complex in terms of the combination, the combination of the characteristics are evaluated in addition to the individual characteristics. It is necessary to mention, that the regression line does not indicate the correlation of all products, but the trend among the chosen products.

In terms of patterns of table 8, the only two products with the same combinations of placement in relation to the regression line are products F and E. These products does according to figure 7 have in common medium shelf life and medium COGS, while the demand differs with a high demand for product F while a medium demand of product E. In terms of their average order size, a reduction of the order quantity could decrease the amount of crediting of obsolete products. Still, compared to the other 4 products, in relation to the products actual demand, the amount of crediting indicates that the crediting of obsolete products are below the average of the selected products.

Product C and product D holds the same set of product and market characteristics, still only half of the placement in terms of the regression line are similar. The variance of demand and orders differs regarding the placement, still the products are relatively close in distance in the analysis of correlation. Products of short shelf life, high demand and high COGS could improve in terms of reduced amount of obsolete products by reducing the coverage of the average demand, despite of the market characteristics of high demand. As previously mentioned, a more nuanced decision of the quantity to stimulate needs to happen in order to not risk stock out in the stores but at the same time reduce risk of large quantities of credited products due to obsolete products.

In comparison with the other products, product A are the product which are the most credited in terms of obsolete products. This is a product that has characteristics of long shelf life, high demand and low COGS, which reduces the probability of obsolete products, still an evaluation of the probability of loss in terms of profit loss compared to the increased demand due to stimulated sales and quantities.

A generalization of the suggested improvements to keep in mind in relation to the characteristics, are hard to evaluate due to the analysis was conducted with six selected products. Therefore, a further investigation of what information would be valuable in terms of evaluating what products and the quantity to stimulate sales in the individual stores should be further evaluated. Ramanathan (2012) addressed that sharing of data within the supply chain increases the ability to indicate the actual demand of the products and reduce the amount of obsolete products.

The main question when it comes to the stimulated sale initiatives and the stimulated quantities, are the probability of profit gain versus the probability of profit loss. Of both stimulated sale initiatives and stimulated quantities, information of previous promotions or sale initiatives of the same products and the rate of success (Ramanathan, 2012). Where the success of the promotion can be defined with different indicators. In the thesis, a suitable indicator would be either the profit gain vs the profit loss due to the stimulated sales, the amount of crediting due to obsolete products and the evaluation of the sustainability. When evaluating the success of a promotion or sale initiative, the demand of the products during the stimulated sales or, the national promotions or activities initiated by the grocery chains. A separation of the demand when the products

are stimulated and when the products purchased due to automatic replenishment could be valuable. The timing of the sale initiatives and the stimulated quantity of national promotions or activities are helpful when evaluating the profitability of the stimulated, as a result of seasonality and trends of products (Swink et al., 2017).

6 Discussion

The discussion provides an examination of the findings in the thesis provided in chapter 5. The two research questions and their related findings are discussed separately.

6.1 RQ1: The consequences of the buy-back agreement

The research question of the consequences of the buy-back agreement are evaluated firstly, by discussing the findings related to research question 1. The limitations of the study are also further discussed.

Profit loss due to the buy-back agreement

With the stated profit loss due to the buy-back agreement, it expresses the profit loss in terms of the products replaced by monetary value and replaced by products. With an even distribution in terms of the initial value of the products by the two different replacement categories, the products that are replaced by products had an actual cost of the replacement of the product by products was calculated as 70% of the products replaced by the actual value. As both replacement categories again include all of the categories of crediting. The profit loss due to replacement of products, it reduces the profit loss of the manufacturer compared to replacement of value. However, it increases the amount of profit in the supply chain. So, does this cause the food waste to increase within the supply chain?

In terms of arguments opposing that the stimulated sales increase the total food waste within the supply chain, is that the additional products replenish the shelves and effects the automatic replenishment orders. When the obsolete products, which is stimulated sale initiatives or stimulated quantities of national promotions or activities, are replaced by new products the responsibility of the products are on the individual store. Still, the replaced products are an indirect food waste due to the buy-back agreements. With the lack of information of the food waste of the individual stores that is the result of the replaced products, it reduces the knowledge of the total impact of the buy-back agreements on the food waste in the supply chain. The food waste due to the replacement products depends if the replacement products increase the demand, by keeping the discount of the price or maintaining the visibility in the store. If the placement of the products or the discount of the price is not further applied, it can result in further food waste within the supply chain and thereby reduce the sustainability of the supply chain. In the same way as the national promotions, the replacement products may impact the automatic replenishment which again can increase the variability of demand of the products. This can have an impact the food waste at the production of the manufacturers.

The buy-back agreements and attitudes towards short term profitability, can impact the sustainability of the supply chain. However, as Brynild Gruppen has increased the focus on performance of the sale consultants, it reflects the manufacturers focus on both long term profitability and sustainability of the supply chain.

