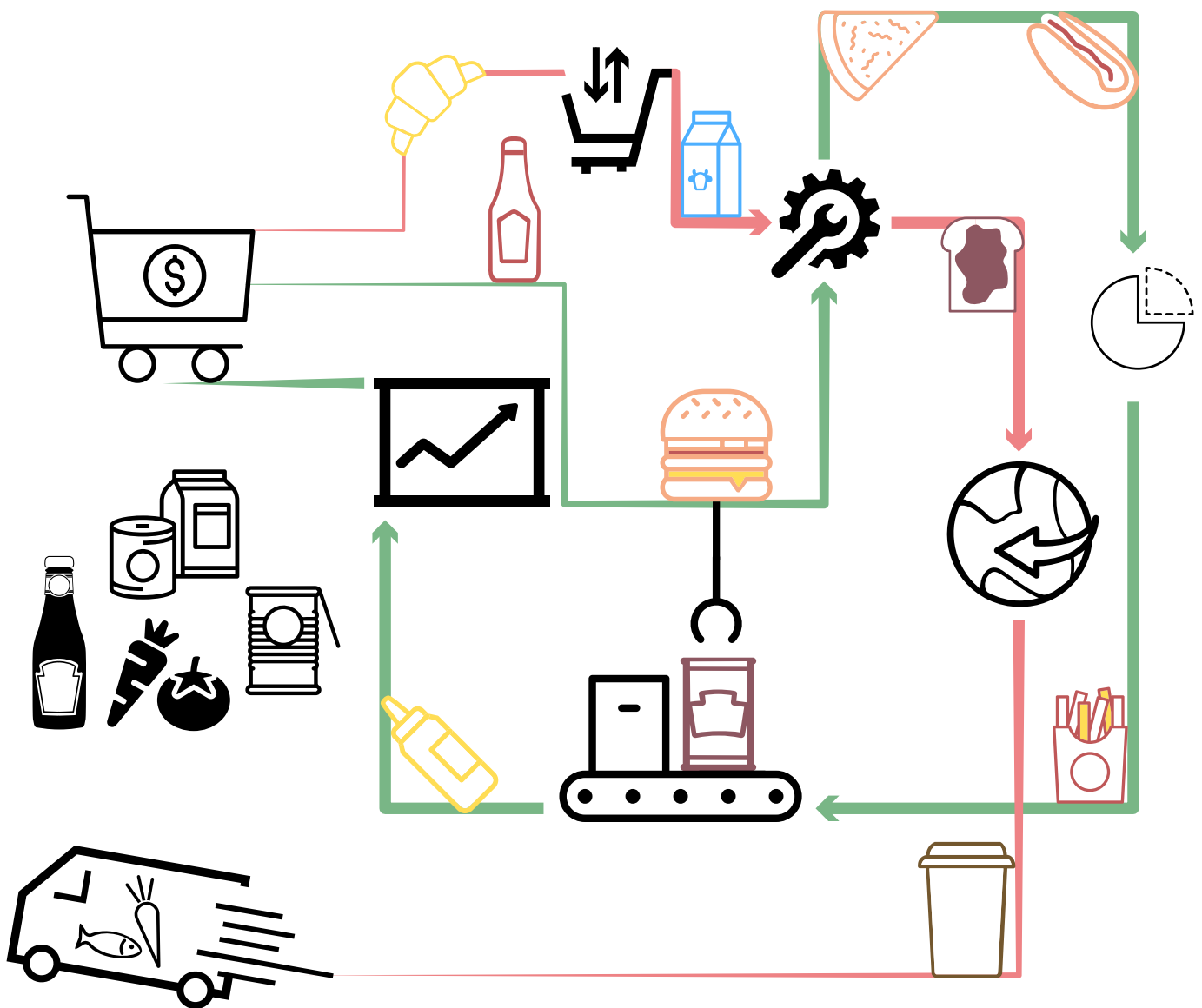


A STEP BEYOND THE FOOD WASTE HIERARCHY IN **FMCG** COMPANIES:

A CASE OF THE **KRAFT HEINZ** COMPANY

Master Thesis

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A step beyond the food waste hierarchy in FMCG companies: A case of the Kraft Heinz Company

Master thesis submitted to Delft University of Technology
in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE

in Management of Technology

Faculty of Technology, Policy and Management

by

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To be defended in public on August 29th 2019

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In God we trust. All others must bring data.

Edwards Deming

For reasons of confidentiality, some information has been hidden.

Acknowledgement

First, I would like to show my appreciation to TU Delft and the city of Delft for becoming my second home during the last two years. I would also like to express my gratitude to the members of the graduation committee for their support during these months. I am grateful to Professor Tavasszy, Professor Ludema and Professor Lukosch for challenging me and providing valuable advice. Thanks to their guidance, I have been able to go a step further and improve the outcome of this report.

I want to thank the Kraft Heinz Company for the opportunity they have given me. I entered the company without any job experience but I felt the support from everyone from the first day. These months at the company became an unforgettable experience. The main person “found guilty” of making sure I enjoyed is Anu. I am truly grateful for his confidence on me and the number of lessons he has taught me. He allowed me to learn so much, not only about supply chain, but also about the whole business. He encouraged me to develop numerous skills which will certainly help me in my future career. I am also thankful to him for transmitting not only his knowledge but also his passion for this work.

I feel blessed and thankful for the friends who have been supporting me during these two years. Thank you to my friends back in Spain for making sure our friendship continued and encouraging me to pursue my dreams. I am also grateful for the new friends I have made during my stay in the Netherlands. Sharing this journey with them has made it more than enjoyable. Special reference needs to be made to my flatmates. Living and sharing day to day experiences with them has become an unforgettable memory.

Last but not least, I could not conclude this section without expressing my gratitude to my family for their support and love. Special thanks to my parents and my brother as they have always done the impossible to ensure I was fine. I am truly grateful they always believed in me and helped me to reach my goals. They are the cornerstone of everything I have achieved and the main reason which brought me to the defence of this project.

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Abstract

Global population is expected to keep growing in the coming decades. The United Nations claims that food production will need to increase by 70% due to the growth of population. It will be challenging to increase food production to those levels if the amount of food losses in the supply chain of Fast Moving Consumer Goods (FMCG) companies is not decreased.

Supply chain losses are the destruction of food which was once produced for human consumption but never reached this purpose. Supply chain losses can happen due to multiple reasons. Incorrect planning, poor forecasting or defective inventory management can be some of the root causes.

This thesis proposal aims to carry out a deep analysis of food waste management in FMCG companies. The available literature will be reviewed and compared with current situation in one of the largest food and beverage companies in the world, the Kraft Heinz Company. The knowledge gap will be addressed and series of improvements will be developed to enhance the food loss prevention process in FMCG companies.

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Executive Summary

This project was born based on the supply chain losses performance of one of the largest food and beverage companies in the world, the Kraft Heinz Company. The initial goal was to analyse and design the needed improvements which could help managing the commercial losses of the company. Based on the initial objective, a literature review was conducted.

This project carried a study of the current literature based on a funnel approach. The relevance of food loss and its relation with the food supply chain was reviewed. At each stage of the supply chain, food waste is generated. Per the level of development of a country, losses tend to occur more at a different stage (Kummu et al., 2012). Nonetheless, food loss is relevant due to the significant amount of money and resources invested as well as the environmental impact. One of the stages in which food waste is generated is the manufacturing and distribution stage. FMCG companies are part of this stage as they process the food received from the agricultural production and deliver it to retailers and wholesalers. Based on this, the relevant literature for FMCG companies related to food loss was reviewed.

Significant topics such as supply chain visibility or inventory management were analysed to conclude with the current literature regarding food loss management. The current state of the art in food loss management highlighted the food waste hierarchy. It is a structured surplus food control system which proposes a series of steps before the destruction of food (Papargyropoulou et al., 2014). Furthermore, Garrone et al. (2016) tested the food waste hierarchy across ten manufacturing companies operating in the north of Italy. Based on their analysis, the authors concluded that the efficiency of the food waste hierarchy is dependent on the level of development in the following factors Fig. 0.1:

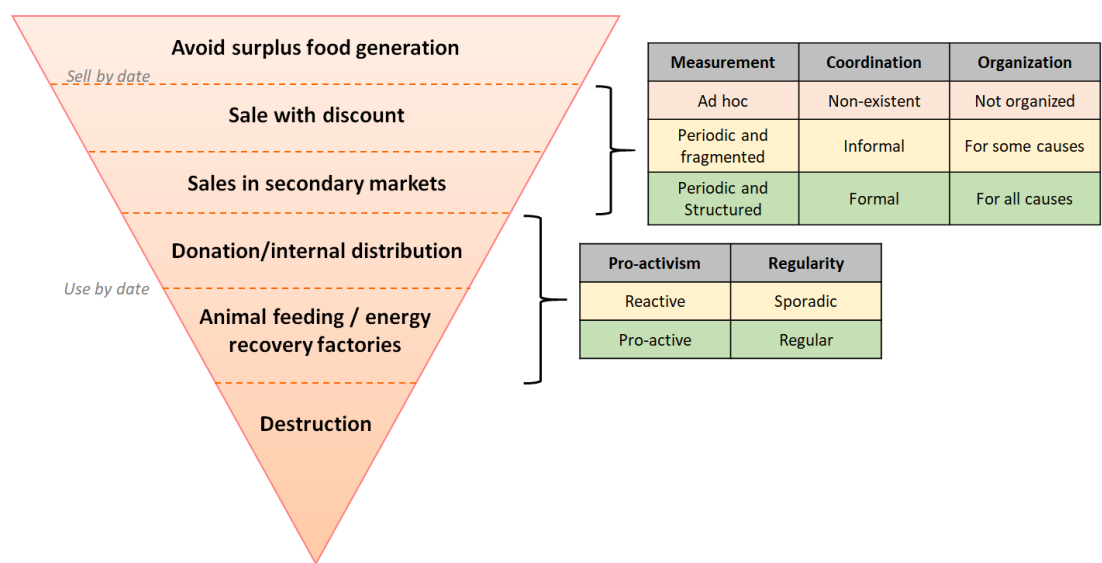


Fig. 0.1: The food waste hierarchy and related factors.

Parallel to the literature review, an analysis of the current situation at the Kraft Heinz Company was conducted. Based on a series of the interviews and data collection, the company was studied as well as their current way of working. Once the analysis was concluded the literature review was compared to the current way of working at the Kraft Heinz Company. It was clear that the company was already following the suggestions from the literature. The food waste hierarchy had already been implemented with a limited rate of success. Even though the company was up to date with the current state of the art in food management, it did not avoid the disposal of some of the company products.

Per the comparison between the literature and the company, it is concluded that a series of variables are not covered in the literature which also impact the performance of the food waste hierarchy. The main topics not addressed in the available literature were:

- The implementation of the food waste hierarchy in multinational companies divided in several business units. The current literature had only tested this hierarchy in companies operating in smaller regions. Once it is implemented in a company where factories/warehouses are spread around Europe and business units face different challenges regarding food loss management, the issue acquires a different dimension.
- The measurement of commercial losses evolution across each BU and the entire company. The literature does not suggest which KPIs can provide a better control of the performance of the company. Moreover, the existence of specific KPIs would allow creating the needed visibility for high management positions.
- The needed processes around each stage of the food waste hierarchy to improve their efficiency. More specifically, there is no guidance in the literature regarding the needed processes or actions to prevent stock from passing the trade window and entering the food waste hierarchy.

The current situation led to the analysis of the supply chain losses drivers at the company. This analysis was developed based on the literature and the interviews conducted at the company. The supply chain losses drivers were divided in those triggered before the production (i.e. incorrect production planning, short shelf life or inaccurate demand forecast) and after production (i.e. clearance efficiency, wrong stock deployment or logistics issues). As this project was developed inside the SC Hub of the company, a stakeholder analysis was carried to understand the interests and power of each of them. This analysis was conducted to develop a series of improvement where the more influential stakeholders could be engaged.

The first development consisted on improving the visibility of the on-hand stock of the company based on the Trade Best Before End (T-BBE) date and the Best Before End

(BBE) date. This visibility allowed the creation of three new KPIs to better measure the performance of the company in food loss (Fig. 0.2):

- New Stock passing T-BBE per week.
- Stock being cleared from Past T-BBE per week.
- Stock expiring and becoming Past BBE per week.

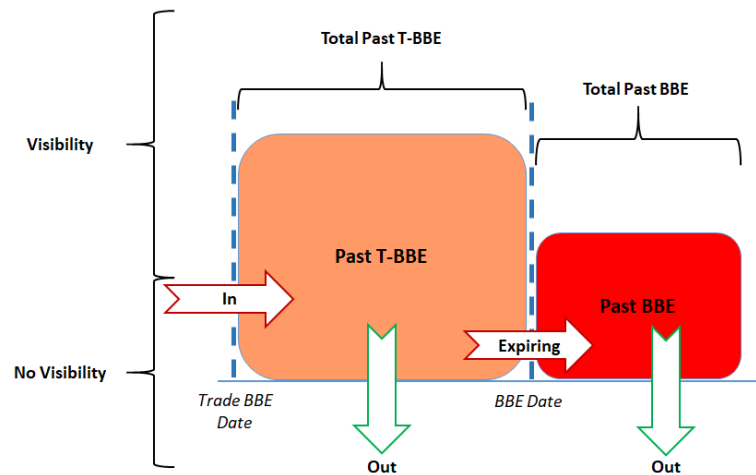


Fig. 0.2: Levels of visibility at the Kraft Heinz Company.

By capturing the flow of stock through these three gates, it is possible to conclude how good the actual performance of each BU is. The ideal scenario to reduce commercial losses would mean that a BU is constantly decreasing the amount of stock passing T-BBE while increasing the amount of stock cleared without new expired products. The enhancement of the current visibility allowed the development of two different tools to prevent food loss.

Firstly, a wrong stock located process was created to highlight the stock which was at the wrong warehouse. This improvement brought the needed visibility for this issue and allowed the development of the needed activities to face it. Secondly, the excess production review process was improved based on the new KPIs. This process, as part of the preventive actions, aims to reduce the amount of stock entering the liquidation process as part of the food waste hierarchy. To implement and engage the needed stakeholders, this process included a likelihood factor based on the data measured by the new KPIs (Table 0.1).

Table 0.1: Likelihood factor for excess production.

Has that EPN passed the T-BBE year to date?	Has that EPN passed the BBE date year to date?	Likelihood factor
No	No	10%
Yes	No	50%
No	Yes	75%
Yes	Yes	100%
New Product Development		

The excess production review process compared the planned productions and the projected on-hand stock with the forecast in demand. If the total future stock was higher than the expected sales, there was a risk of excess production. This likelihood factor allowed narrowing the scope and focusing on those productions which are more likely to present a risk for the supply chain losses of the company. By linking the current stock with the future stock, the stakeholders felt more confident with the process and the engagement increased.

The improvement part aimed to cover some of the gaps in the literature by a series of processes and tools which could be implemented in the company. These improvements were included as part of the loss prevention process of the company and designed to become durable in the long term.

The project concluded by answering the main research question: *How can a FMCG improve the implementation of the food waste hierarchy to reduce their commercial food losses?* Finally, this project made three recommendations for future research based on the analysis. The need to develop new process to enhance the forecast accuracy of the FMCG companies was the first suggestion. Secondly, based on the limitations of the excess production review process, it was proposed to design a process to examine and modify the current production minimum order quantities (MOQ) of the company. If the current MOQ is producing more than what it is expected to be sold, the MOQ should be reduced or the product should not be produced. As this decision concerns different teams within the company, a jointly review process should be developed.

The last recommendation is based on the features of the food waste hierarchy once it is implemented in a multinational company. The available literature was not covering the implementation of this approach in a company divided in business regions in multiple locations. This project suggests the creation of a central clearance team which coordinates and supports the liquidation process when a business unit struggles to prevent their stock from expiring.

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List of Abbreviations

AFF	Affiliates
APAC	Asia Pacific Continent
BBE	Best before End
BU	Business Unit
CFR	Case Fill Rate
CMA	Cost Margin Average
COGS	Cost of Goods Sold
D&E	Distributors & Exports
EBITDA	Earnings before Interests, Taxes, Depreciation and Amortization
EMEA	Europe, Middle East and Africa
EPN	European Product Number
FA	Forecast Accuracy
FAO	Food and Agriculture Organization
FEFO	First-Expired-First-Out
FIFO	First-In-First-Out
FMCG	Fast Moving Consumer Goods
FSQ	Food Safety Quality
GAS	Germany, Austria and Switzerland
KHC	Kraft Heinz Company
KPI	Key Performance Indicator
LATAM	Latin America
LSP	Logistics Service Provider
MEA	Middle East and Africa
MOQ	Minimum Order Quantity
MTO	Make-To-Order
NOD	Notice of Discontinuation
NPD	New Product Development
NSV	Net Sales Value
OH	On-hand
P&L	Profit and Loss
QSM	Quick Serve Meals
R&D	Research & Development
R&P	Raw & Packs
RCA	Root-Cause Analysis
RIRO	Run-In-Run-Out
SC	Supply Chain
SCL	Supply Chain Losses
SF	Sales Forecast
SKU	Stock Keeping Unit
SS	Safety Stock

T-BBE	Trade-Best before End
UK	United Kingdom
WH	Warehouse
ZBB	Zero-based budgeting

1. Introduction

1.1 Background

In 2018, the Kraft Heinz Company (KHC) commercial budget in Europe suffered a hit of \$XXX. Out of the total, \$XXX worth of finished goods and \$XXX worth of raw and pack materials were destroyed and became supply chain losses. On top of that, the Kraft Heinz Company suffered a hit on their profit worth of \$XXX due to clearing the stock once it was past the sell by date. Supply chain losses is defined in the KHC as the stock which is written off once sent to destruction. Supply chain losses due to manufacturing or logistics issues are not considered in this project as it will not be included in the scope of the project.

At the beginning of the year, KHC had the target of zero supply chain losses and a maximum of \$XXX worth of raw and pack materials destroyed. Given the situation at the end 2018, the KHC needed to improve the supply chain losses reduction process.

For a FMCG company such as the Kraft Heinz Company, supply chain losses have a negative impact in many areas:

- It increases the costs related to inventory such as storage expenditures.
- To write off the stock adds extra costs as the company must pay for the destruction of those products.
- In some warehouses, expired stock reduces the capacity for fresh or new productions.
- It reduces the profit made by the company. In other words, the company invested different resources to manufacture a product which never was paid off.
- It does not align with the vision of the Kraft Heinz Company: *To be the Best Food Company, Growing a Better World*. To reach this goal, the KHC does not want to have any of their produced food thrown away.

Consequently, the practical relevance is justified by the need of the KHC to improve the supply chain losses performance in 2018. Regarding the academic relevance of the project, Chapter 2 will give a better understanding of the gap in the literature. Briefly, the available literature suggests a food waste hierarchy to deal with surplus production depending on the remaining shelf life of the product. The suggested hierarchy was already adopted by the Kraft Heinz Company in 2018. Contrary to what is expected by the literature, the KHC did not experience high rates of donation and liquidation efficiency. Even though the food waste hierarchy seems to be a valid starting point to face surplus food management, it does not cover all the issues behind the generation of supply chain losses at the KHC. Moreover, the case studies carried out by different authors did not consider a company as big as KHC which is operating in more than one region and with big volumes.

This project therefore aims to analyse what are the drivers behind generation of supply chain losses at the KHC. The aim is to understand whether all the root causes are already studied in the literature and which ones are unique from the KHC. The drivers behind the generation of supply chain losses will be analysed by the combination of literature, interviews and historical data. The main stakeholders related to supply chain losses will be interviewed to have a qualitative point of view. The historical data will be used to quantify the causes behind supply chain losses.

Once the drivers are known, this project will study the current action plan to reduce supply chain losses. From there, the needed improvements will be mapped and added to upgrade the loss prevention process. The new actions will tackle the problem from two different perspectives. Firstly, the preventive part of the loss prevention process aims to reduce the creation of surplus, hence, reduce the future stock at risk of becoming supply chain losses. Secondly, the corrective actions have the goal to improve the management of the on-hand stock before it reaches the use by date and becomes supply chain losses.

1.2 Thesis objectives

As it is already briefly described in the previous section, the objective of this project is to go a step beyond the food waste hierarchy. This step would be taken by analysing what is not actually covered by the literature and suggesting and implementing the needed improvements at the Kraft Heinz Company. Moreover, this project aims to understand the root causes behind the generation of Supply Chain Losses in FMCG (Fast Moving Consumer Goods) companies. This thesis project also aims to study which are the needed actions that FMCG companies must take to reduce food waste.

Before the situation at the Kraft Heinz Company is analysed, the goal is to review the available literature regarding food waste management. This is a broad topic which can be confronted from different sides. Since this project is developed at a FMCG company, the focus will only be on the literature related to those stages of the food supply chain in which FMCG companies intervene. As an example, food loss produced at the consumer side will not be considered in this project. The literature review will be carried out to study the state of the art in FMCG companies and food waste prevention. Once the literature review is done, it will be possible to determine if the KHC is currently following the suggestions from the literature.

The literature review will also provide some causes behind the generation of food loss. Nevertheless, it is relevant for this project to study the drivers behind the generation of supply chain losses at the KHC. Therefore, as an objective of this thesis, a supply chain losses analysis will be carried out before moving into the improvement stage.

The analysis will consist in a series of interviews to different stakeholders of the company and an analysis of the historical data. The main stakeholders at the KHC which have a direct influence on supply chain losses will be interviewed. This will help

to know the influence they have on supply chain losses, if their objectives align with the reduction of it and what constraints or issues they generally face when trying to reduce the generation of supply chain losses. On the meantime, the historical data will be processed to understand which food categories or channels have a greater impact of losses.

Once the literature review and the supply chain losses analysis is almost concluded, the objective will be to analyse the current loss prevention process. It will be checked which of the current drivers are not being considered and which drivers are not being efficiently confronted. This project aims to reduce supply chain losses simultaneously from two different types of actions: preventive actions and corrective actions. These drivers will be quantified based on robust data.

Preventive actions will focus on the reduction of excess stock production. Surplus food is the stock which most likely will become supply chain losses. Hence, the aim is to reduce surplus by analysing which future productions will generate excess stock.

Corrective actions will focus on the management of on-hand stock. Moreover, it will focus on the management and clearance of the on-hand excess stock. Firstly, it will be analysed what demands the stakeholders from the Supply Chain Hub to improve the efficiency. The current process will be mapped and an improved process will be suggested to cover those drivers or constraints highlighted during the analysis stage. New KPIs will be developed to better quantify the performance of the company. Furthermore, the corrective actions will be linked to the preventive actions to support the forecasting of excess stock based on actual numbers. This improvement will allow creating more confidence on the processes around supply chain losses and boosting the engagement of stakeholders in the process. As part of the future recommendations, the project will propose the creation of a central clearance team which will support the liquidation process across the Business Units (BU) in the KHC.

All in all, the reduction of supply chain losses at a FMCG company such as KHC is a challenging process where many stakeholders are involved. Given this situation, this project aims to implement a process in which the production of excess stock can be prevented. To create confidence about this process and convince stakeholders of the needed actions to prevent supply chain losses, the preventive actions will be linked to the actual numbers measured in the corrective actions. By supporting the preventive actions with robust current data, stakeholders will feel more engaged in the process and the implementation will be more effective.

1.3 Scope and deliverable

Once the objectives of the thesis are stated, it is needed to address the scope and deliverable of this project. As it will be explained in the literature review, food loss is generated along the food supply chain, from field to fork. This project only considers the food loss generated at the manufacturing stage by FMCG companies. As the whole

food supply chain is a complex process too big to cover by only one master thesis project and the thesis will be carried at the Kraft Heinz Company, it is therefore needed to restrict the scope of the project to this stage.

A FMCG company can mainly generate supply chain losses due to three reasons: manufacturing supply chain losses, logistics supply chain losses and commercial supply chain losses (Bilska et al., 2016). The manufacturing supply chain losses occur by the time of production. If there is an error at the production line or the food does not meet the requested quality standards, it will become food waste, hence, supply chain losses. Logistics supply chain losses take place when the product is poorly handled and it gets damaged. If it cannot be reworked to get fixed and needs to be destroyed, it would become logistics supply chain losses. Lastly, it is considered commercial supply chain losses to the food produced to be sold but remains in the warehouse until reaching the expiration date and it is not sold.

The scope of this project aims to impact the performance of commercial supply chain losses. The project will be carried out mainly in cooperation with the demand and supply planning teams of the company. These two teams have a greater impact on commercial losses but cannot influence the performance of manufacturing and logistics supply chain losses, hence the scope of the project will cover the reduction of commercial losses. Moreover, this project will not address the supply chain losses of raw and pack material and it will focus on finished goods supply chain losses. This is based on the higher value of finished good losses compared to the raw and pack material losses as well as the time constraints for the completion of the project.

Fig. 1.1 illustrates a simplified FMCG company supply chain. From field to fork, there are various stakeholders inside and outside FMCG companies which are part of the supply chain. From the literature, it will be concluded that supply chain losses are part of each stage of a supply chain. Therefore, as the scope is based on FMCG companies, this project will focus on the food losses generated in FMCG companies, and more specifically, on commercial losses. Supply chain losses due to manufacturing, procurement, logistics or quality issues will not be considered as commercial losses. Furthermore, this project will be developed as a member of the SC Hub of the company. As the company is currently dealing with more than 4000 SKUs, the outcomes of this project aim to be applicable for both fast and slow movers' products. Finally, this project will not take into consideration marketing or innovation decisions inside the company.

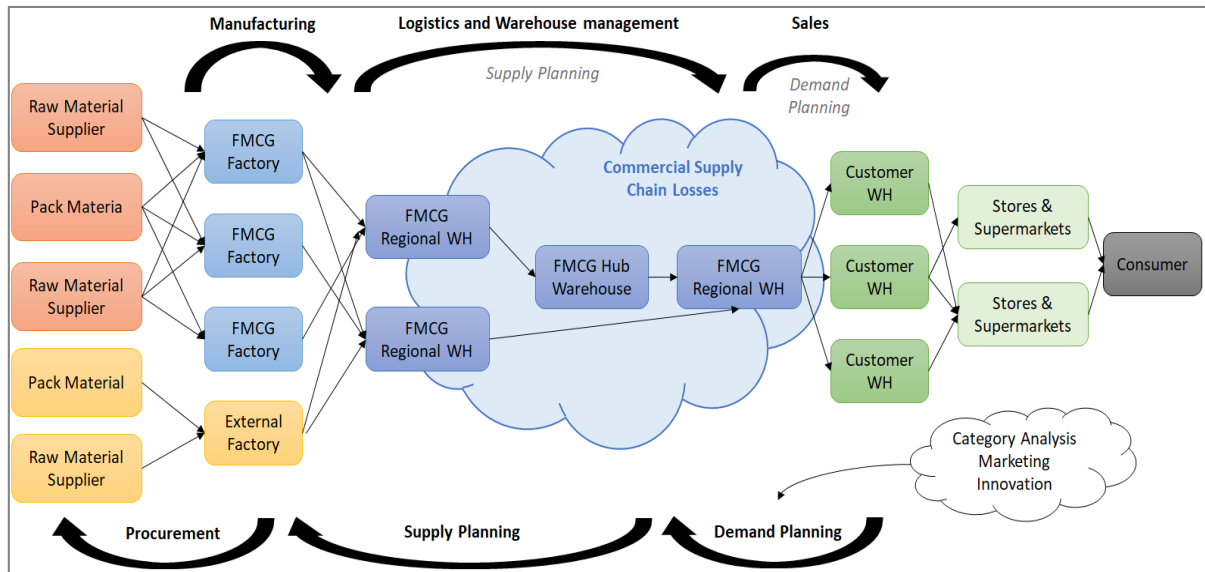


Fig. 1.1: Example of a FMCG company supply chain scheme.

As the project will be developed closely with the demand and supply planning team, it is highly relevant for the objectives of the project to understand their role and influence in commercial losses. Understand their action range and engagement on reducing supply chain losses allows proposing feasible actions.

The deliverable of this project is closely related to the above-mentioned objectives of the thesis project. As part of the corrective actions, the deliverable is to create a dashboard to measure and visualize new KPIs. These new KPIs will be created to provide a better control and visibility of the commercial losses of the company. The data measure by the new KPIs will be used to create and improve the suggested preventive actions. These preventive actions will mainly focus on preventing the generation of excess production. By supporting the preventive actions with robust data and the actual numbers, this preventive tool should also increase the engagement of stakeholders and boost their confidence. All in all, preventive actions will become more effective and realistic for the stakeholders if the future commercial losses forecast are supported by the current measured commercial losses.

1.4 Research question

The abovementioned objective will be met by answering the main research question:

How can a FMCG improve the implementation of the food waste hierarchy to reduce their commercial food losses?

The term “how” in the main research question indicates the need of addressing the gap in the literature. Furthermore, a process needs to be developed based on the feasible range of action of the stakeholders involved. This question will be answered with the help of different sub-questions. Therefore, the following section will show the path to design the needed sub-questions.

S-RQ1: What is food loss and how do FMCG companies deal with food surplus?

The first sub-research question will be answered in the literature review. This stage will help to understand what the issue with food loss is and where in the supply chain is generated. The literature review will also give an idea of the relevance of this topic from a social, economic and environmental perspective.

Following a funnel approach, the focus will be on how FMCG companies such as the KHC are directly or indirectly related to the generation of food loss worldwide. It will help to understand the current state of the art in food waste management in FMCG companies. From there, the analysis will be based on how the available literature suggests these companies should manage food waste. The answer of this question will be compared to the situation at the KHC Company to answer the next sub-research question:

S-RQ2: How is the current situation at the Kraft Heinz Company compared to the state of the art in food waste management?

This second question will be answer between two different stages: the literature review and the supply chain losses analysis. Once the second research question in answered, this will be compared to the current situation at the company. It will be checked if the KHC follows the suggestions available in the literature and whether it is as efficient as suggested in the literature.

S-RQ3: What are the drivers behind the generation of supply chain losses at the Kraft Heinz Company?

Before focusing on any improvements, it is required to have a clear understanding of what is causing supply chain losses at the Kraft Heinz Company. This will serve as the reference points to improve the loss prevention process. The analysis will bring clarity to the constraints different stakeholders might have when working to reduce food loss. It will also help to make the suggested actions more relevant in accordance to the answer of this sub-research question. Once all the above mentioned sub-research questions are answered, it will be possible to move forward and answer the questions related to the reduction of supply chain losses.

S-RQ4: What are the needed improvements to reduce supply chain losses at the Kraft Heinz Company?

This question aims to enhance the current situation at KHC. As it is explained in the previous section, there will be two types of improvements to meet the objectives of the project. Preventive actions will focus on controlling planned productions while corrective actions will focus on the improving the efficiency of on-hand excess stock management. Finally, the feasibility of the suggested actions once implemented in the company will be addressed in the final sub-research question:

S-RQ5: What is the level of implementation for the suggested actions inside the company and how can it engage the needed stakeholders?

The answer for this question is necessary due to various reasons. It will conclude whether the main research question has been answered correctly. It will also help to analyse the feasibility of the preventive and corrective actions developed in this project. Finally, it will allow suggesting recommendations and future research.

Taken all these sub-research questions into consideration, this project will provide an answer to the main research question. The answer will bring the solutions to meet the initial objectives.

1.5 Methodology

As acquiring a clear picture of the overall process to fulfil the objectives of this thesis, this section explains the methodology followed for the development of this thesis.

1.5.1 Literature review

Firstly, the literature review is carried out to have a theoretical baseline for this thesis. It begins by searching through key terms such as “food loss”, “food loss management”, “excess inventory management” and “shelf life inventory management”. This initial search will help to realize the importance of food loss itself. As food loss affects multiple stakeholders and it is happening in every stage of the food supply chain, there will be a large number of articles related to the topic. To limit the number of papers to be reviewed, from a list of almost a hundred papers, only the title and abstract were read. Based on their relevance for this project and the need to do a second search for the more specific articles, no more than ten papers were selected. The main database for this research was Scopus, which usually was redirecting the search to a second database such as Science Direct.

This first search is the starting point which indicates the need to execute a second search for more relevant articles. Following a funnel approach, the initial search of general topics prompted a second search. In this second phase of the literature review, only those articles which were relevant for the issue at The Kraft Heinz Company were selected. Therefore, a new search was carried out by using the following key terms: “FMCG companies and food loss”, “food waste management at manufacturing companies” and “surplus food management at FMCG companies”. Moreover, the findings from these topics led to the final key term, “food waste hierarchy”.

During this second search, it was clear that food waste management in FMCG companies is an issue which became relevant mainly in the last years. As it does not only have an economic impact, but a social and environmental impact, there have been an increment in the numbers of articles related to this issue in the last five years.

The article *Reducing food waste in food manufacturing companies* (Garrone et al., 2016) was found out to be of great importance for the conclusion of the literature

reviewed. It contained the theory related to the food waste hierarchy and it proposed its implementation. This suggestion was implemented in several companies and the results among them were compared. This article will become one of the main articles used to compare the KHC and the current state of art in food waste management.

1.5.2 Interviews

The literature reviewed is carried in parallel with the analysis of the Kraft Heinz Company and the definition of the problem. As the literature reviewed was developed to have a theoretical baseline for the thesis, this analysis is developed to have a practical baseline. The Kraft Heinz Company, its supply chain losses and its current way of working will be studied. Interviews will give a better understand of the previous topics and will also initiate the next stage, the supply chain losses drivers' analysis.