Shelf life, demand of products and obsolete products

In the first analysis which is based on hypothesis 1, indicated that short shelf life and low demand products would be the products with the most amount of obsolete products. Analyzing all products that have been credited due to obsolete products it indicated that this was not the case. The analysis indicated that the products with high demand and high shelf life was the products which was mostly credited due to obsolete products and a tendency of overstimulate of products of a medium to high shelf life and of medium to high demand. A reason for this could be that the products of high demand, are more easily replaceable than products. However, products of low demand can also be replaced by high demand products, but products which were replaced conclusively consisted of products of high demand.

On the other hand, the when the products are replaced by products instead of the value of the products then the risk of obsolescence of the products falls on the individual store. So, with a lack of the ability of evaluate and a tool to estimate the probability of profit loss and the probability of profit gain, regarding a stimulation of sale initiative or stimulated sales, the decisions are based on the tacit knowledge of the sale consultants. A use of tacit knowledge, without a calculated decision can cause additional profit loss.

The replaced products create additional waste within the supply chain and decreases the sustainability of the supply chain. Still, the buy-back agreements with the additional visibility in stores and the opportunity to increase the quantity of the national promotions, increases initial demand of the products and increases the probability of keeping multiple national manufacturers in the competitive supply chain of snack and confectionery. As a conclusion of the literature, the products of short shelf life and low demand should be the most credited products and a deviation from this can suggest that the sale consultants stimulate sale initiative and stimulate quantity on the wrong products. On the other side, in the literature shelf life and low demand are characterized differently than in the literature which investigate the meat, dairy and bread supply chain. Where short shelf life in the snacks and confectionery supply chain, is in this thesis, defined as products below 240 days, while the products of short shelf life in the dairy supply chain is defined as 14 days. Yet, as the time of the products are relative the products of short shelf life and low demand are not the most obsolete products. Also, it can be a result that the products with short shelf life and high demand are less stimulated by the sale consultants of than the products of medium to high shelf life and medium to high demand. Therefore, the percentage of the obsolete products per unit stimulated on the products of short shelf life and high demand are higher than the products of medium to high shelf life and medium to high demand. In addition, the COGS of the products which the products of large amount of obsolete products are not investigated, and it could also give a broader perspective to evaluate. Are the most amount of obsolete products of low COGS?

Further, with an increasing demand of the products it results in an increasing amount of crediting of both all categories of crediting and obsolete products. This could suggest that the products with higher demand are more appealing when choosing the products to stimulate sale on. Is this due to a larger amount of stimulated sales or stimulated quantities of the products of high demand, than the products with low demand or medium demand? It is not given that products of high demand can increase the demand more by increasing the visibility in comparison to products of lower demand. When it

comes to stimulating quantity of national promotions or activities, the resulting demand of the promotions are difficult to indicate based on the demand during the periods of standard sale. The timing of the stimulated sale initiative and the national promotions and already planned activities, have an impact on the actual demand during the periods of increased visibility of products and during national promotions.

Suggested by the analysis and figure 19 and 20 the products of low shelf life are more sensitive of an increase of demand of the products and the amount of crediting of all categories and obsolete products. This can indicate that due to the shelf life and the demand of the product, the decisions of the quantity to stimulate are less nuanced of the products of short shelf life. Also, the amount of products stimulated by the sale consultants are larger than they should be in relation to the shelf life and the demand of the products. The products of high shelf life, represented by the shelf life of 540 days, has a less visible change in the regression lines from figure 19 to figure 20. This can suggest that a large portion of the crediting of the products of shelf life of 540 are due to obsolete products. Does this indicate that products which is stimulated by the sale consultants with high shelf life, are neglected in terms of markdowns?

Impact of promotions and visibility in the individual stores

In the investigation of the impact of promotions and increased visibility of the products in the individual stores, figure 21, it shows a clear indication that increased stimulated sales increase the demand of the products. However, the extent of the analysis in terms of the resulting demand are not evident. If this is due to the promotions or the increased visibility within the individual stores are not apparent in the conducted analysis. Also, the effect of an increased quantity or increased amounts of stimulated sales are not indicated.

Primarily, a comparison of the orders stimulated by the sale consultant and the resulting demand can indicate the success of the stimulated sales. Since the products within the snacks and confectionery supply chain, are impulse-buy products where the loyalty of brands is low, the value of the historical data can vary. Also, the monthly demand if no stimulated sales of the products occurred, the results of this is difficult to predict. Since, the monthly demand of the products could vary due to trends or seasonality of the product. Historical data material does not supply all of the necessary information regarding the future demand, it can give an indication of future demand. Therefore, the method of comparing the monthly orders and the resulting monthly demand could be improper. However, the success in terms of increased demand does not show the resulting amount of obsolete due to the stimulated sales which impacted the demand. So, the success of the stimulated sales cannot be based on the impact of increased orders on the demand of the products.

The impact of the stimulated sale initiatives and the stimulated quantities of national promotions and activities are not separated when evaluating the resulting demand of the products. Therefore, a detailed overview of the success of the previous stimulated sales could impact the success of the future stimulated sales. Still, the impact of an increase in the orders of the selected products varied in figure 21. An investigation of the characteristics of the products could have given further insight into the impact of an increase in orders on the demand. By increasing the amount of products investigated and an inclusion of products of low and medium demand, would the result be different

in terms of the impact of promotions and visibility in the stores? Would it have a greater impact, than the products of high demand?

Variance of the orders and demand and the correlation of obsolete products

The variance of the demand, in terms of the monthly demand between the first and third percentile are relatively stable. In addition, on average across the products the maximum and minimum values are close to the mean. However, there are multiple outliers for two of the products. The variance of demand can be affected by seasonality of the products, trends in the market or the impact of promotions and visibility in the individual stores. Given the products within the snacks and confectionery supply chain, which is impulse-buy products the results are surprising. However, the products chosen are products of high to medium demand. Could this be different for the products of lower demand? Could this be due to timing of the stimulated sales?

Of the variance of the orders, the mean of the monthly orders of the selected products are relatively similar. It can have an impact that five of the products have a market characteristic of high demand, while the last product has a medium demand. With a rotation of the products included in the national promotions, it can be an explanation of the similarities of the mean monthly orders. Also, the product of the highest variance of the monthly orders (product A) and the product of the least variance of monthly orders (product C) have the same mean of the monthly orders. This can indicate that product C has a more even distribution of the stimulated sales compared to product A. The product characteristic of product C consist of short shelf life and high COGS, while product A has long shelf life and low COGS. Therefore, an indication of the connection of the variance in orders are that products which has a low COGS and long shelf life, are evaluated as lower risk products and are therefore the monthly orders differs more so than products of other characteristics. Could more frequent orders and more even distribution of the monthly demand impact the amount of obsolete products? The long term effect of stimulating products of long shelf life and low COGS needs to be evaluated in terms of the resulting obsolete products. How does an increase of obsolete products of these characteristics impact the sustainability of the supply chain? In figure 27, it shows that an increased variance of the monthly orders increase the amount of obsolete products. However, by investigating only six products it is a questionable correlation since one of the products has a great impact in terms of the correlation.

When comparing the variance of the monthly demand and the monthly orders, the monthly orders have a larger variance. Does this pay off in terms of profit and food waste? Both the correlation of the variance of monthly orders and monthly demands with the amount of obsolete products indicate that an increased variance of the aggregated monthly orders. But, how does the combination of variance of monthly demand and monthly orders impact the profit and food waste. It is a complex problem statement, since the stimulated sales impact the demand of the products. By stimulating sales to manage the variance of the demand, it cannot be stated that it would decrease the amount of obsolete products since it can result in additional obsolete products and increase the food waste within the supply chain.

Average crediting, average order size and coverage of average order size

In the last part of the second analysis, hypothesis 4 indicated that products of short shelf life and low demand increase the amount of credited products of obsolete products due to increased order size. Also, it suggested that average crediting due to the coverage of the average order size depends on the shelf life and the demand of the products.

In the correlation of the average order size and the average amount of crediting due obsolete products, the correlation is strong. Despite the categorization of shelf life, demand and COGS of the products, the amount of credited products due to obsolete products increases as the average order size increases. This could indicate that the average order size is not evaluated in terms of the characteristics of the products as they should. Products of high demand, low shelf life and high COGS, have a high amount of credited products due to obsolete products, even with a high demand. It could imply that the COGS of the products are more valuated than the actual demand when evaluating the order size, which decreases the amount of credited products due to obsolete products. Still, it is important to remember that by reducing the order size of a stimulated sale, it can result in lost sales and potential profit could be lost.

While, the correlations of the coverage of the average order size of the actual demand of obsolete products are positive, but the confidence interval is wide. As two of the products with the same COGS and shelf life, the product of high demand compared to the product of medium demand, had a larger amount of average crediting of all categories.

This can indicate that the products of high demand are less effective during sale initiatives or error in the estimation of the stimulated quantity. It could suggest that products with high demand and long shelf life, are estimated to have a smaller coverage of the average order size than the products of high demand and medium shelf life. In terms of crediting due to obsolete products, the coverage of the average order size suggests to be impacted by the COGS of the products where a low COGS results in a high coverage, while a high COGS results in a low coverage. The amount of obsolete products due to a stimulated sale, does not seem to be effected by the demand of the products directly. The combination of characteristics seems to effect the coverage of the average order size and the average amount of obsolete products like suggested in the literature. However, the demand of the selected products is not low. It is also important to note that this is an analysis of six selected products and not of all products. This can have an impact on the result of the correlation of the coverage and the average amount credited of obsolete products.