At the beginning of the project, a series of informal interviews with different stakeholders was conducted with the following three objectives: Understand the stakeholder current influence on the loss prevention process, understand their motivation and KPIs and understand their limitations or constraints faced. The interviews were face-to-face interviews and skype interviews. In the first round of interviews, the following stakeholders were encountered:

- Loss prevention lead EMEA
- Head of Supply Planning EMEA
- 2 supply planners and 2 supply planner leads
- One demand planner of each BU
- Warehouse manager of UK, Benelux and Iberia
- Logistics manager of UK, Benelux and Iberia
- ZBB leads of UK and Benelux
- Supply chain finance manager – EMEA Loss controller

Based on the first round of interviews, it was already possible to have a clear picture of the KHC organization and the current loss prevention process. As the project was developed as a member of the SC Hub, this situation easily allowed reaching any stakeholder on skype. Therefore, shorter conversations took place to complement the information gathered during the first round of interviews. In addition to the task developed for this thesis project, some other tasks were carried as part of the internship. These external activities helped increasing the understanding of the company and the routines and processes carried by the different teams inside the company. There was a weekly communication with the demand and supply planning teams which helped to build deep understanding of their tasks but also the usually faced issues.

1.5.3 Data collection

To quantify the supply chain losses of 2018 and develop the needed tools for the improvement part, the company allowed using their data base and currently

implemented software. Historical data was mainly used in the analysis stage to quantify the production and sales and the amount of stock passing the trade window in 2018. The softwares used were:

- **SAP.** It provided live data of the current inventory of the company as well as any movements of stock.
- **JDA.** This planning software was used both by demand and supply planning team. Demand planning team made use of JDA to update the demand forecast and the supply planning team to plan the future productions based on demand forecast and current on-hand stock.

For the improvement stage, gaining a sufficient knowledge of these two softwares was required as well as understanding how the stakeholders at the company were working with them.

1.5.4 Design cycle for improvements

The improvement stage was carried out following a design cycle approach (Wynn et al., 2005). From the analysis previously developed, the issue was identified and possible solutions considered. The most attractive solutions were developed and presented to the stakeholders at the company. Their feedback was captured and taken into consideration to improve the suggested solutions. Once the tool was finalized, it was implemented and used by the stakeholder. Their feedback after implementation was again captured and the needed improvements took place. Overall, the circular approach was followed in which a problem is defined; a solution is developed, implemented and improved constantly based on the design cycle in Fig. 1.2 (Massachusetts, 2006).

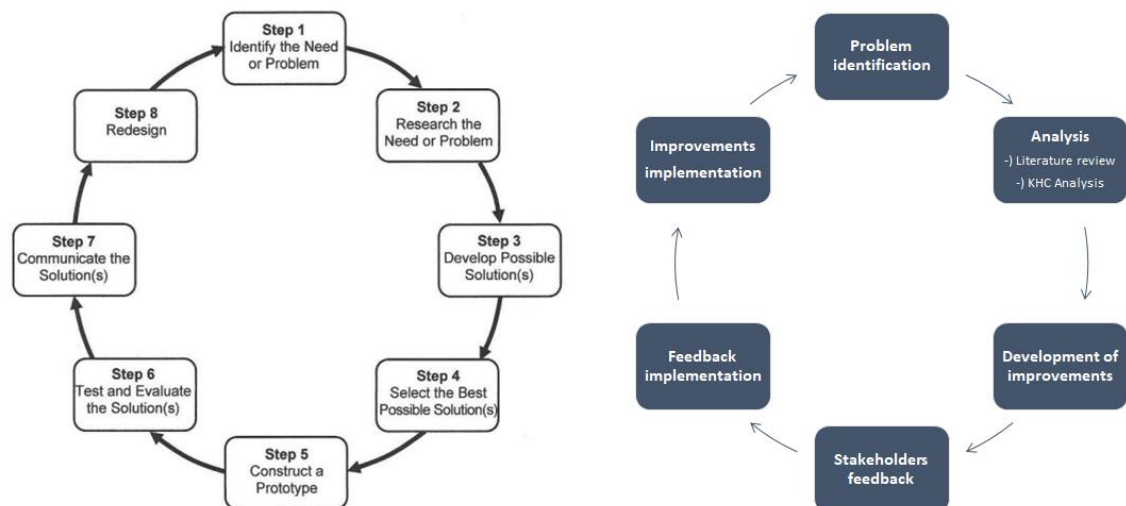


Fig. 1.2: Design cycle (Massachusetts, 2006) and Master Thesis design cycle approach

Based on the design cycle in the literature, a new design cycle approach was developed due to the needs of the project. In this project, the analysis step was extensive as the literature as well as the current situation at the company was

reviewed. Moreover, a supply chain losses analysis was carried. Once the improvements were developed, these were presented to the stakeholders at the company and their feedback will be considered. Given the size and complexity of a multinational company such as the KHC, it will be difficult to implement measure and quantify the efficiency of the suggestions. Therefore, the feedback and acceptance by the company stakeholders will be taken as the reference point to conclude the level of success inside the company. Once the stakeholders' feedback was captured, the improvements were ready to be implemented in the company.

1.6 Thesis outline

The needed steps to achieve the objectives of this project are summarized in Fig. 1.3. Once the introduction is concluded, two different tasks will be carried. Chapter 2 includes the literature review. In this chapter, the current state of the art regarding food loss in FMCG companies will be analysed. Parallel to chapter 2, the Kraft Heinz Company current way of working will be analysed. The results of chapter 2 and 3 will be compared in Chapter 4. This chapter will address the knowledge gap in the literature. Based on this comparison, an analysis of the supply chain losses drivers will be conducted in Chapter 5. Chapter 6 will explain the needed actions to reduce the food loss at the company given the current situation and literature. Once completed, the thesis will conclude by answering the main research question and developing future recommendations.

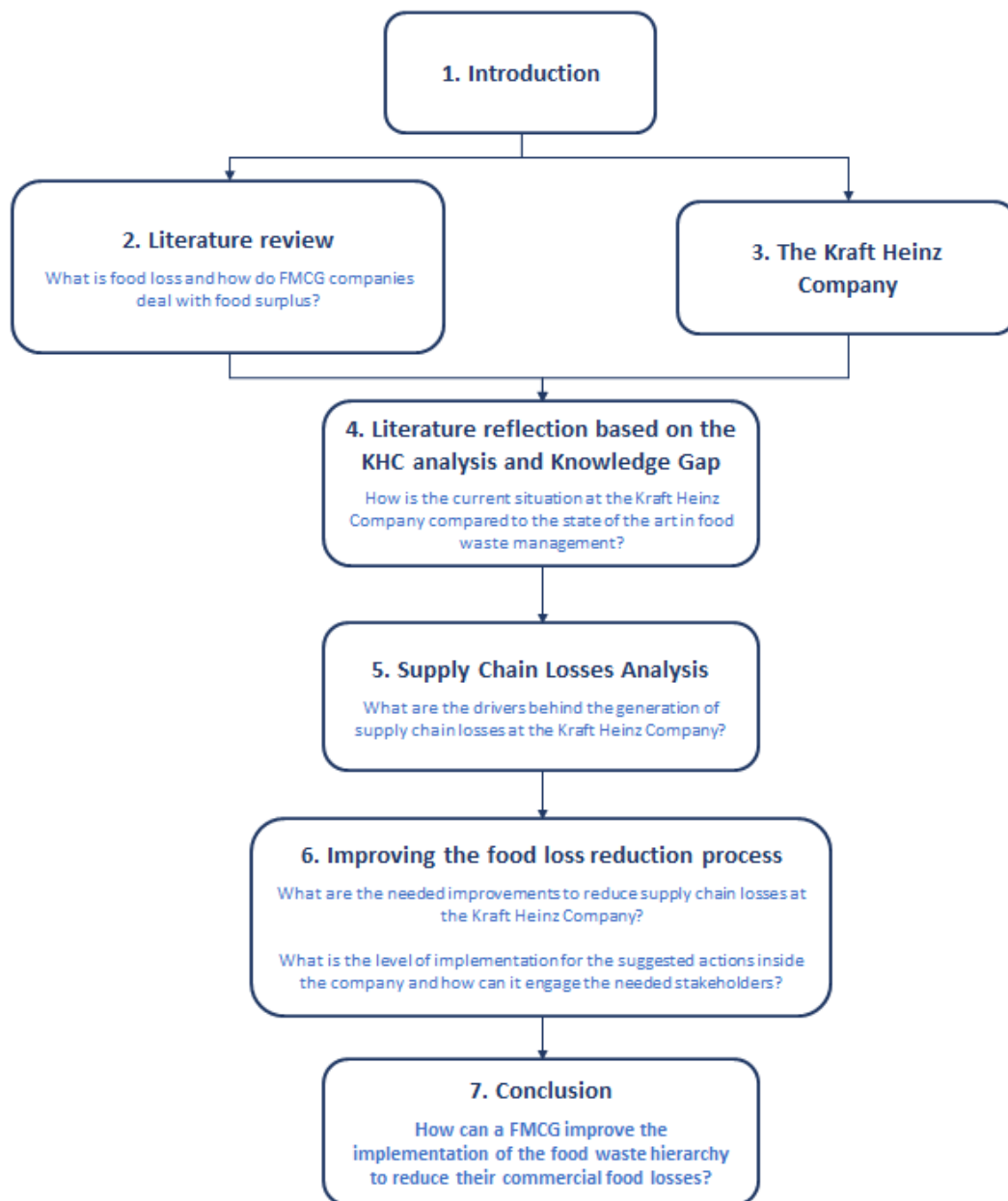


Fig. 1.3: Master Thesis project outline

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2. Literature review

The literature review has been carried out by following a funnel approach (Fig. 2.1). It starts by analysing the problem of food loss worldwide. In that section, the relevance of the topic for governments, companies and society is given. It is justified why food loss is a topic which affects many stakeholders. These actors can have different interests regarding food loss, nevertheless, they will all benefit from the reduction of food loss.

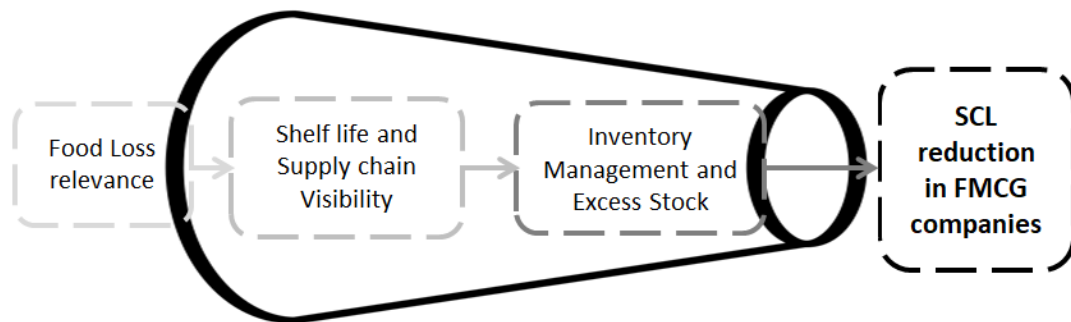


Fig. 2.1: Literature Review Funnel Approach.

Once the relevance of the issue is given, the focus is on those topics which have a greater relevance for the objective of this project. For this purpose, the topic of supply chain visibility and shelf life is included. As it is further explained below, the relevance of supply chain visibility to monitor shelf life is a key topic to prevent food loss.

Before the key literature for this project is reviewed, inventory management theory and excess stock is studied. These two areas have a great impact of the prevention or generation of food loss in FMCG companies. Inventory management is directly related to the creation of excess stock. If excess stock is created, it means that inventory management was not performed well. Moreover, this is the stock which has no demand forecast planned. If a solution to consume this excess stock is not found, it will eventually become food loss and impact the profitability of the company.

Given the relevance that surplus food has on supply chain losses, the literature review concludes with an analysis of the current state of the art in food loss reduction in manufacturing companies. The available literature defines the food waste hierarchy as a guideline to establish the most appropriate way to manage food waste (Papargyropoulou et al., 2014). Firstly, the food waste hierarchy opts for the prevention (or minimization) of food surplus and avoidable food waste. The second desired option is that the surplus generated is distributed among charity groups. This solution does not provide an economical benefit for the company, however it improves the company's image and food reaches its initial purpose, human consumption. If this possible solution is not feasible, the food waste hierarchy

proposes the distribution of the food excesses to animal feeding or biofuel plants as the last option before its destruction.

To conclude, the literature review aims to answer the first sub-research questions. Firstly, the objective is to understand how food loss is defined in the literature. Additionally, an explanation of the relation between FMCG companies and food loss is also needed. When the general terms are clear and enough knowledge has been acquired, the objective is to focus on the following research question: *What is food loss and how do FMCG companies deal with food surplus?* The answer of this question will be of high importance to understand in which situation the KHC current way of working is compared to the suggestion made by the literature.

2.1 Food loss worldwide

The Food and Agriculture Organization of the United Nations (FAO) estimates that approximately one-third of the food produced for human consumption is lost yearly from the food supply yearly. In terms of quantity, more than one billion metric tonnes of food are wasted (Gustavsson et al., 2011). Food is wasted throughout the entire food supply chain. From the initial agricultural production to the waste generated at the household. Food loss generation is not constant among countries (Fig. 2.2). In medium- and high-income countries, food is wasted even though it is still acceptable for human consumption. Nevertheless, there is a significant amount of food which is loss at early stage such as agricultural production or post-harvest handling and storage (Gustavsson et al., 2011). In low-income countries, most of the food loss is generated and the early or middle stages of the supply chain. It can be concluded that, at the consumer side, the proportion of food loss generation is greater in medium- and high-income countries than in low-income countries.

The total per capita production of edible parts of food for human consumption is, in Europe and North-America, about 900 kg/year (Gustavsson et al., 2011). Out of that, around 200kg/year is wasted between the production and the retailing stages. FMCG companies play a key role in this phase. These companies most often oversee the production and transportation of the food to retailers. These are the steps when a big amount of food is loss in the food supply chain.

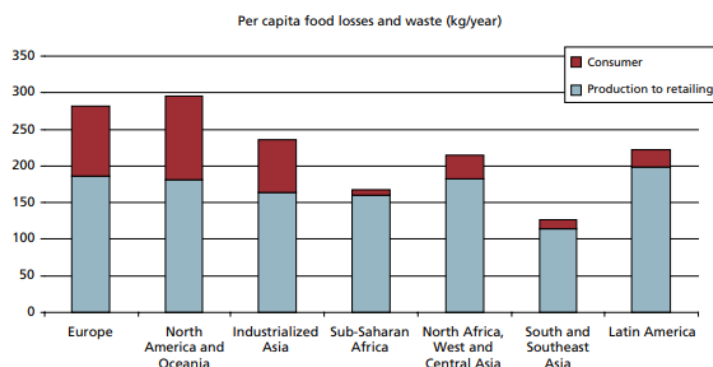


Fig. 2.2: Per capita food losses and waste, at consumption and pre-consumption stages, in different regions (Gustavsson et al., 2011).

Buzby et al. (2012) analyses the reasons for the importance of food loss and the impact it has in different fields. The first reason given is related to the increase in world population. Per the predictions made by the United Nations, world population will have exceeded 9 billion habitants by 2050. This growth will demand to increase food production worldwide by 70% (United Nations, 2011).

Most of the increase in world population is expected to happen in developing countries. Nevertheless, developed countries are not exempts dealing with this issue. Buzby et al. (2012) define food insecure households as “having difficulty providing enough food for all of their members at some time during the year due to a lack of resources”. In 2010, Coleman-Jensen et al. (2011) studied this issue in the United States of America. They concluded that, out of 304 million households, almost 49 million people (14%) faced issues of food insecurity.

The second reason on why food loss is relevant is the result of the misuse of a significant amount of money and resources that had initially been invested in the production of food but it does not achieve its goal of being delivered to the customer. These resources are wasted throughout the entire lifecycle of food, in other words, resources are used for production, storage and transportation. Researchers at the US National Institutes of Health estimated that the food waste production consumed more than 25% of the total freshwater used in the United States and around 300 million barrels of oil (Hall et al., 2009).

The third reason given by Buzby et al. (2012) is that there are multiple negative externalities that arise from the production to the disposal of food waste. These negatives externalities have a negative impact to the society as well as the environment. Some negative externalities which rise at the beginning of food's life cycle are unavoidable. The problem is when the food which caused those negative externalities ends up as food waste instead of feeding the population. As per Lundqvist et al. (2008), these are some examples of these externalities:

- Greenhouse gas emissions from cattle production.
- Air pollution caused by farm machinery and trucks that transport food.
- Water pollution and damage to marine and freshwater fisheries from agricultural chemical run-off during crop production.
- Soil erosion, salinization, and nutrient depletion that arise from unsustainable production and irrigation practices.

There are also some negative externalities raised during the disposal of food waste. Incineration creates emissions harming human health and environment. From an economical point of view for FMCG companies, disposal means an extra increase in their expenditures. Moreover, the disposal cannot be achieved immediately after the product has reached its expiration date. For that, the company is paying extra storage costs without reporting any future benefits.

Kummu et al. (2012) analyse food loss and the impact this have on the environment globally. Alongside with the work developed by Gustavsson et al. (2011), food supply chain losses are divided in five categories (Table 2.1):

Table 2.1: Definition of food loss category (Kummu et al., 2012).