Limitations of the analysis

There are several limitations to the study which have impacted the interpretation of the case study. Where the length in terms of years of the data material and the amount of actors investigated in the supply chain have limited the study. In order to investigate patterns in the data material, it would be valuable to investigate the data material over a longer period of time. The products of supply chain of snacks and confectionery are characterized as impulse-buy products and the demand of the products could have variations of the demand since the supply chain also is characterized by high level of innovation. The new products could impact the shelf space given to the standard products which has the potential to affect the demand of the products. Also, as the study

focuses on one manufacturer and one grocery chain, it limits the study and the validity of providing general advice to the supply chain of the buy-back agreements. A study which included multiple actors within the supply chain would increase the accuracy and the reliability of the study (Noor, 2008).

The limitation of including multiple grocery chains, was due to limitations of data material. NorgesGruppen was the only grocery chain which was included in all of the data material. Also, the limitation of the length of the study related to limitations of the data material and 2017 was the only year which included all of the data material. As a result of the different packages that Brynild Gruppen offers the grocery chains, which contains multiple products, the total demand and total amount of crediting of all categories and obsolete products is not reflected in the illustrations of the analysis. A major flaw in the data material was that a separation of what products the sale consultants had effected through stimulated sale initiatives or stimulated quantity of national promotions and activities. Therefore, an assumption was that all products above the automatic replenishment, which was also assumed across all individual stores, was stimulated by the sale consultants. As a result, an overestimation of the amount of orders related to the stimulation of sales and quantities of the sale consultants decrease the validity of the analysis. This indicates, that it is a higher percentage of obsolete products than suggested in the analyses.

In terms of the categorization of the characteristics limits the study. In the different characteristics, a partition of the values was based on the range of the values. It did not originate in literature found, so in comparison of different studies with different ranges of values, a comparison was proven difficult. In the category which includes all obsolete product, the "seasonal 100%" was not included, which it should have been. Still, none of the products of the second part of the analysis had crediting due to the category of "seasonal 100%". However, the impact of exclusion of "seasonal 100%" the first analysis is still unclear.

Aspects to include in the analysis, which could change the outcome of the thesis, are investigated. If the demand and the shelf life of the products were evaluated, when an evaluation of the distribution of the four sets of combinations of characteristics, a tendency of the combination could have been evaluated. The impact of the result could have given a result if product of short shelf life and low demand was the most credited products due to obsolete products. An evaluation of the value of the products could contributed to an insight into profit loss due to crediting in the sub analyses of the shelf life and the demand related to the amount of crediting due to obsolete products. In the second part of the analysis, an evaluation of all products, could have given more insight into a general idea of how the variance of demand, variance of order, average order size and the coverage of the average order size correlated with obsolete products. Still, it would have made the evaluation of the characteristics of the products difficult.

6.2 RQ2: Suggested available information in order to reduce amount of crediting

With the same structure as sub chapter 6.1, a discussion of the findings related to research question 2 following of the limitations of the findings.

The findings of research question 2, was a result of the literature study of data material to have available to improve the estimation of demand and estimate demand during stimulated sales, and from the analysis of the data material. The suggestions of how to better estimate the demand and the probability of profit gain versus the probability of the profit loss due to stimulated sale initiatives or stimulated quantity, was based on the characteristics of the products investigated in the second part of the analysis.

When the sale consultants stimulate quantities of already existing orders of national promotions and activities, the difference of the profit loss due to obsolete products are large since national promotions and activities that has not stimulated quantities does not result in profit loss of the manufacturer. Assumable, it can have an impact of the size of the stimulated orders and therefore also the total amount of orders of the products. Without further evaluation of the risk of the product in terms of quantity, it can result in additional obsolete products and a decreased profitability. Therefore, a further evaluation of the probability of profit loss and the probability of profit gain can impact benefit potentially increase the profitability within the supply chain.

When stimulating sales, the shelf life of the products is an important characteristic to base the sale initiative and quantity on, when deciding the coverage of the order quantity. In the second sub analysis conducted, the use of the characteristics of the products applied was the COGS, the shelf life and the demand of the products. By evaluating additional characteristics, it could provide additional perspectives and dependencies. For example, the variability of the demand during the year could improve the estimations of the probability of profit loss or profit gain. However, this increases the complexity of the analysis. A more complex analysis is more difficult to draw conclusions or indications of, but it provides a more realistic view on the situation and what characteristics the sale consultants need to evaluate when evaluating what products and the quantity to stimulate at what time.

The stores are individual, and the demand of the products differ, but a finding in the analysis indicate that independent of the COGS, the demand and the shelf life of the products, by decreasing the order size it can reduce the amount of obsolete products. Still, by stimulating a too small quantity of the sale initiative, this can result in a stock-out. Since the profit loss due to a stock-out are larger than the cost of an obsolete product, this must be evaluated. An evaluation of the probability of profit gain versus the probability of profit loss, a more nuanced decision can be made. This must be evaluated further, in terms of what information to include when evaluating this. Also, a standard for acceptable risk should be made since this will give further guidelines to the sale consultants. However, this can limit utility of the tacit knowledge of the sale consultant and decrease the amount of products in the stores. A reduced visibility within the individual stores could give further consequences in terms of the bargaining arguments in the negotiations and further loose shelf spaces to the competitors.

In the analysis it was indicated that products of short shelf life and high COGS are products to be careful with when estimating the demand of the products, since the high COGS increases the loss at a faster rate than the other products with other characteristics. The demand during stimulated sales, changes to a larger extent in comparison to the standard demand, even though the standard demand are also variable as a result of the market characteristics. In addition, the timing of the sale initiatives, national promotions or activities, impacts the resulting demand and it can therefore be difficult to rely on

if information of previous sales of national promotions, activities or sale initiatives are not available. The quantities of the stimulated quantities are more critical than the stimulated sale initiatives, since the loss are often greater than the profit gain of an increased order quantity. Still, since more products in store increases the demand, it is difficult to state the importance of stimulating quantity compared to the importance of the sale initiatives. Based on the findings of the valuable information to have available, the success of previous stimulated sales, national promotions and activities, in terms of demand and the timing of these. Also, information of the competitor demand could give helpful insights, since the products are impulsive-buys and the loyalty of brand are low of the products. Still, according to (NOU, 2011) it should not be done since it can affect the market share in an unethical way.

For the sale consultants to have information of the success of previous sales and the demand of the products, further collaboration between manufacturer and the grocery chains in terms of information sharing needs to be developed. However, the bargaining power of the grocery chains and the competitive market of the snacks and confectionery supply chain, it can be difficult to implement. As information between the actors in the supply chain are concealed to increase bargaining power of the different actors. Still, as the sale consultants have the data of the majority of the stimulated sales, a collection of the information of the resulting crediting of all categories and obsolete products due to stimulated sales.

The limitations of the study are connected to the analysis as previously described in the last sub chapter. An additional analysis of the profit gain vs the profit loss could been informative of the choices of the chosen products in terms of stimulated sale initiatives and stimulates quantities. Still, the focus of the thesis does not include an evaluation of this and could have increased the scope and decreased the validity of the thesis. The most limiting aspect of the analysis was the investigation of the selected products and not inclusion of investigation of the variance of demand, variance of orders, average order size, coverage of the average order size and the average crediting of obsolete products. Still, it would not give additional advice in terms of the characteristics of the products. Since the demand of the products differs from store to store, the analyses were executed at a product level. Still, an investigation at store level based on the amount of obsolete products could give helpful insight. However, the various demand of the individual stores would have made it difficult to give general advice for the sale consultants.

6.3 Summary of discussion

The summary of the discussion addresses the consequences of the buy-back agreements. The products of medium to high shelf life and of medium to high demand are the most obsolete products, which is the opposite of what the literature indicate. However, the percentage of obsolete products of the amount of units which are stimulated sales is not provided in the analysis and limits the analysis.

Since the most replaced products are products of high demand, it can be discussed further if a perception of a lower risk due to a decreased value loss, since the profit loss are 70% less of replacement of products compared to replacement of value. Also, in terms of obsolete products the products of medium shelf life, are more sensitive to a larger demand than the products of low and high demand. A suggestion would be that it is

more difficult evaluate the demand of the products of medium shelf life because of the sale period of the product are less extreme than the products of short and long shelf life. However, it is a high correlation between the average order size and the average amount of obsolete products. This could indicate that the estimation of the stimulated sales does not include all characteristics when estimated. Still, the interactions of the different characteristics within the products are complex are difficult to evaluate the demand during the stimulated sale initiatives, national promotions and activities.

In the correlation with the amount of obsolete products, all analyses showed a positive correlation. However, the confidence interval of the analyses was of various size. With the analysis including the six chosen products, the reliability of the analysis was low. However, it revealed patterns of the most credited products due to obsolete products in terms of profit and quantity. Also, the correlation of average order size and the average amount of obsolete products per order showed a strong correlation. This could indicate that the chosen products are not thoroughly evaluated in terms of the characteristics of the products and the market. An evaluation of the characteristics could potentially decrease the reduce the amount of obsolete products of the products

The decisions of stimulation of sale initiatives and stimulated quantity of the national promotions and activities could improve from tacit knowledge of the sale consultants by basing the estimations of the stimulated sales on the characteristics of the products and additional data material. Since the demand of the stores differ, it is of importance to base the decisions on the specifics of the individual stores. However, the analysis showed an high correlation of obsolete products and the order size of the products. Still, by decreasing the quantity of each orders, stock-out can and affect the demand of the products. Therefore, an evaluation of the probability of profit loss and profit gain through the evaluation of the data material, could give an indication of profitable decisions which could reduce the resulting food waste. Which again could increase the sustainability of the supply chain.