Loss name	Definition
Agricultural losses	Contains losses due to mechanical damage and/or spillage during harvest operation, crop sorting etc.
Postharvest losses	Contains losses due to storage and transportation between farm and distribution, and spillage and degradation during handling.
Processing losses	Includes losses during industrial or domestic processing.
Distribution waste	Includes losses and waste in the market system, including wholesale markets, supermarkets, retailers, and wet markets.
Consumption waste	Includes all the losses and waste at the household level.

Kummu et al. (2012) analysed the total food production globally and how much of it is lost in the supply chain. From a total production of 2609 kcal/cap/day, 1995 kcal/cap/day (76%) are consumed by humans. The remaining 614 kcal/cap/day (24%) are lost. Fig. 2.3 shows the total food crop production and how food losses occur throughout the supply chain. This chart would vary if a difference between medium/high-income countries and low-income countries is made.

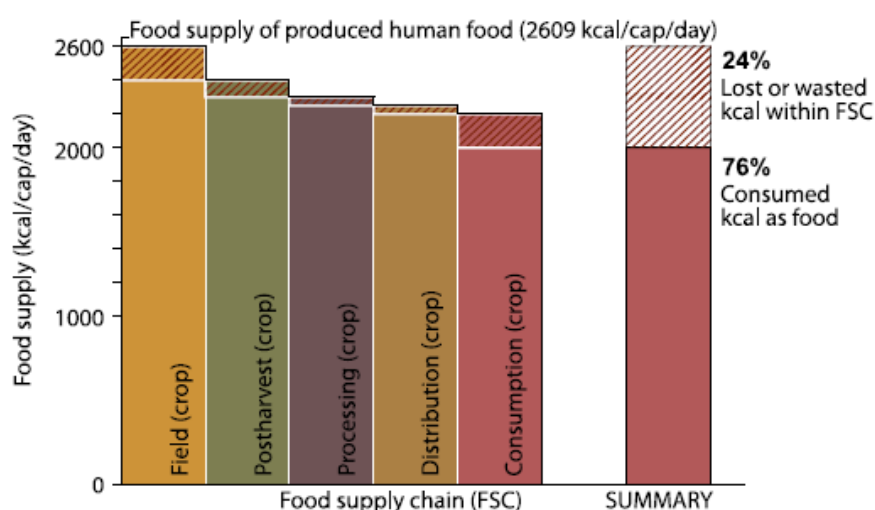


Fig. 2.3: Food production and food loss along the food supply chain in kcal/cap/day (Kummu et al., 2012).

The abovementioned differences between the low-income countries and medium/high-income countries are due to various reasons. Low-income countries are challenged by technical and infrastructural limitations. In medium/high-income countries, food loss is mainly caused by consumer behaviour and lack of coordination

between the actors in the supply chain (Giroto et al., 2015). Inadequate planning and expiry of “best before dates” likewise lead to large amounts of waste.

Priefer et al. (2016) analyse the contributions of each stage of the supply chain to total food waste across the twenty-eight countries member of the European Union (Table 2.2). Priefer et al. (2016) present a different split for the stages of the supply chain compared to the article from Kummu et al. (2012). Nevertheless, it is also a valid differentiation and there are still many similarities between the stages of the food supply chain provided by the various authors.

Table 2.2: Main causes for food loss on the different stages of the food supply chain in European Union (Priefer et al., 2016).

Stages of the chain	Contributory factors
Agricultural production	• Sorting out of products at farm gate due to rigorous qualitative standards set up by large-scale distributors concerning weight, size, shape and appearance • Market prices that do not justify the expense of harvesting • Overproduction due to supply agreements with retail chains • Crop damaged during harvesting
Manufacturing	• Irregular sized products trimmed to fit or rejected entirely • Inconsistency of manufacturing processes leading to misshapen products or product damage • Contamination in production process causing loss of quality • Food spoilage due to packaging problems • Surplus production of supermarket's own brands that cannot be sold elsewhere • Excess stock due to 'take-back' systems and cancellation of orders
Distribution and wholesale/retail	• Lack of cold storage/interruption of the cold chain • Packaging defects resulting in product damage • Overstocking due to inaccurate ordering and forecasting demand • Obligation for retailers to order a wide range of products and brands from the same producer in order to get beneficial prices • Failure to comply with minimum food safety standards (e.g. microbial contamination, pesticide residues) • Marketing strategies like 'buy one get one free'
Hospitality industry and catering	• Oversized dishes • Offer of buffets at fixed prices encouraging people to take more than they can eat • Use of individual portion packs (e.g. for jams, cereals, juice and milk) that do not meet the customer's needs • Difficulties in assessing the demand (number of customers) • EU hygiene rules, e.g. two-hour guarantee on unrefrigerated products
Households	• Lack of planning/knowledge concerning food purchase and storage • Impulse purchases (buying items that are not currently needed) • Purchasing of new products that the consumer then 'do not like' • Inadequate package sizes (e.g. oversized ready to eat meals) • Poor storage management (e.g. inadequate wrapping) • Confusion about date labels ('best before', 'use by') • Lack of skills for food preparation • Poor experience in planning meals • Preparing oversized meals • Lack of skills for recombining leftovers into new meals

As the objective of this project is mainly focused on reducing commercial losses in FMCG, this project will not focus in all the causes given in (Table 2.2). Therefore, it has been highlighted those factors which have relevance for this project. The food loss causes which are covered in this project belong to the stages of manufacturing and distribution. Among the factors belonging to the distribution and wholesale/retail stage, some of them have been excluded as they are not applicable to the case of the KHC. Retailer marketing strategies or order policies are not part of the process taking place in FMCG companies. Moreover, the focus of this project is on avoiding the production of excess stock as well as the corrective actions needed to prevent it to become food loss.

2.2 The relation between supply chain visibility and food loss

Muriana (2017) consider shelf-life as the most influential factor in the generation of food loss. Singh and Cadwallader (2004) propose a complete definition of food shelf life which is “the time until a perishable product becomes unacceptable for human consumption under given storage conditions”. Shelf life can be divided into two

different categories (Table 2.3). In the present work, the focus is on fixed shelf life products, as the Kraft Heinz Company does not manufacture any random lifetime products.

Table 2.3: Fixed and random shelf life products .

Loss name	Definition	Example
Fixed Shelf life	These products have a deterministic shelf life. Shelf life can be determined in advanced	Canned food Pasta
Random lifetime	These products' lifetime cannot be determined in advance	Fruit Vegetable

The importance of monitoring the remaining shelf life is recognized in the literature. It can result in an improvement of profits and/or reduction of food losses. Not only monitoring shelf life is a relevant topic, but internal sell by date is also critical in terms of loss prevention. If the internal sell by date is exceeded, it means the product arrived at the destination when they had a remaining shelf life which makes it further unsalable to the regular buyer. Exceeding of the internal sell by date does not mean the product is not consumable any more, as the shelf life (use by date) date is not exceeded yet (Muriana, 2017). An alternative buyer with different requirements regarding the sell by date might still buy the same product.

“Sell by date” and “use by date” play an important role in supply chain losses. From the manufacturing side, it can happen that the expiration date is not correctly set. Especially in canned products, the food might still be consumable even if the shelf life is past. Manufacturers need to analyse if the expiration dates in the label of products are consistent with the quality status of the product at the end of it (Lebersorger, 2014). If the manufacturer is too conservative on the decision of the shelf life of the product, it can eventually end up as food loss while it is still consumable.

From the buyer side, “sell by date” can also be negotiated better in accordance with the needs of the buyer. There is not much available literature regarding this issue, nevertheless, as this date is established from an agreement between the manufacturer and the buyer, if the buyer is less rigid on its requirements, the manufacturer can clear the stock which is closer to expiration. This situation would reduce the supply chain losses at the manufacturing side.

Monitoring both “use by date” and “sell by date” can help managers in food manufacturing companies to decide when a product can be withdrawn from the primary market. Biliska et al. (2016) identify fifteen recovery points where the withdrawal process can take place to avoid food loss. Four of these recovery points are related to the product being close to expiration date. In order to monitor the stock correctly, companies need to enhance their inventory visibility. By improving inventory

visibility, companies can better track the remaining shelf life and make better decisions that can prevent food loss.

Supply chain visibility is a commonly used term in supply chain management. Nevertheless, there is a different perception of supply chain visibility and its definition among the literature. Williams et al. (2013) define it as “the access to high-quality information that describes various factors of demand and supply”. Barratt and Oke (2007) go a step further and define supply chain visibility as “the extent to which actors within a supply chain have access to or share information which they consider as key or useful to their operations and which they consider will be of mutual benefit”.

Francis (2008) analysed the different definitions given to supply chain visibility. He proposed a new definition which can be used to clarify its understanding when discussions occur between the supply chain management community and vendors about supply chain visibility capabilities. His definition is built on an intensive research throughout the available literature. The term is defined as “identity, location, and status of entities transiting the supply chain, captured in timely messages about events, along with the planned and actual dates/times for these events”. It is a more complete definition as it captures several important features of supply chain visibility.

Despite the differences in its definition among the literature, authors agree on its importance for supply chain management. The primary goal of supply chain visibility is to upgrade company performance, also by supporting the decision-making process (Caridi et al., 2014). Despite significant interest in the matter, supply chain visibility requires the possibility to access accurate information on time. For this, it is necessary to have access to real-time data by the required IT tools.

Caridi et al., 2014 develop a method which helps to understand which performance improvements are achieved due to investing in supply chain visibility. The model proves to be efficient, as it can be easily customised in accordance with the level of effort (which suppliers and which KPIs to focus on) managers want to put into the evaluation. The model provides a reliable estimation of the expected improvements which will be achieved.

Christopher and Lee (2004) argue that confidence among the supply chain actors is critical. If this situation does not exist, there are some possibilities that the supply chain may enter what it is called in the article as a “risk spiral”. Due to the lack of confidence in demand forecast, lead times or transportation reliability, among others, each partner along the supply chain starts either inflating or disguising their on-hand inventory. As the confidence level is reduced, each partner starts gaming the system, hence, the “risk spiral” continues. To prevent this catastrophic cycle, supply chain visibility is crucial to keep the confidence level along the whole supply chain. Shared information across the supply chain is the key to enhance visibility as well as confidence.

One of the benefits mentioned by Christopher and Lee (2004) is that shared information decreases uncertainty and thus reduces the need for safety stock. Fewer inventories help to monitor the remaining shelf life of the products. Overall, the result reduces the risk of food loss.

Inventory visibility is an important aspect of supply chain visibility and a key tool for decreasing food loss. It provides accurate information about inventory, enabling to manage it as effectively as possible. Inventory visibility has three main advantages: it provides a mean to track goods and materials; it helps visualizing inventory movements enhancing the decision-making process in disruptive event management, and provides a reliable performance indicator (Zhang et al., 2011). From food loss perspective, inventory visibility helps in various ways. Not only it helps to monitor the remaining shelf life of the products but it also helps to identify different recovery points (Bilska et al., 2016) where donation process can take place to avoid food loss.

2.3 Inventory Management and Excess Stock

Inventory is essential to meet the demand of customers. However, it is also a threat as it takes space in the warehouse, generates transport and storage costs and absorbs financial assets (Viloria et al., 2016). Moreover, in FMCG companies, inventory is even more critical as the stock will become useless when it is past shelf life. Inventory reduction can improve operational efficiency, but it can also negatively impact the level of customer service. Thus, inventory management is a key topic for FMCG companies.

Poor inventory management decisions usually lead to, either over-stock or under-stock. Over-stock or excess stock is the stock that has not yet been sold and that exceeds the demand forecast for that product (Jedermann et al., 2014). Some of the negative effects of excess stock are the risk of not selling it, extra storage costs or reduction of capital.

One of the most common supply chain strategies currently used is First-In-First-Out (FIFO). FIFO is an inventory management system in which the oldest stock received in the warehouse is shipped out first. On the contrary, the latest stock received stays in the warehouse until it becomes the oldest stock stored. Hertog et al. (2014) move the emphasis from the classical FIFO towards First-Expired-First-Out (FEFO) strategy (Fig. 2.4). FEFO allows the optimization of perishable goods flow by checking which products will expire first, instead of which products arrived first. By adopting this strategy, the amount of food loss can be diminished.

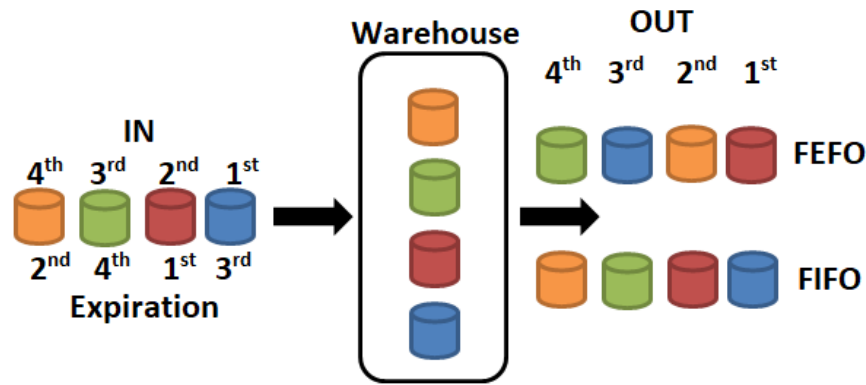


Fig. 2.4: FIFO vs FEFO (Hertog et al., 2014).

While FIFO assumes that the priority for stock rotation is based on releasing the stock which has been the longest in the warehouse, FEFO prioritizes the stock which is the closest to the expiration date (Jedermann et al., 2014). In other words, supply chain managers can coordinate the remaining shelf life of products with the number of days to the destination (Hertog et al., 2014). This situation allows items in a critical state to be shipped first to prevent food loss (Jedermann et al., 2014).

Hipólito et al. (2014) develop a Model Predictive Control approach capable of following the remaining time until expiration date to avoid food loss. The objective proposed in this article is to adjust production to the market demand while reducing the risk of goods losses due to overproduction. Nevertheless, to make this approach more accurate regarding real situations, the model is missing the inclusion of a forecast module.

As mentioned above, some models need extra features to make them more suitable for real-life situations. Other models, once implemented, do not provide results as good as expected. Kumar et al. (2013) aim to identify the gap between inventory management theory and real-life inventory practices carried out in FMCG companies. One of the first causes of this gap is the assumptions made by researchers, who strive for mathematical optimality at the cost of unrealistic assumptions. Many researchers have concluded that inventory models developed in universities or research groups have not fully met the expectations held by corporations (Kumar et al., 2013).

Kumar et al. (2013) also identify a lack of accountability as a challenging situation for inventory control. Decisions regarding inventory management are made by various people from different departments, hampering the coordination as well as the overall high performance.

Some recommendations are made to help bridge the gap between academicians and practitioners. The focus shall be on the research on implementable solutions rather than optimal solutions. In many firms, inventory managers want to improve their practices as cheaply and quickly as possible rather than adopting complicated optimal but non-implementable solutions. As stated by Kumar et al. (2013), “a reasonable and

timely solution to the right problem is far better than an 'optimal', usually, time-consuming, solution to the wrong problem."

Finally, it is suggested to focus on the inventory problems facing particular industries. If the models take into consideration specific parameters of the industry, companies may pay more attention to the results brought by academicians. As this literature review is regarding food inventory, many of the literature regarding inventory management in the broad context had no applicability when it was analysed for the food sector.

2.4 FMCG companies and supply chain losses reduction

In the previous section, by following the tunnel approach, the focus had moved from food loss and its relevance worldwide into a more specific topic such as inventory management. To make this literature review as relevant as possible for the objective of this master thesis, it is still needed to narrow down the scope of the review. Hence, this literature review will conclude by analysing what Fast Moving Consumer Goods (FMCG) companies are and how those companies which produce food deal with the surplus generated.

As the name already suggests, Fast Moving Consumer Goods companies are defined as those companies which sell product at a relatively low cost, to a large consumer group, on a regular basis. As a large portion of the population consumes the stock produced by these companies, FMCG companies tend to manufacture these products in big volumes and sell them in small quantities (Singh, 2014).

FMCG is a wide category which includes different types of products. There are consumable items, such as food and beverages, produced by companies as The Kraft Heinz Company. Nevertheless, personal care products or cleaning products are also considered FMCG products.

Consumers tend to purchase FMCG products quite often and whenever they need them. FMCG products are usually easy to get, as they are sold in numerous establishments. Supermarkets are the main place where these products are purchased. As further explained by Singh (2014), consumers do not want to spend much of their time visiting more than one store to purchase these items. They will rather go to the same establishment and purchase or the needed items. Supermarkets are giving the customer all the choices and all products under one roof.

The reason why consumers buy these products frequently is due to the fact that most of the products are perishable and non-durable. Hence, a consumer buys them when the need arises. Fast moving consumer goods can have different shelf life according to their features. While fruits and vegetables are highly perishable, canned food can have a total shelf life between one and four years. Some other features of these products are (Singh, 2014):

- Consumers do not spend too much time to decide which product they will buy among the different possibilities given at the store.
- Marketing and word of mouth usually play a key role in the customer's decision.
- FMCG products usually meet the demand of a wide range of the population. Products can be divided in necessities, comfort and luxury items. Price and income elasticity of demand varies across products and consumers.