7 Conclusion

7.1 Relevance of study

By investigating the consequences of the current buy-back agreement within the snacks and confectionery supply chain, the thesis gives suggestions of how to adapt to the buy-back agreements. By reducing the amount of waste due to the buy-back agreements. Also, multiple literature studies suggests how the shelf life, the demand and the order size affects the amount of obsolete products, but the definition of the range of the shelf life, demand and order size differs from different supply chains and products. For example, the definition of a high shelf life product within the dairy supply chain are different of a high shelf life product in the snacks and confectionery supply chain. Therefore, an investigation of the snacks and confectionery supply chain could contribute to insight into correlation of the shelf life, demand and order size and the amount of obsolete products.

7.2 Key findings

In terms of the consequences of the buy-back agreements, the the analysis indicated that the most credited products due to obsolete products, are products with a medium to high shelf life and medium to high demand. According to the literature, the products of short shelf life and low demand are the products that result in the most amount of obsolete products. This could indicate that the product and market characteristics are not evaluated in terms of the stimulated sales. Due to limitations of the study, the percentage of obsolete products of the amount of units of the stimulated sales are not evaluated. By investigating all of the products this could provided further insight into the obsolete products due to stimulated sales and the characteristics of the products. In addition, the analysis showed that obsolete products which was credited through replace of products, were consistently high demand products. In terms of profitability, the probability of profit loss reduces due to the lower cost of replacing the product of new products and the products can be regarded as products of less risk by the sale consultants. However, the sustainability within the supply chain of the replacement of products needs to be evaluated in terms of the resulting food waste.

The variance of the monthly demand, variance of the monthly orders, the average order size and the coverage of average orders showed a positive correlation with the amount of obsolete products. However, with the analysis including the six chosen products it reduces the reliability of the correlation. Still, all the analyses indicate that an evaluation of the product characteristics of shelf life and COGS, and the market characteristics of demand could impact the resulting amount of obsolete products. However, the demand due to promotions and increased visibility within the individual stores are difficult to evaluate.

Regarding the valuable information to the sale consultants, information of success of previous national promotions and activities with the demand and the timing are necessary when evaluating the probability of profit loss and the probability of a profit gain. Also, the stimulated sale initiatives would benefit from information of previous

success of the products and the information of the increased demand due to the increased visibility in the individual store. The success of the previous stimulated sale initiative or stimulated quantity, need to include information of the sale quantity, the resulting demand and the timing of the sale. Additionally, the average demand of the products has the potential to evaluate the probability of the profit loss versus the probability of profit gain.

7.3 Recommendations and further work

In the recommendation of further work, a more comprehensive description of what data material would be of interest to reduce the profit loss due to the buy-back agreements within the snacks and confectionery supply chain. By investigating all products credited due to obsolete products and their correlation to variance of demand, variance of orders, average order size and coverage of the average order size. Also, additional focus of the sustainability as a result of the buy-back agreement could provide an interesting perspective of the bargaining power within the snacks and confectionery supply chain. An investigation of other supply chains and the consequences of the buy-back agreement would contribute in the research of the consequences of the buy-back agreements of products of other characteristics. By increasing the amount of actors in the supply chain and investigating patters of a longer time period, the result of the study can increase the insight and validity of the research. Further investigation of the combinations of the characteristics, shelf life, demand and COGS, could disclose the complexity of the characteristics of the correlation to obsolete products due to the buy-back agreements.

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Appendices

A Interview guides

A.1 Interview guide with sale consultants of Brynild Gruppen

The work day of a sale consultant

As a sale consultant, are you also a promoter by profession?

The job of the sale consultant is not the same as the job of a promoter. It is two individual jobs which is employed by Brynild Gruppen. However, the sale consultants also refill the shelves with products in certain stores to keep the stores satisfied with the collaboration and to increase the probability of increased sale of their products in the individual store, but the main job of the sale consultants are to stimulate sale initiatives and stimulate quantity of already existing orders in the individual stores. The promoters visit the stores more regularly and has also scheduled itineraries. They refill the products in the shelves, in particular the pick and mix section of nuts. The job of the promoters are to make sure that the products are visually appealing to the customer. During the month of May the promoters will be fired because the grocery chains want more responsibility and have the individual stores more independent of the manufacturers. This can affect the relationship between the individual stores and Brynild Gruppen, and therefore the relationship between the grocery chains and Brynild Gruppen.

If not, do you work together?

The sale consultants and promoters do not facilitate to work together in the individual stores, but it can by coincidence occur that a sale consultant and a promoter visit the same store at the same time.

Is it a decided upon rotation of the visitation of the individual stores?

An overview of what stores to visit at what day is planned, but the stores can still reach out if they need the sale consultant to be present for some specific reason. The plan take into account the size of the stores and plan accordingly. Therefore, certain stores are visited more regularly than others.

What is taking up most of your days?

The main task of the sale consultant is to stimulate sales, in terms of sale initiatives or stimulated quantity of already planned orders of products included in national promotions or activities, in the individual stores. When present in the individual stores, the placement of the products are checked to conform to the agreements of placement during hunting season. The sale consultants needs to present the products, in order to stimulate sale. Still, this depends on the product type (seasonal, new products or limited addition) and the grocery chain, the necessity to present the products. When stimulating sales, a conversation between the grocer and the sale consultants take place in order to discuss the quantity and if the grocer agree on additional visibility of the products the

sale consultants want to stimulate sale initiatives on. Local promotions are rare, since the grocery chains wish for continuity across the individual stores within each brand. Still, special occasions like re-openings or anniversaries of the stores. Coop Obs has a tendency to want local promotions. Coop Extra, Rema 1000 and Kiwi have defined that only national promotions are run in all of their individual stores.

The job of the sale consultant consist of building relationships with the grocers at the individual stores and understanding the demand of the customers and how promotions and additional visibility of the products affects the demand. Local knowledge of the individual stores are applied in addition to an monitored insight into previous demand of the products in the individual stores with the end goal to increase the profit of Brynild Gruppen.

How is the communication with the grocers?

The communication between the sale consultants and the grocer happens when the sale consultants visit the individual stores. The next meeting with the purchasing manager of larger stores are decided at the previous meeting. Still, the grocer occasionally contact through mail or phone if an issue is time critical.

Information, sale and promotions

What data do you have access to?

Not much data is accessible. What products to stimulate in terms of quantity and sale initiative mainly depends on experience and the gut feeling. If it is a new store, where the sale consultant is unsure about the previously sold amount of different products, the grocers show data regarding the amount of sold items of different products.

Do you have any knowledge of sales consultants from competing companies? Is information shared?

The sale consultants does not have insight information of what products and at what quantity the competing manufacturers sell to the individual stores, in terms of promotions and sale initiatives. Brynild Gruppen and the competing manufacturers fight for the same shelf spaces and for the additional visibility in the individual stores, so it is not natural to have an open dialogue with the competitors. Still, they have a certain idea of the outcome of the central negotiations based on the placement in the shelves and sale initiatives. Since the negotiations are constantly throughout the year in addition to the yearly hunting season, these can change and have an impact on the shelf spaces and what products are in the assortment of the individual stores. Still, the sale consultants have an insight into new products and seasonal products of the competing manufacturers.

Do you have set goals of what products to stimulate quantity or stimulate sale initiatives on the individual stores?

During the central negotiations between the manufacturers and the grocery chains, the national promotions and activities are decided. But the final quantity are not set, since the sale consultants try to change the initial quantity by stimulate quantity of these products. The sale consultants try to stimulate quantity on all national promotions and

other activities. But, does weight the risk of stimulating quantity. However, the grocers in the individual stores are the final decision maker in terms of the quantity.

Also, the management of Brynild defines focus periods of what products to stimulate sale initiatives on, which depend on the seasons. For example, during the months prior to summer they tend to value the sale consultants to push chili nuts (which is a perfect combination with a cold beer) and pastilles.

Still, the sale consultants have the possibility to stimulate sale initiatives that is not defined by the negotiations or by the management by Brynild Gruppen, based on experience the sale consultants and the knowledge of high runners of the individual stores. This increases the visibility of the products and can stimulate the demand of the products in the individual stores.

What product orders are registered directly to Brynild Gruppen and which go through the order management of NorgesGruppen?

If it is stimulated sale initiatives, the orders are registered by the sale consultants directly. The quantity of seasonal products, which is presented by the sale consultants in the individual stores, are registered by the sale consultants. Already registered orders of the individual stores can be stimulated additional quantity, as for example national promotions and activities, can be registered of both the sale consultants and the individual stores. If it is registered through the order management of NorgesGruppen, an change of quantity are done by the grocer. Still, it is necessary to point out that the buy-back agreements are an oral agreement and this is not a signed contract, but it is a common understanding in the supply chain since the power lies with the grocery chains in regard to negotiations and the final decision lies with the grocers within the individual stores.

Do you have insight into order frequency of automatic replenishment or the inventory level at the individual stores?

Do not have insight into this. The job of the sale consultant is to increase the demand of the products, so the sale consultant not stimulate quantity the automatic replenishment of the products.

What information and data from Brynild do you have on hand?

Does not have insight of the inventory level of products at the production inventory. Still, the sale consultants have individual inventories of high runner products if the individual stores wish to replace the obsolete products with high runner products.

Is it additional pressure from Brynild Gruppen to stimulating sale initiatives?

Yes.

Do you have insight into the amount of obsolete products due to automatic replenishment and orders that is not stimulated by the sale consultants?

Do not have this. Since the manufacturer does not need to credit these products, since it is not stimulated by the sale consulants.

Do you have an overview of the expiration dates of the products that you stimulate, in order to have control when the products should be marked down as a result of approach of the expiration date?