For FMCG companies, lost sales have a significant impact. It means a diminished in their profitability and a lost in their revenues. Furthermore, it can also mean the customers decide to purchase the competitors' products. It might have a bigger impact if the customer migrates to the competitor for future sales.

Given the competitiveness of FMCG companies, they cannot afford losing the demand or stock-outs. Failure on forecasting, poor ordering, seasonal products or promotion planning errors are some of the causes which can lead companies to the generation of surplus and, eventually, the generation of supply chain losses (Muriana, 2017). Moreover, there is a trend, especially in supermarkets, to make the shelves look full. Per Muriana (2017), consumers are willing to purchase more quantities of food if they see full shelves. This situation triggers the orders, inflating the amount ordered compared to the amount needed. This situation affects different stages of the food supply chain. It will make manufacturing companies to boost the productions, and those will demand more raw materials from farmers and livestock owners.

Bilska et al. (2016) are aware of the overproduction and generation of food surplus. In their article, they study the risk of food loss across the food supply chain. Food loss is defined as the decrease in the amount of edible food due to the poor management, quality errors or irregularities in the process. Additionally, food waste is generated do to inefficient management done by caterers and households (Fig. 2.5).

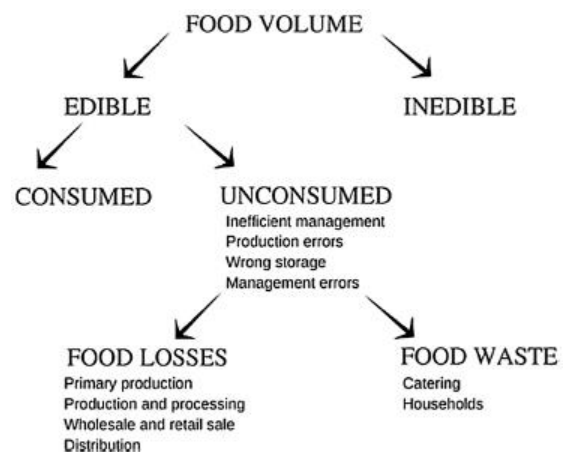


Fig. 2.5: Differences between food loss and food waste (Bilska et al., 2016).

The article focuses on food loss as this master thesis project does. Firstly, the articles analysis the causes for food losses in the food supply chain. For that, an Ishikawa diagram is developed for better understanding. William (2005) states that the Ishikawa diagram is a tool used to get the ideas and find the root causes generating the main problem. The categorization of the causes for food loss in the article is: machines, materials, management, methods and people (Fig. 2.6).

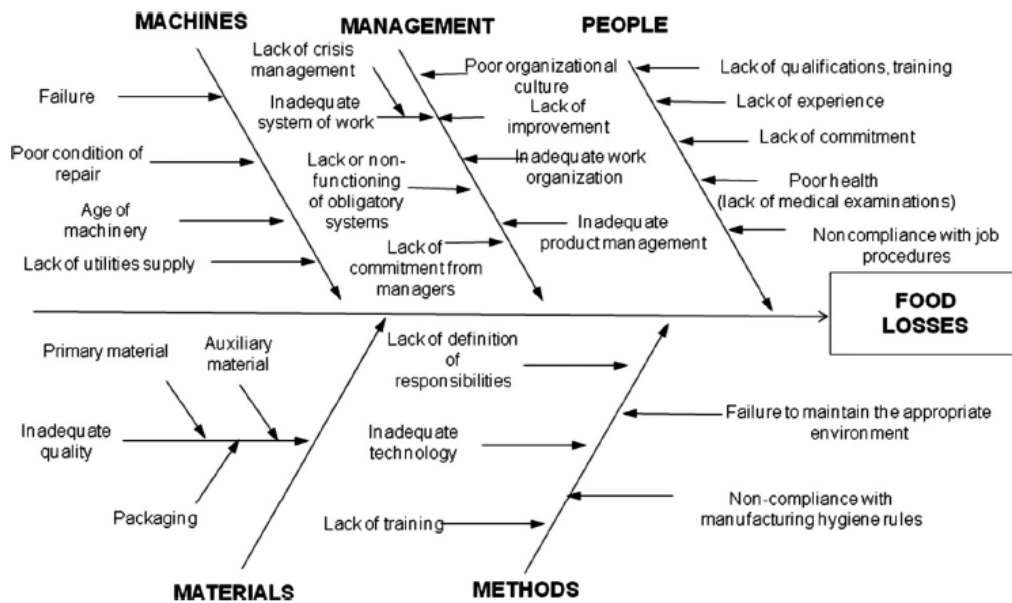


Fig. 2.6: Causes for food loss (Bilska et al., 2016).

The machines category is due to the poor technical conditions of it as well as failures during the production process. Quality of the materials is also a cause of food loss. The quality of the final product depends on various factors such as the quality of the primary and auxiliary material as well as the packaging. The management category embraces the food loss caused from the absence or inadequate operation of obligatory systems to ensure food safety, lack of commitment of managers, inadequate work organisation, and lack of improvement or inadequate product management. People and the methods followed are a key topic in the generation of food loss. Therefore, their decisions and skills are fundamental in the prevention of losses.

Giving the causes of food generation Bilska et al. (2016) analyse the potential to reduce them. For that, some Recovery Points are identified. Recovery points are defined as “operations or stages in the “from field to table” food supply chain, in which measure(s) can be applied to prevent or eliminate the risk of wasted food (Bilska et al., 2016). The donation of food at these stages for social purposes is the solution proposed to prevent food losses.

Bilska et al. (2016) split the food supply chain in four stages, in a similar way as it is done in Table 2.1. These four stages are: Primary Production, Processing, Distribution and Retail. For each of the four stages, the five categories of the Ishikawa diagram are analysed. Each cause is described, its consequences explained and the potential activities to reduce exposed. Moreover, it is highlighted whether is possible to recover that food and donate it for social purposes or not. Not only these recovery points prevent food to become food loss, but it also makes food to reach its initial goal, to be consumed by humans. In total 20 potential solutions to reduce food loss are giving and

15 recovery points are suggested. In Table 2.4, those recovery points which are of interest for FMCG companies have been included.

Table 2.4: Recovery points for donation in the food supply chain for FMCG companies (Bilska et. al, 2016).

Stages	Category	Description	Consequences	Potential to reduce
Primary production	Management	Inadequate material management (e.g. food discarded due to undesirable parameters)	Conditional possibility to use materials	Donation
	Management	Market slump (protracted storage of materials in the field/storehouse)	Materials are fit for use	Donation
	People	Lack of experience (allowing for overproduction), poor work organisation, poor knowledge	Materials are fit for use	Donation
Processing	Methods	Inadequate technology, errors during the production process, absence of training, lack commitment of the staff	Product unfit for sale, but can be consumed (e.g. is deformed, wrongly labelled, wrong weight of the product)	Donation
	Materials	Inadequate quality of packaging (wrong label), (protective barrier not broken)	Products are unfit for sale, but can be consumed	Donation
	Management	Inadequate product management (overproduction, excessive demand estimates)	Product is fit for consumption (ensuring that the expiration date is not exceeded)	Donation
	People	Lack of experience, lack of appropriate qualifications, non-compliance with job procedures, absence of training courses, lack of commitment	Product is fit for consumption (ensuring that the expiration date is not exceeded)	Donation
Distribution	Machines	Failure of the vehicle (old age of the automobile or refrigeration truck)	Product is fit for consumption, conditionally fit for sale/consumption	Back-up equipment/ vehicle, Donation
	Materials	Inadequate quality of packaging (mechanical damage to bulk containers)	Product unfit for sale but can be consumed	Donation
	Management	Inadequate product management (excessive estimation of orders), poor working organisation, poor organisational culture, absence of training, lack of obligatory systems, procedures, lack of commitment	Product is fit for consumption (a close to-end expiration date)	Donation
	People	Lack of experience, knowledge, commitment, training	Product is fit for consumption (a close expiration date)	Donation

These recovery points bring an alternative solution to the management of surplus production before it becomes food loss. Donation to organization for social purposes is a feasible possible which can benefit various stakeholders. Nonetheless, the literature is still missing a process where more than one solution is proposed at the different stages of the life cycle of a product. To fill this gap, Garrone et al. (2016) propose a structured surplus food control system. The control system firstly opts to prevent the generation of surplus/excess whenever possible and manage it correctly whenever it is generated. Managing the surplus means to act on it promptly when there is a risk of passing its shelf life without reaching the customer. Therefore, Garrone et al. (2016) provide an operational food waste hierarchy which can be followed to manage surplus efficiently and effectively (Fig. 2.7).

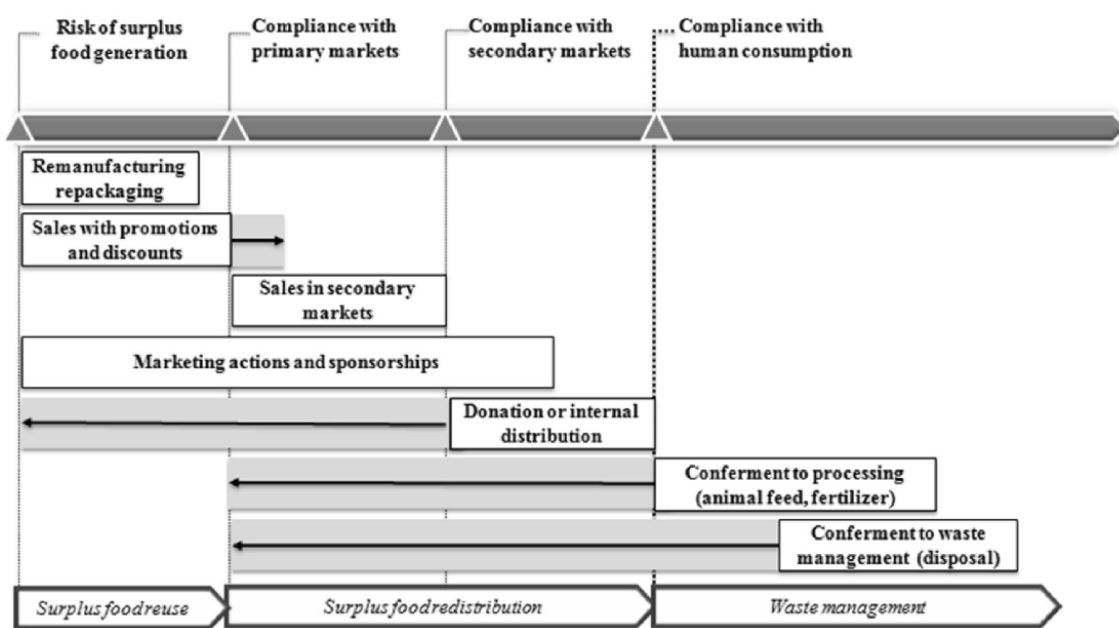


Fig. 2.7: Surplus food management (Garrone et al., 2016).

Per the proposed process in Fig. 2.7, the first option to consider should be the reuse of the excess generated. Remanufacturing can be a solution in case production errors happened. If the issue is regarding the packaging or labelling, repacking the product can allow it to become sellable and prevent the generation of waste. This process must be checked by the quality department to ensure the product still meets the safety requirements. This option enables the product to be sold in the primary market if the sell by date is not reached after the remanufacturing/repacking is made. If the sell by date is exceeded, but the expiration date is not, secondary markets might as well be an alternative solution to clear the product. The negative side of this stage is that remanufacturing or repackaging adds extra expenditures to the products, which increases the cost of it. Hence, it might not an efficient process for some companies.

Sequentially, Garrone et al. (2016) suggest that even though excess stock is generated, it can be profitable for FMCG companies to sell it within the primary market. Given the need to clear the surplus production, offering the stock in the primary market at a

lower price can be the solution. Even though this solution does not add extra costs to the product, it has some weaknesses as well. It needs a fast and close coordination between the various departments inside the company, such as sales, marketing and planning regarding how much will be the discount for the intended customer. Additionally, there are not many customers who might accept the trade-off between short shelf life and reduced price. Once the primary market is not an available choice anymore, the company should use secondary markets. These secondary markets can be distributors specializing in the surplus of products or special points of sale managed directly by the company.

Up to this stage, there is an alternative process which can be followed when the product is either sellable in the primary or secondary market, to utilize the surplus food by sponsoring specific organizations or arrange product testing events (Garrone et al., 2016). The company can allow its workers to suggest events or organization to be sponsored, such as charity events or competitions where the excess is offered to attendants. Moreover, the company can also redistribute the surplus among its employees. When the product is close to expiration, the company can decide to give it for free among its employees. Although this option prevents the surplus to become food loss, it is not an effective solution in companies where the surplus generated is by far larger than what the employees could take with them. Consequently, as it was already suggested by Bilska et al. (2016), donation to non-profit organizations allows companies to ensure their produced food is consumed as well as improve the image of the company.

Once the product reaches its expiration date, there are still some alternatives to be considered before the product becomes food loss. It can be sold to companies which utilize it to produce biofuel, fertilizers or cattle feeding. FMCG companies can still make a profit out of this as well as reduce the food loss generated by them. If any of the previously explained options is feasible, the food will be loss and sent for disposal to the sites where this process is carried. This is the less desired option for the companies and increases the expenditures of the company.

There are several authors who also studied the food waste hierarchy as a solution to manage food surplus and prevent food loss. As Fig. 2.7 suggest, Papargyropoulou et al. (2014) proposed a similar food waste hierarchy (Appendix A: The food waste hierarchy in the literature). In the study, it is as well suggested that the first step towards a reduction of food waste should be the adoption of a more sustainable production and consumption approach to minimize the surplus of food. Even if preventive actions are taken, it can happen that the excess production cannot be avoided. For that, the distribution of excess production to groups affected by food poverty, followed by the option of converting food waste to animal feed is suggested.

Mourad (2016) also takes as valid the food waste hierarchy analysed by previous authors. In the article, Mourad (2016) analyses the interests' actors might have from

an environmental, social and economic point of view (Appendix A: The food waste hierarchy in the literature). In the article, two categories of actions are distinguished:

- **Weak actions.** These actions focus on improving efficiency, neglecting rebound effects and long-term risks.
- **Strong actions.** These actions are attentive to overall resources limitations and appropriate patterns of production.

According to the goals of different actors, they might have different interests along the stages of the food waste hierarchy. As an example, Mourad (2016) explains that actors involved in environmental organization would promote recycling while business organization would promote optimization of process to reduce costs. Moreover, non-profit entities with social purposes will dedicate themselves to food recovery and distribution whereas companies will not see as economic beneficial to donate their product for free. Given that, it is suggested that strong prevention is the best long-term opportunity. It allows the reduction of excess stock which allows less confrontation among different groups through the food waste hierarchy.

Garrone et al. (2016) analyse the relationship between the prevention of food loss and the management of food surplus. The article analysed the critical factors for surplus food management:

- i. **Measurement.** Surplus food is measured more effectively if it is measured regularly and communicated to the different stakeholders involved.
 - a. **Ad hoc measurement.** Surplus is only measured if the amount generated is extremely high.
 - b. **Periodic and fragmented measurement.** Surplus is measured regularly. However, it is measured by different actors in the company depending on what time of surplus has been generated.
 - c. **Periodic and structured measurement.** Surplus is measured regularly with standard processes known by all the departments.
- ii. **Coordination.** Coordination among the different departments of the company regarding the excess stock management helps to make better and faster decisions.
 - a. **No coordination.** The decision-making process is not made among the various departments involved.
 - b. **Informal coordination.** There is no regular coordination. Discussion between various actors happens only when needed.
 - c. **Formal coordination.** Regular meetings take place where various actors actively participate in the decision-making process.
- iii. **Organization.** Various causes can generate surplus food, and making decisions in a timely manner requires designing a process around each of these causes.
 - a. **Process not organized.** There is no organized procedure to face the generation of surplus.

- b. **Process organized for some causes.** There is an organize procedure for some of the causes behind the generation of excess stock.
- c. **Process organized for all causes.** There is a formal approach to tackle all the causes behind the generation of excess stock.

Garrone et al. (2016) tested how these factors are related to surplus management efficiency across ten manufacturing companies operating in the north of Italy. These companies varied in their size as well as the products they commercialize with (dairy products, beverages, fresh products and confectionary products). A cross-case studied was carried on to study how strongly each factor is implemented by the manufacturing companies (Fig. 2.8, where companies are named from A to J).

	A	F	H	I	C	E	J	B	G	D
Measurement	H	H	H	H	H	M	M	L	L	L
Coordination	H	H	H	H	M	M	M	L	L	L
Organization	H	H	M	M	M	M	H	M	M	L
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Management Control System	High	High	High	High	Med	Med	Med	Low	Low	Low
Reuse and redistribute	100 %	100 %	100 %	80 %	85 %	50 %	45 %	32 %	15 %	8 %

Fig. 2.8: Cross-case analysis for management control system variables (Garrone et al., 2016).

The surplus food management effectiveness is measured according to the amount of food recovered for human consumption. Recovered food is that portion of the total surplus which is still used for human consumption. Garrone et al. (2016) deduced from the cross-case analysis that surplus food savings vary according to how committed manufacturers are to managing the problem. As some companies consider surplus food as an important issue, it is measured regularly. Moreover, coordination among different departments exists which allow to take different measures depending on the causes triggering the existence of surplus food. This situation allows those manufacturing companies to improve their efficiency in terms of reuse and redistribute of their excess stock.

A second analysis was done by Garrone et al. (2016) to study the donation efficiency when there is partnership between the food aid organizations and the manufacturing company. For the donation process, the critical factors considered for the analysis where:

- i. **Pro-activism.** The company can either act actively on the process or remain inactive until the food aid organization reaches them.

- a. **Reactive.** The food aid organization reaches the company and asks for available food for donation.
 - b. **Pro-active.** The company reaches the food aid organization and asks if the can take the available surplus.
- ii. **Regularity.** The donation process can be regular or sporadic.
- a. **Sporadic.** Donation is only happening when the company detects the existence of donation which cannot be sold. This process is not happening on a regular basis.
 - b. **Regular.** The donation process takes place on a regular basis.

	H	I	A	F	E	J	C	B	G	D
Pro-activy	P	P	P	P	P	P	P	R	R	R
Regularity	R	R	S	S	R	S	S	S	S	S
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Partnership with food aid organization	High	High	Med	Med	Med	Med	Med	Low	Low	Low
Donation	100 %	80 %	80%	75 %	50%	45 %	10 %	12 %	7 %	5 %

Fig. 2.9: Cross-case analysis for partnership with food aid organizations (Garrone et al., 2016).

As a result of the cross-case analysis, the percentage of food donated among the ten manufacturing companies was measured (Fig. 2.9). To improve the donation process, a proactive position from the company is needed to boost the interaction between them and food aids organizations to increase the amount of surplus donated.

2.5 Conclusion

As explained at the beginning of this chapter, the literature review has been developed based on a funnel approach. Firstly, the intention was on explaining the relevance of the topic in terms of global food loss. The principle stages of the food supply chain were explained and the food loss per stage was quantified. Some causes behind the generation of food loss were also included. As this analysis was not taken specific regions into account, a separation between high/medium-income and low-income countries were made. Given than this project is not aiming to reduce food loss at every stage of the food supply chain, the topics of the literature review was limited by only considering what is relevant for a FMCG company such as the Kraft Heinz Company.

Consecutively, the importance of monitoring shelf life to prevent food loss was analysed. At this point, a split between fixed shelf life and random lifetime products was made. As the Kraft Heinz Company does not commercialize with random lifetime products such as fruit or vegetables, the literature regarding these products was

discarded. Terms as “sell by date” or “use by date” were added in the review as they have a big relevance in the generation/prevention of supply chain losses at the Kraft Heinz Company. The importance of supply chain visibility was also considered. This topic is relevant as justifies how shelf life can be monitored better if the company has the needed level of visibility of their stock. This issue is relevant for this project as well due to the reason that all the actors at the company should be aware of the surplus generated. Not only supply chain visibility means to have access to real-time data, but this data should arrive to all the stakeholders involve in the prevention of supply chain losses in a clear and simple way. If all the actors involved in the process are not aware of the status of the inventory, the reduction of food loss is hindered.

Subsequently, inventory management was reviewed. As it is explained in the chapter, a better management of the inventory reduces the production of excess stock, hence, decreases the possible amount of food which can become food loss. Inventory management models such as FEFO was included to expose the benefits compared to the standard FIFO model. At this point, the gap between inventory theory models and real-life situation was considered. The causes lying behind the discrepancies between what theoretical models propose and the results obtained when applied were discussed. It was concluded that sometimes academicians strive for optimal solutions when companies prefer cheaper and quickly, but less optimal, solutions.

The last section of this chapter before this conclusion includes the most relevant topic for the objective of this thesis project. Firstly, it was explained what FMCG companies are and what are the special features of their business. The reasons behind the production of excess stock in these companies were explained. Given the current situation, it seems to be very complicated that FMCG companies change their actual procedures and erase the issue of surplus food from their agenda. Therefore, the literature regarding surplus food management and food loss prevention was reviewed.

Bilska et al. (2016) analysed the causes behind food loss as well proposed several recovery points in where de donation process to food aids organizations could take place. At this stage, donation was considered a key process to prevent supply chain losses. Nevertheless, the review was still missing a formal procedure in which different actions are considered depending on the status of the product. The food waste hierarchy filled this gap. It is suggested different action plans depending on whether the product is sellable in the primary market, secondary market or usable for donation. Moreover, the literature suggests that some of the expired food can be used for animal feeding or biofuel production before sending it to destruction.

Garrone et al. (2016) analyses some factors which have a direct influence on how a company is able to reuse, redistribute or donate food surplus before it becomes food loss. According to the authors, a company which aims to follow the waste hierarchy must:

- Measure the stock periodically and structurally
- Formal coordinate the various actions actively
- Organize a process around all causes generating excess stock

In addition, for a company to have a high rate of donation of products before expiration, the company needs to have a regular and pro-active process around food aids organizations. Fig. 2.10 is created to summarize the factors influencing the different stages of the food waste management. There is no mention in the literature regarding the avoidance of food surplus. For the following steps, the level of development in five different factors will influence the success of the food waste hierarchy.

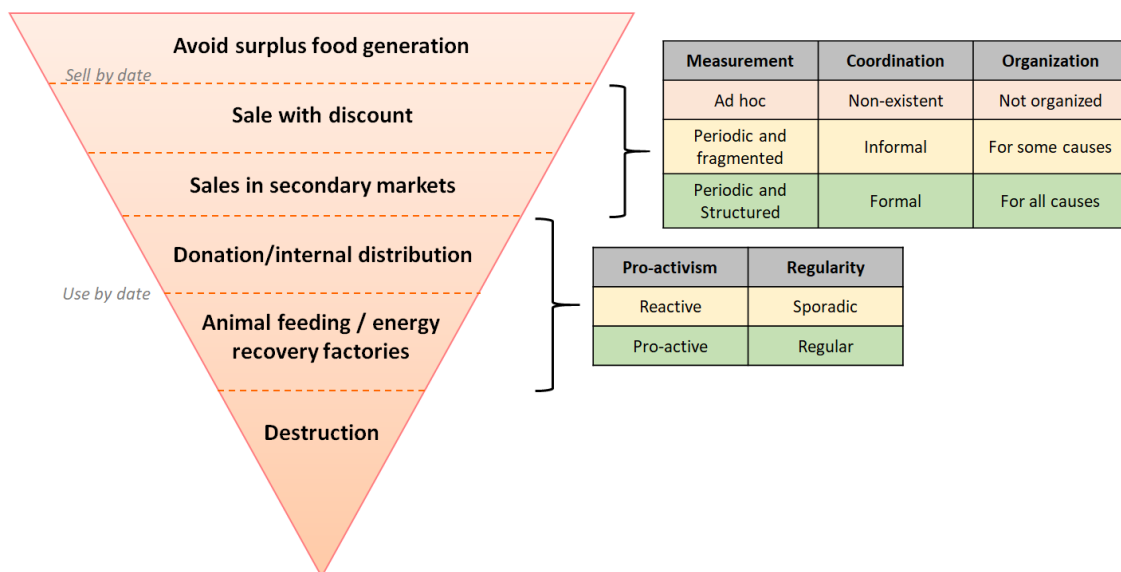


Fig. 2.10: Literature review summary for food loss management in FMCG companies.

In the next chapter, the current way of working regarding supply chain losses at the Kraft Heinz Company will be analysed. Furthermore, these processes will be compared with the suggestions in the literature. From this comparison, the gap in the literature will be addressed.

3. The Kraft Heinz Company

Before the analysis of supply chain losses, it is needed to deeply understand the company and its features. A description of the company's background is followed by an explanation of its current organization and structure. The company's portfolio and its current way of working regarding supply chain losses are also brought into this chapter.

3.1 The Kraft Heinz Company historical background

The Kraft Heinz Company is an American food company born in early 2015 from the merge of Kraft Food and Heinz. Heinz was founded in 1869 and re-founded seven years later. 1876 was also the year Heinz launched their most iconic product, the Heinz's tomato ketchup. The product was also launched in the British market in the coming years. This allowed the company to grow rapidly.

Given this growth and its high acceptance in UK, Heinz expanded its portfolio. One of the most iconic brands is Heinz Beanz (Fig. 3.1). Every day, 1.5 million cans of beans are sold in the UK which account for around 2 million people. Apart from Heinz Beanz, the company has other well-known brands such as Heinz Salad Cream, Heinz Spreads and Pickles and Heinz Soups.



Fig. 3.1: Heinz Beanz.

In 1999, Heinz acquired the Indonesian brand "ABC" based in Jakarta and which produced sauces, condiments, juices and syrups. The Heinz Company also started producing HP Sauces and Daddies, two brands of brown sauces that belong to HP Foods which was acquired by the company in June 2005. In the same year, Heinz took over Lea & Perrins from Danone. Furthermore, the company has two licenses with Weight Watchers and Jack Daniel's sauces.

Compared to Heinz, Kraft Foods was a "younger" group which experienced various mergers and acquisitions since its birth. It was founded in 1903 and then re-founded six years later by the Kraft brothers. In 1930, the company was acquired by National Dairy Products Corporation. Later, in 1980, Kraft merged with Dart Industries. In 1988, Philip Morris Companies (today known as the Altria Group) acquired Kraft for 12.9 billion dollars and combined it with General Foods, though they continued to operate separately. From that moment, the company started to expand outside the United States by acquiring other companies. Other mergers and acquisitions happened until 2015, when the biggest merge between the Heinz Company and Kraft took place.

Among the well-known Kraft Brands, Kraft Dinner and Kraft Mac&Cheese are their top brands in the United States. The company also owns Jell-O or Philadelphia. In the snack business, the company owns Planters and Maxwell house in the beverage business.

The Kraft Heinz Company had annual revenue of 26.2 billion dollars in 2017, eight brands accounting for more than 1 billion dollars of total sales and around 39,000 employees in more than 40 countries throughout the world. Thanks to the merger, the company became the 5th largest food and beverage company in the world and ranked third in North America.

3.2 The Kraft Heinz Company Organization

As a multinational company, the Kraft Heinz Company is present in every continent. Internally, the company is divided in five different regions: U.S., Canada, EMEA, LATAM and APAC (Fig. 3.2).



Fig. 3.2: The Kraft Heinz Company worldwide.

This project will not focus in all the regions in which Kraft Heinz commercialize, therefore the scope of the project will be in EMEA, specifically in Europe. EMEA is divided in Europa and Middle East and Africa (MEA). In Europe, there are four different regions (Fig. 3.3):

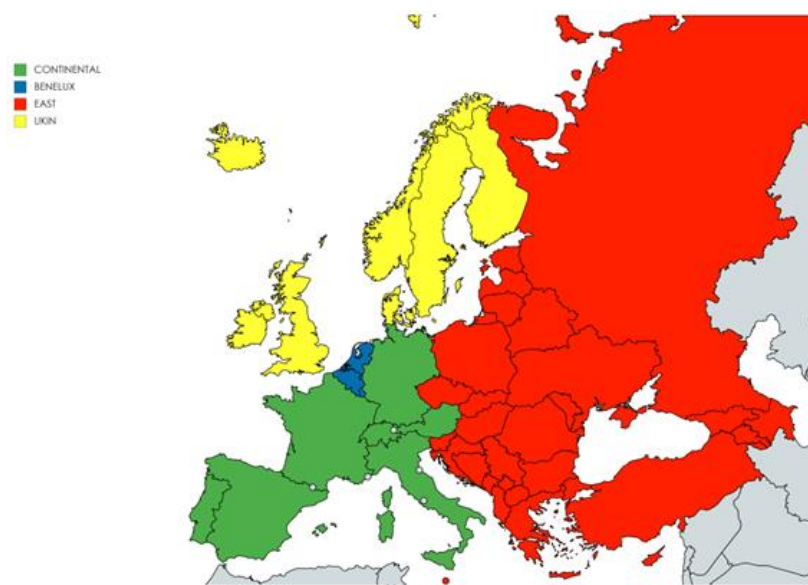


Fig. 3.3: The Kraft Heinz Company Europe.

Table 3.1: Sales regions.

Sales region	Business Units	Countries
UKIN	UKI	United Kingdom and Ireland
	Nordics	Scandinavian countries
Continental	Italy	Italy
	GAS	Germany, Austria, Switzerland
	France	France
	Iberia	Spain and Portugal
EAST	Russia	Russia
	D&E - East	Eastern Europe Countries
	Poland	Poland
Benelux	Netherlands	Netherlands
	Belgium	Belgium

3.3 The Kraft Heinz Company portfolio in EMEA

The Kraft Heinz Company commercialize with 22 different brands in EMEA (Appendix B: The Kraft Heinz Company Brands in EMEA). The different products are divided into three different categories: Sauces, QSM (Quick Serve Meals) and Infant & Nutrition food (Table 3.2).

Table 3.2: The Kraft Heinz Company food and beverage categories.

Sauces	QSM	Infant
Ketchup	Soups	Infant Snacks and Biscuits
Hot Sauces	Beans	Dry meals
Mustard	Ready Meals	Wet meals
Mayonnaise and Salad Cream	Ready Meal – Pasta	Desserts and Cheese
Salad Dressings	Noodles	Drinks
Condiments	Dry Pasta	Milk
Brown Sauces	Dry Meal Mixes	
BBQ Sauces	Dry Bakery Meals	
TBP – Tomato Pulp	Frozen Meals	
TBP – Tomato Paste	Frozen Dessert	
TBP – Tomato Frito	Vegetable	
TBP – Peeled & Diced Tomatoes	Oatmeal	
Pasta Sauces	Bread spreads	
Satay Sauces	Bread toppings	
Vinegar	Gluten Free	
Worcester Sauces	Drinks	
Soy Sauces	Snacks	
Stir Fry Sauces	Tuna	
Coconut milk		

For each of the category above, there are multiple SKUs (Stock Keeping Units) depending on the recipe and package used. In total, the KHC deals with more than 4000 different SKUs. Fig. 3.4 shows an example of the varieties of QSM products from the EMEA catalogue.

Table 3.3 shows the split of production and sales by the different categories in 2017. Ketchup, beans and soups are the top three categories in terms of production as well as sales. In 2017, the total amount of beverage and food produced by the KHC was worth of \$XXX. Regarding sales, \$XXX worth of stock were sold. These two values are measured at cost of goods sold (COGS)¹.

Table 3.3: Production and Sales at COGS value in 2017.

2017		
Category	Production (COGS)	Sales (COGS)
KETCHUP	Confidential information	
BEANS		
SOUP		
INFANT WET FOOD (AMBIENT)		
MAYONNAISE		
TOMATO PRODUCTS AND PASTA SAUCES		
OTHER SAUCES AND CONDIMENTS		
PASTA		
BREAD TOPPINGS AND SPREADS		
OTHER DRINKS		
INFANT SNACKS AND BISCUITS		
INFANT DRY CEREALS		
OTHER AMBIENT MEALS		
ASIAN SAUCES AND CONDIMENTS		
FROZEN MEALS AND SIDES		
STEAK SAUCES AND MEAT CONDIMENTS		
SALAD DRESSING		
MARINADES AND GRILLING SAUCES		
FORMULA		
OTHER NUTRITIONAL FOODS		
FRUITS AND VEGETABLES		
ALL OTHER PRODUCT TYPE		
MUSTARD		
INFANT DRINKS		
OTHER ETHNIC CONDIMENTS AND SAUCES		
FROZEN DESSERTS		
OILS FATS AND MARGARINE		
OTHER INFANT FEEDING		
RELISH AND PICKLES		
VINEGAR		
GRAVY		

One year later (Table 3.4), the total production increased to \$XXX. Sales value increased in 2018 too. It reached the total value of \$XXX at COGS value. If the indirect expenses are added, the total expenses in sales for 2018 were worth of \$1.8 billion. As the revenues in the same year were worth of \$2.7 billion, the earnings before interest, taxes, depreciation and amortization (EBITDA) was worth of \$0.9 million (Table 3.5).

¹ COGS: Cost of goods sold refers to the direct costs related to the production of that good. It includes the materials and labour costs. It does not include indirect expenses such as distribution or sales force costs.

Table 3.4: Production and Sales at COGS value in 2018.

2018		
Category	Production (COGS)	Sales (COGS)
KETCHUP	Confidential information	
BEANS		
SOUP		
MAYONNAISE		
INFANT WET FOOD (AMBIENT)		
OTHER SAUCES AND CONDIMENTS		
TOMATO PRODUCTS AND PASTA SAUCES		
PASTA		
INFANT SNACKS AND BISCUITS		
BREAD TOPPINGS AND SPREADS		
OTHER DRINKS		
INFANT DRY CEREALS		
ASIAN SAUCES AND CONDIMENTS		
STEAK SAUCES AND MEAT CONDIMENTS		
OTHER AMBIENT MEALS		
MARINADES AND GRILLING SAUCES		
SALAD DRESSING		
FROZEN MEALS AND SIDES		
FORMULA		
FRUITS AND VEGETABLES		
OTHER NUTRITIONAL FOODS		
MUSTARD		
ALL OTHER PRODUCT TYPE		
INFANT DRINKS		
OTHER ETHNIC CONDIMENTS AND SAUCES		
FROZEN DESSERTS		
OILS FATS AND MARGARINE		
OTHER INFANT FEEDING		
RELISH AND PICKLES		
VINEGAR		
GRAVY		

Table 3.5: Financial results in 2018.