The expiration date is not included in the sale history. But, generally the expiration dates are similar for most of the promotions that are run simultaneously. When this is discovered in one store, grocers in other stores are contacted to mark down that exact product. Sale consultants also contact other sale consultants to spread the word.

Can the individual store ask for a better deal of promotions?

The individual stores on occasions ask the sale consultants for better deals if they wish to increase the size of the promotion, in comparison of the central decided quantity of the national promotion. It is not possible to improve the unit price, but more product can be offered, in order to reduce the price per item for the retailer. It is important to note that this is evaluated from case to case, and no standards are specified. The individual sale consultants make decisions, but the management can be contacted if the sale consultant are unsure of an improvement of the promotion is feasible.

Do you often do you plan local promotions?

The chains has a strict policy of local promotions. It is difficult to get local promotions, but reopening of stores and jubilees are more accepted in the industry.

Regarding the material flow of the products in to the individual stores stores, do you have information of which orders are ordered by the sale consultants and which are ordered by the store?

The sale consultants has the overview of what orders are ordered by the sale consultant and what orders are made by the individual stores.

Responsibility and improvement areas

Are you in contact with the grocery chain or just the individual stores?

The sale consultants has the responsibility of the individual stores. The chain sale manager has the responsibility of the grocery chains and the negotiations with the different grocery chains.

What are the improvement areas of the job as a sale consultant?

As a sale consultant the aim is to increase the profitability, by profitable growth. The long term effect of the sale of large volumes of products during the national promotions it increases the risk of obsolescence, can reduce the product quality when purchased by the customer and can decreases the order frequency of the products. The sale consultants want to be more precise of choosing the quantity to stimulate during national promotions and activities, since the sale consultants want more exposure with more sale to the final customer, but at the same time wish to decrease the waste of products and the probability of profit loss.

Crediting of products

Can you explain the different forms for crediting?

The products which is stimulated, are either be marked down where the risk are divided between the manufacturer and the individual store, or it can become obsolete and an refund of the products through replaced value or products. For Brynild it is the most favorable to replace with goods, since this additionally gives an income of the initial purchase during the sale initiative.

What decides whether the stores will receive money or replaced new product for the marked down products and obsolete products?

The stores decides whether they want to receive new products or money in return. Often the stores want replacement goods, since this is a faster solution. With markdowns, the individual store can receive replacement cost of the value of the loss of profit Brynild experiences during the mark downs. ***What boxes needs to be checked in order for Brynild to credit the products?***

During the oral agreement of the buy-back agreements, it is accepted that the sale consultants credit the products that they stimulate sale on which either is marked down or become obsolete. Because of the separation of power within the snacks and confectionery supply chain, this is an accepted agreement within the supply chain. Since crediting also consist of discounts, this is the cost of being able to stimulate sale initiatives in the stores.

Is there a difference in the buy-back agreement if the products are stimulated as sale initiatives or the quantities through national promotions or activities?

This depends on the deal between the sale consultant and the individual store. Mainly, the seasonal products are marked down though the system automatically in the grocery chain, but the products which are standard products or new products which is stimulated through sale initiatives or stimulated quantities of national promotions or activities, these needs to be manually marked down by placing a new bar code over the original bar code of the individual products.

A.2 Interview guide with an individual store within NorgesGruppen

Order frequency and order size

Is it automatic replenishment of products or is it often done manually?

Automatic replenishment of products, except for fruit and vegetables.

What does that depend on?

This automatic replenishment are dependent on the forecast of the products that are based on the historic data, shelf life and the shelf placement.

Does it take into account weather, inventory levels and does estimate the expected future

demand?

The inventory levels are registered in the software and this a source of error. It does include an estimation of the future demand.

Do you often order more than the actual demand, and store the additional products over the store shelves?

Does not store the product above the shelves for additional inventory, because this is a specified policy within the store concept within NorgesGruppen.

Crediting

Are you uncertain of what products to credit, since it is not contractual but an oral agreement?

It is not a problem to remember what deals are made with the sale consultants and because of their power of the supply chain, it is not a problem to credit products that are stimulated by the sale consultants.

Is Brynild Gruppen, in comparison to for example Orkla, on the higher end of crediting of standard products?

It is evident that some sale consultants from other manufacturers are paid by the amount of products pushed and not by the accuracy of the stimulated sales in the individual stores, and this results in additional crediting in individual store that is credited by the manufacturer.

Information and promoters

What information do you have available?

The lists of automatic replenishment, historic data, the inventory and the purchase price of the planned activities and national promotions.

Do you have information of the inventory levels at the wholesaler?

This is not information that is available for the individual stores.

How do you know the inventory level of the products and how do you know that the products in store are approaching the expiration date?

This is a source of error. The level of the inventory are registered in the system, but the amount of products are not always registered correctly. Department managers has the responsibility to detect products that are approaching the expiration date.