2018 Results (\$ billion)	
Total Expenses	\$1,8
Sales (COGS)	Confidential information
Indirect expenses	
Revenue	\$2,7
EBITDA	\$0,9

MSD													
Category	Ready Meal - Pasta				Noodles		Dry Pasta						
Brand	Weight Watchers				Amy		Pudliszki						
Range	Kraft Mac n' Cheese				Amy		Pudliszki						
Format	Pot	Stove Top	Can	Sealed Pack	Carton	Sealed Pack	Honig	Honig	Honig	Honig	Lasagna	Long	Short
Sizes	330gm	206gm	400 gm	300g	500 gr	500 gr	500 gr	250 gr	500 gr	225 gr	500gr	500gr	500gr
				600g	250 gr	375 gr		300 gr		250 gr			340gr
					625 gr			350 gr		500 gr			
					1 kg			500 gr					
Flavours	4	4	3	6	8	6	1	9	1	4	1	11	

Fig. 3.4: Example of QSM Catalogue EMEA 2018 - Pasta and Noodles.

3.4 Supply Chain Losses at the Kraft Heinz Company

Supply Chain Losses are defined by the KHC as the financial costs related to the physically dispose of products and/or their provision (i.e. aging, quality and damages). Losses lead to a substantial cash flow disruption as the company spends millions of dollars annually producing these items and once they are thrown out, money was wasted for no reason. Additionally, hunger is a global problem and throwing away food is not what Kraft Heinz is willing to stand for. The main sources of Supply Chain Losses can be tied back to either Commercial or Operational issues in the supply chain (Table 3.6):

- a) Commercial relates to Sales Units/Regions.
- b) Operational relates to all factories, internal manufacturing warehouses and logistics services providers (LSPs).

In a simple form, anything in the commercial bucket is related to sales, innovation and discontinuations. Anything in the operational bucket is related to quality and operational execution, damages, stock counts, etc.

Table 3.6: Supply Chain losses buckets.

Cause	SC Loss Driver	ZBB Sub-package	Description
Commercial	Innovation	Innovation	Excess inventory resulting from recently launched products
	Lost distribution	Planning (Comm)	Remaining stock which cannot be sold anymore
	Discontinuation	Discontinuation	Remaining stock, which cannot be sold anymore (including Raw/Pack/WIP)
	Forecast Accuracy	Planning (Comm)	Aging stock, driven by Sales forecast errors
Operations	Quality	Quality losses	Goods with quality issues that cannot be reworked
	Inventory count	Inventory counting losses	Impact of adjusting stock to reflect accurate stock levels excluding factory R&P, which need to be part of yield
	Damage	Internal damage	Damaged goods that are not sellable anymore
	Incorrect Planning	Planning (Ops)	Aging stock, driven by Planning error
	Overproduction	Overproduction	Aging stock, driven by over production
	Projects (i.e. Footprint)	N/A	All SC losses driven by footprint (not reported in SC losses but in footprint) or cost-savings projects

As already addressed in the scope section from Chapter 1, and given the current time constraints, this master thesis will focus on reducing the supply chain losses related to the commercial budget.

The KHC represents the product lifecycle as shown in Fig. 3.5. This process represents, in very general terms, how a product comes to life, enters the KHC portfolio and is managed, produced and put in the inventory. The KHC aims to dually deliver to customers but also manage their inventory to sell stock before the sell by date. If the product passes the sell by date, it goes through a clearance process.

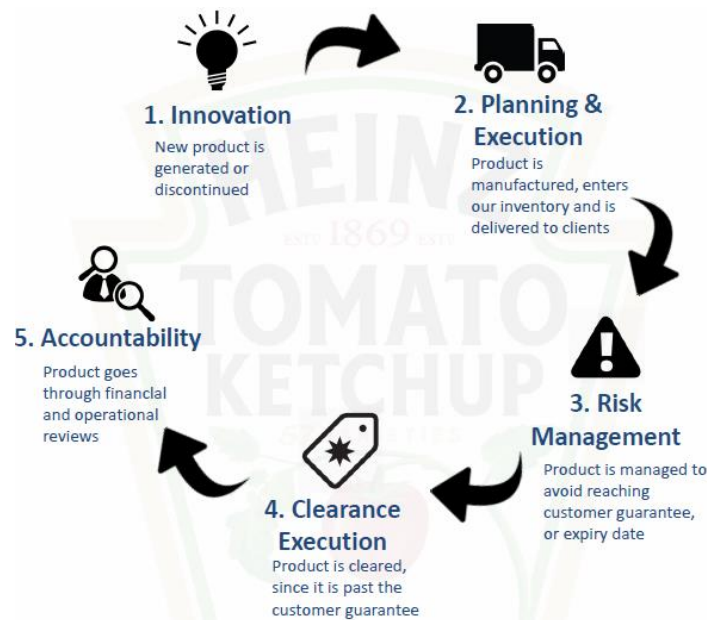


Fig. 3.5: Product Lifecycle for KHC products.

Following sections focus on how to prevent the stock from passing customer guarantee. If this situation is given, then, the KHC proposes a process for the stock to be cleared before it becomes supply chain losses.

3.4.1 How to prevent Supply Chain losses and the KPIs

This section describes the current way of working to maximize loss prevention. This process covers the first two steps of the product lifecycle (Fig. 3.5): 1. Innovation and 2. Planning & Execution.

- **Innovation**

Innovation is described at KHC as any noticeable or value added change provided to the customer. It includes either new products as well product upgrade (new recipe, renewed package, etc.). On the innovation projects, there are several types of risks when it comes to Supply Chain losses, depending on the nature of the project. There are several factors which can create risk:

- Forecast accuracy resulting in excess stock. This excess stock will be considered in the Risk Management phase.
- Replacing SKU's. If existing products will be replaced, it needs to be clear before the new product is launched. If the Run in/Run out process is not managed correctly, the losses associated with replacing stock will happen.

- Execution limitations. A new product development may require to acquire assets. The volumes need to justify this investment as the cost will be amortised to the products over the life time of the asset quantity. As an example, the launch of a new product may face that the minimum run can be too high and contract can prevent from changing that. Then operations produce/purchase more stock than needed, increasing supply chain losses.
- Evaluations. During as well as after the launch phase of an innovation, an evaluation needs to take place whether to continue with the innovation or not and/or what changes are needed to be made to make it profitable.
- Cannibalisation. Due to innovation, existing SKU's may have lower sales due to the cannibalisation impact (lower sales on old product as consumer prefers new product over old).

- **Planning & Execution**

After a product is launched or changed, it enters in the business portfolio and production plan. To protect service and control losses, the following factors are studied:

- Inventory count. Visibility to complete and accurate inventory is critical in identifying and mitigating future losses. As part of inventory management and loss prevention, the KHC current way of working follows FEFO method. If the products which are delivered are not the first to expire in the warehouse, the company runs the risk of large Supply Chain Losses.
- Minimum Order Quantity (MOQ) for factories. Minimum Order Quantity should be compared to the planned production versus the sales forecast and any issue items should be reviewed by a Sales & Operations Planning team. The risk items should be analysed whether it is needed to delist them or review the production parameters.
- Excess Stock. It is the result of sub-optimal management of stock demand. At the KHC, excess stock is defined as the stock above the Maximum Stock². The minimum stock³ and the cycle stock needed depend on the characteristics of each specific market and the standard deviation on demand. Excess stock can eventually lead to Supply Chain Losses and has an implication on the Working Capital. It is critical to identify Excess stock, dispose Excess stock and minimize the risk of creating it again.
- Quality. To ensure that each production meets the KHC quality standards, a part of each production batch is blocked and quarantined by the Quality department. After conforming that the quality of the products is up to standards, the products are released for sales. Nevertheless, it can sometimes occur that the product does not meet the quality standards. If the product can be reworked, it will add extra manufacturing cost but it will prevent the Supply

² Maximum Stock = Minimum stock + replenishment cycle stock.

³ Minimum Stock = Safety Stock + Quality Inspection Stock + In transit stock.

Chain losses. If the product cannot be reworked and remains unsuitable, it needs to be destroyed and will become operational supply chain losses. Sometimes, a product can be sold not to the regular customer but to another company as the input for their product. As an example, the oil of the mayonnaise can be processed by a biofuel company or some raw materials can be processed into animal feeding. Fig. 3.6 shows the different results of a product after being blocked by the Quality team.

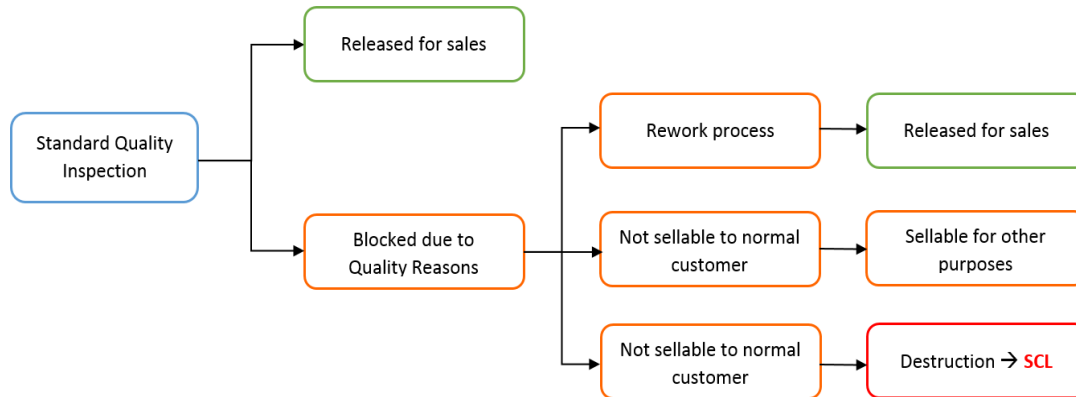


Fig. 3.6: Standard process for Quality Blocked Stock at KHC.

- **KPIs**

Table 3.7 summarizes the several KPIs that the KHC uses to control and track the performance of loss prevention. This table is based on the interviews conducted to supply and demand planning teams and the loss prevention lead. All these stakeholders outlined the same KPIs.

Table 3.7: Loss prevention KPIs.

KPI	Definition	Calculation	Format	Granularity
Write-off Project	The innovation project write-off that was identified and become a target needs to be tracked.	Total \$ budget versus Actual \$	Total project	SKU
% Minimum Run versus Sales Out	Every production run that is larger than the sales volume over the shelf-life of the product creates excess stock, which will eventually turn into a loss.	% of sales that the company can sell out of then minimum run	Year to Go	SKU
Quality losses / Ton	It represents the quality losses per produced ton per line.	\$ Quality loss / Total Tons	Month to Date	Tons
Inventory Cycle Count Accuracy	The % Inventory counted from the total inventory	Inventory counted / Total inventory	Total	SKU
Inventory Count results	This number represents the result from inventory cycle count accuracy in monetary terms.	Inventory Counted (\$) – Total Inventory (\$)	Month to date	SKU
Innovation losses / Innovation CMA	The % that the Innovation loss absorbs or the total realised commercial CMA ⁴ .	Innovation loss / Innovation CMA	Year to Date	Category

⁴ Contribution Margin Average (CMA). Profit made as the difference between Sales Value and COGS.

3.4.2 How to manage Supply Chain Losses and the KPIs

This section describes what is the current way or working to manage the on-hand stock which might generate supply chain losses in the short term. This process works as a benchmark for each of the Business Units (Table 3.1). There are four different dates in the life-cycle of a product which are relevant:

- Date of production.
- MAX Coverage.
- Trade Best Before End Date (T-BBE Date).
- Best Before End Date (BBE Date).

A product is considered to be healthy stock if it has not exceeded the maximum coverage date. The maximum coverage is the maximum number of days the stock is expected to be in the warehouse before it is sold. Once this is date is reached, the product become excess stock. Excess stock can be split in two categories. If the product has not exceeded the customers guarantee (T-BBE date), it is considered Risk Stock. On the contrary, if the customers guarantee is exceeded, it is defined as aged stock. Risk stock can be sold through the normal channel as the healthy stock. Fig. 3.7 and Fig. 3.8 have been developed according to the explanations given by the stakeholders during the interviews.

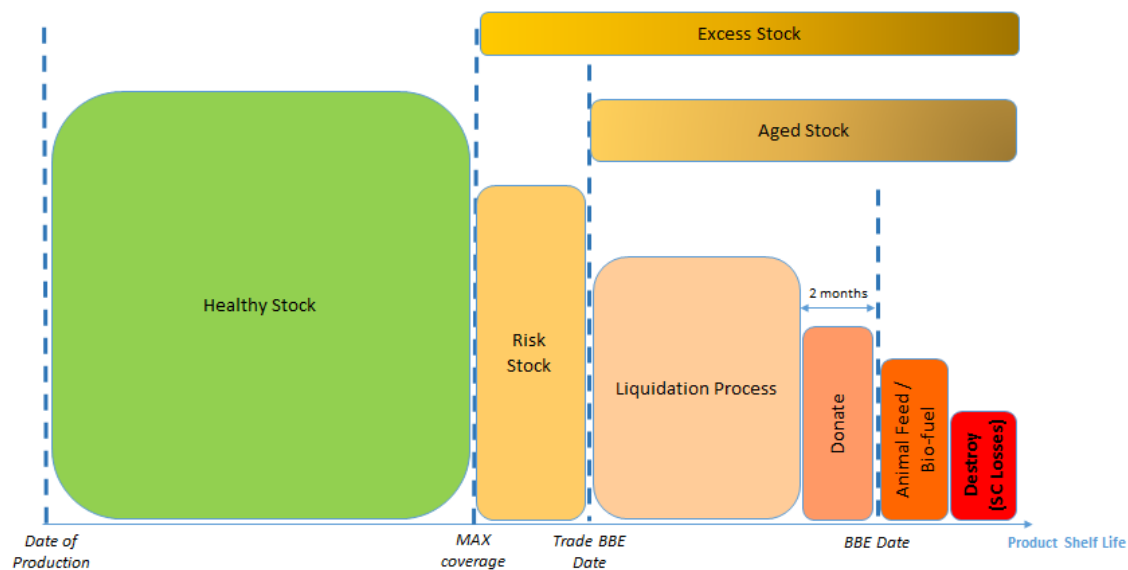


Fig. 3.7: Current way or working to manage excess stock at the KHC.

Once the T-BBE date of a product is exceeded and it is considered aged stock, the BBE date becomes a crucial deadline to prevent supply chain losses. Generally, this stock is sold at a lower price, reducing the profit of the KHC. According to how close the stock is to reaching the BBE date, different action plans for the stock are carried to maximize the profits (Fig. 3.8).

Firstly, the Business Units (BUs) should negotiate with the customer if it is possible to purchase the product even though it has a remaining shelf life lower than the minimum shelf life required. If this option is not valid, negotiations with discounters and brokers should take place as this is the secondary channels in which the stock can be sold. The brokers would purchase the product through e-auctions. If possible, the company should negotiate the bid offered by the brokers. However, given the time limitations due to the remaining shelf life of the product, most of the bid cannot be extensively negotiated and must be quickly accepted/rejected.

If the stock cannot be cleared in any of the before mentioned steps, the last option is to donate it. This channel should be considered once the stock will expire in less than sixty days and all the other options have been tried without success. Each BU must have different partnerships agreements with charity groups or foodbanks to speed up the process.

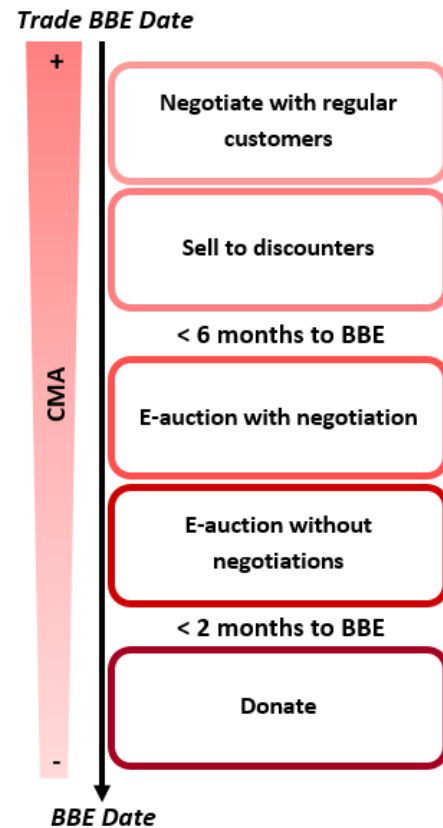


Fig. 3.8: Liquidation Process at the KHC.

Along the different steps shown in Fig. 3.8, the chances of suffering a CMA hit increase. CMA is related to the price at which the product is sold (NSV⁵) compared to its COGS value (Table 3.8). If the product is sold at a price which is lower than the COGS value, then it is considered a CMA hit.

Table 3.8: Effects on CMA due to the liquidation process

Type of deal	Effect on CMA
NSV > COGS	Positive CMA
NSV = COGS	Neutral CMA
NSV < COGS	Negative CMA
Donation: NSV = 0 < COGS	Negative CMA

If any of the steps shown in Fig. 3.8 was successful, and the stock reaches its BBE date, the company still has two channels to prevent it from becoming supply chain losses. The KHC can try to sell it for animal feeding or to bio-fuel companies. These two last options prevent the stock to be destroyed however they are usually sold at a very low price; therefore, it means a negative CMA.

⁵ NSV: Net Sales Value.

- **KPIs**

Table 3.9 summarizes the several KPIs that the KHC uses to control and track the performance of loss prevention. Similarly to Table 3.7, Table 3.9 has been developed from the information and explanations given during the interviews.

Table 3.9: Managing Losses KPIs.

KPI	Definition	Calculation	Format	Granularity
Aged Stock	The % of total stock Past T-BBE and Past BBE compared to the total on-hand stock.	Total aged stock / Total stock	Month to Date	SKU
Excess Stock	The volume of stock due to the misalignment between Supply and Demand	Total stock – Maximum Stock ²	Month to Date	SKU
Liquidation Execution	The % of aged stock which is sold through secondary channels.	Total cases sold / Total to be cleared cases	Month to Date	SKU
Donation Execution	The % of donated stock out of the total goods to be donated.	Donated cases / Total cases to be donated	Month to Date	SKU
Cost Recovery	The % of total cost that it could be recovered during the liquidation process	Cost recovered / Total cost	Month to date	SKU
Loss to Perfection	The total value the company lost on unsellable stock. It is the sum of total supply chain losses plus the margin lost during the donation/liquidation process	Supply chain losses + CMA hit	Month to date	Category

3.5 Conclusion

In this chapter, the Kraft Heinz Company has been analysed from different angles. Firstly, the historical background and its organizational structure among the different continents were discussed. Then, the chapter focused on the KHC portfolio in EMEA, which is divided in Sauces, QSM and Infant products. The amount produced and sold in the last two years was measured and, for 2018, an analysis of the profit made by the company was added.

Furthermore, Chapter 3 considered all the information gathered during the interviews regarding supply chain losses at the Kraft Heinz Company. From the interviews and short meetings held with the stakeholders of the company, the processes regarding supply chain losses were divided between preventing supply chain losses and managing supply chain losses. Preventing supply chain losses were mainly focused on those activities which can trigger the generation of excess stock which would become commercial losses in the future.

Managing supply chain losses section was more focused on those activities related to on-hand stock management. Moreover, the section explained which steps the company takes according to the remaining shelf life of the product. In a nutshell, the different steps to prevent supply chain once the product has reached its total trade

shelf life are: sell with discount, sell in e-auction, donate, send to animal feeding or biofuel sites and, lastly, destroy.

Chapter 4 will compare the outputs and findings of Chapter 3 with the conclusions of the literature review. The theoretical approach and the current business situation will be jointly analysed. This will allow highlighting any current knowledge gap as well as the needed improvements.

4. Literature Reflection based on the KHC analysis and Knowledge Gap

Once Chapter 2 and Chapter 3 are concluded, it is possible to compare the theoretical approach in the literature with the situation in one of the biggest food and beverage multinational companies. Fig. 4.1 compares the food waste hierarchy found in the literature with the current way of handling excess stock at the KHC. Both processes are similar, hence, it can be concluded the company has already implemented the food waste hierarchy as part of their routines and processes.

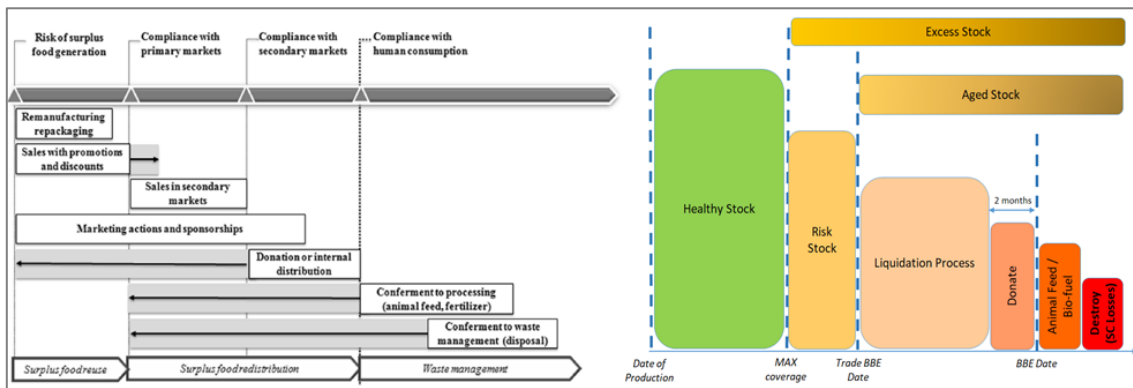


Fig. 4.1: Food waste hierarchy vs current way of working at the KHC.

Garrone et al., (2016) analysed which were the critical factors for surplus food management. The food waste hierarchy would rather be successful or not according to the level of commitment these factors are considered within the company. Consequently, the factors are compared with the current way of working at KHC:

- **Measurement.** The KHC Company measures the aged stock periodically and the information is shared among the main stakeholders.
- **Coordination.** Even though each BU coordinates the clearance process differently, all the BUs do it regularly and actors participate proactively based on the process explained in Fig. 3.7.
- **Organization.** Most of the causes behind the generation of surplus are known and the company has a formal approach for them.

In terms of donation, there are two factors considered by Garrone et al., (2016) which can lead to 100% donation effectiveness:

- **Pro-activism.** Each of the BUs at the KHC contacts food banks or charity group when there is stock to be donated.
- **Regularity.** If the food aid organizations accept it, all the BUs are willing to donate aged stock at least once per month.

Per the factors found in the literature, the company already has the needed level coordination and organization to experience high liquidation and donation efficiency. Based on the literature, a company which follows these guidelines should be able to prevent food loss or have a very small portion of food destroyed. At the KHC, by following these guidelines, the company could reduce the amount of food destroyed up to a point. The commercial losses budget still suffered a hit of \$XXX which were not prevented even though the food waste hierarchy was followed. Based on the current situation, the KHC is far from experiencing such a high level of efficiency. Each month, the company is adding new stock to its supply chain losses, meaning that the company needs to go a step beyond the implementation of the food waste hierarchy.

The first issue missing in the literature was the absence of information regarding the implementation of the food waste hierarchy in multinational companies. The available literature only described the food waste hierarchy and implemented it in companies operating in small regions. Once the food waste hierarchy is implemented in a company such as the KHC, which has factories and warehouses across Europe, this supply chain networks become an extra layer to consider. Supply planning is done centrally and then each BU commercializes the stock produce for them. The stock is not always at the regional warehouse of the BU as the company has their own network of warehouse for the storage.

There were any analyses studying the situation of multinational FMCG regarding supply chain losses. Hence, it was not possible to benchmark the loss prevention performance of the KHC in comparison with companies such as Nestlé or Unilever. It would have been of great interest for the objectives of this project to know how other leading companies of the market prevent the destruction of food.

In addition to the issue of a multinational company which is divided in various business units, the SCL performance of the company is not equal for all the business units. In the case of the KHC, each BU follows the food waste hierarchy independently. The food waste hierarchy efficiency among the BU is different per the characteristics of each region. Therefore, the literature regarding the food waste hierarchy is missing the issue of a company which is divided in different units with different limitations and regional constraints. It is needed to include what extra actions are needed to improve the performance of the company SCL based on the individual performance of each business unit.

The second main gap is the analysis of concrete measures to prevent SCL. The available literature mainly describes the different stages along the food waste hierarchy but does not go in detail. There is a lack of elaborated processes around each of the stages. The food waste hierarchy states that the first stage is the prevention of excess stock. Nevertheless, it was not found in the literature how to proceed with this suggestion. This project will describe and implement a process where future excess

generation is reviewed and prevented. This will allow adapting the theoretical suggestion into a practical process.

The third piece of knowledge missing in the literature is on how to translate the performance of the company for high management positions. In other words, the literature does not cover how a company can track the evolution of commercial losses across each BU and the company as a whole. The most commonly used indicator for this purpose is a KPI. Therefore, the literature should cover which are the needed KPIs a multinational company should measure to track their performance. Once the KPIs are clear for a company, it is possible to develop specific process around that KPI to improve this measure. Additionally, the performance of the company can be quantified and brought to high management positions. The stakeholders in these positions can have a clear picture of the current situation and base the decision-making process considering these new KPIs as well.

Based on the current state of the art in the literature and the situation at the Kraft Heinz Company, the theoretical and practical relevance are justified as well as the need for improvements. Next chapter will deeper analyse the causes behind the commercial losses at the Kraft Heinz company whether these have ever been addressed in the literature or not. In accordance with this analysis and the gap uncovered by the literature, Chapter 6 will develop the needed processes and tools to enhance the SCL performance of the company.

The improvements will be developed based on the possible range of action as part of the SC Hub of the KHC. A supply chain losses stakeholder analysis will be developed. It will help to address which stakeholders can have a greater influence on the commercial losses of the company. The improvement section will be carried based on the position the stakeholders have in an interest-power matrix. The suggestions will be mainly data oriented to justify the need of them based on the numbers. Moreover, by justifying it with data, the goal is to increase the engagement of the stakeholders in the SCL processes of the company.

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5. Supply Chain Losses Analysis

The following chapter will consider the supply chain losses (SCL) result at the Kraft Heinz Company in 2018. Firstly, the total losses and CMA hit suffered will be quantified. The evolution of the aged stock will be analysed as well as the main risky categories. The major factors contribution to the generation of supply chain losses at KHC will also be studied. Lastly, those stakeholders related to supply chain losses and its relation with SCL will be considered.

5.1 Supply Chain losses problem definition at the Kraft Heinz Company

Commercial losses are the sum of the CMA hit due to liquidation of aged stock under its COGS value plus the supply chain losses value. As stated in the previous chapter, SCL is only considered to be the stock which is destroyed, hence, written off. Liquidation, donation, animal feeding or bio-fuel are different channels which contribute to the CMA hit of the company.

Fig. 5.1 shows the total net commercial losses for the KHC in 2018 were. A total of \$XXX million worth of stock passed T-BBE at some point in the year in Europe. Out of the total, \$XXX where liquidated with a negative CMA and \$XXX worth of stock became supply chain losses as they were written off (destroyed). Additionally, \$XXX worth of raw and pack material (R&P) were destroyed. \$XXX net commercial losses meant the 0.53% of the total sales made during the same year.

Given the numbers above, the KHC decided to set a new target for commercial losses in 2019 (Fig. 5.1). The company aim is to reduce its net commercial losses from \$XXX to \$XXX.

Ideally, the goal for the company is to have a maximum of \$XXX write offs for R&P materials, zero supply chain losses and \$XXX as CMA hit. This objective means the reduction the net commercial losses in \$XXX compared to 2018 results. Moreover, the percentage of net commercial losses compared to the total net sales expected for 2019 should not be higher than 0.44%. The challenge presented for 2019 is even

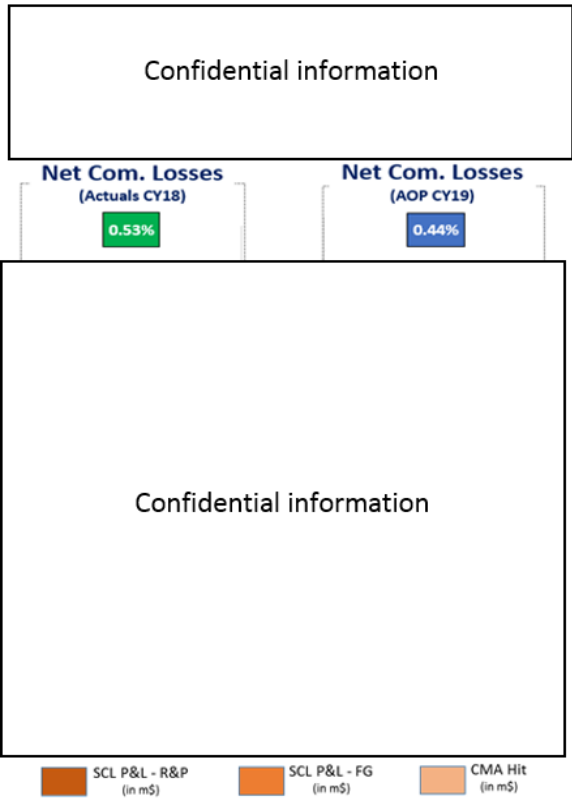


Fig. 5.1: Net Commercial SCL in 2018 and Net Commercial Losses objective for 2019 (the KHC internal data source).

higher as the company will finalize the integration of Middle East and Africa (MEA) and the numbers for 2019 will take into consideration the situation of, not only Europe, but also MEA.

The net commercial losses result in 2018 and the objectives the company has established for themselves for the coming year justifies the practical relevance of this thesis for the company. Therefore, both the academic and practical relevance of this thesis are justified.

5.2 Aged sock analysis in 2018

Fig. 5.2 shows the evolution of aged stock for Europe in 2018. As illustrated, the total aged stock constantly increased along the year. The year started with around \$XXX worth of aged and it ended with roughly \$XXX. Even though the total absolute value of aged stock was constantly increasing, the percentage of aged stock out of the total stock did not constantly increase over 2018. This is due to the fact that the total production rate was higher than the rate of stock passing its trade BBE date.

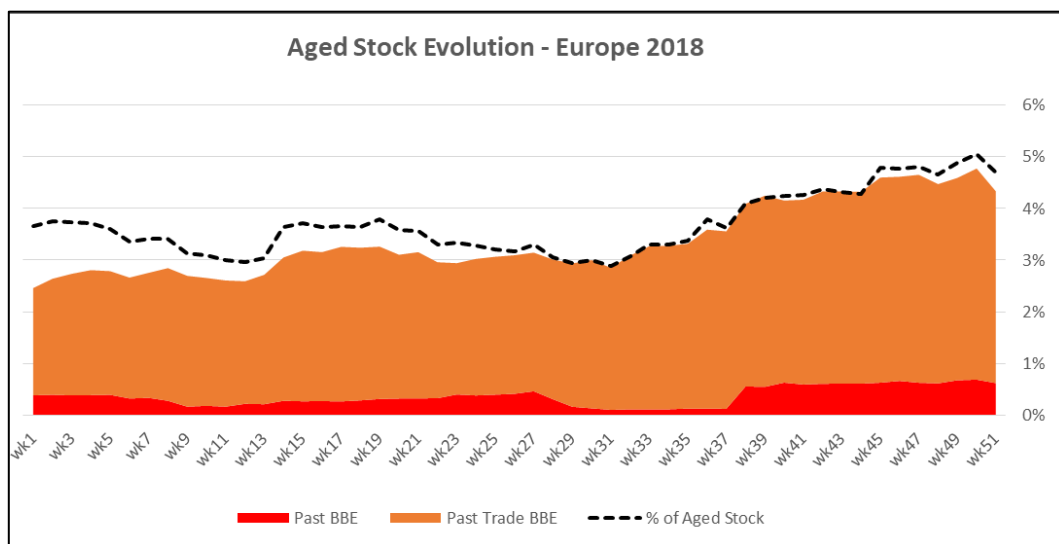


Fig. 5.2: Aged Stock Evolution at the Kraft Heinz Company in Europe, 2018.

An issue which was found and highlighted by top managers inside the company was the lack of visibility in the liquidation process of each BU. Each week, top managers were only able to know the total value of stock past T-BBE and past BBE. This number is changing every week as it depends on four different values as illustrated in Fig. 5.3

Therefore, one of the objectives of this project is to improve the visibility from which the decision-making process can be based. It is not enough to know how much is the value of the stock either past T-BBE or BBE.

$$\text{Total Past T-BBE in week X} = \left(\begin{array}{l} \text{Total Past T-BBE in week X-1} \\ + \\ \text{New stock which passed T-BBE in week X (IN)} \\ - \\ \text{Stock which passed BBE in week X (EXPIRING)} \\ - \\ \text{Stock which was liquidated from the total stock} \\ \text{Past T-BBE in week X-1 (OUT)} \end{array} \right)$$

Fig. 5.3: Total stock Past T-BBE detailed calculation.

This needed visibility will be justified by the next example: it may be the case that a BU is reducing the total value of stock Past T-BBE. Taking into consideration the current visibility at the KHC (Fig. 5.4), this scenario would lead top managers to believe that this BU is improving its performance. Nevertheless, if the visibility is upgraded, the reasons behind the reduction of this value can be known. If it is the case where the BU is increasing the total value of stock passing T-BBE per week even though the BU is increasing its efficiency in the liquidation process, it cannot be considered the BU is improving its performance. Therefore, if full visibility is reached, the top managers in the company can track the performance of each BU from two areas: how much stock is passing T-BBE per week (possible creation of new KPIs) and how much stock is being liquidated by the BU per week (Liquidation Execution KPI). The same level of visibility can be reached for the stock Past BBE.

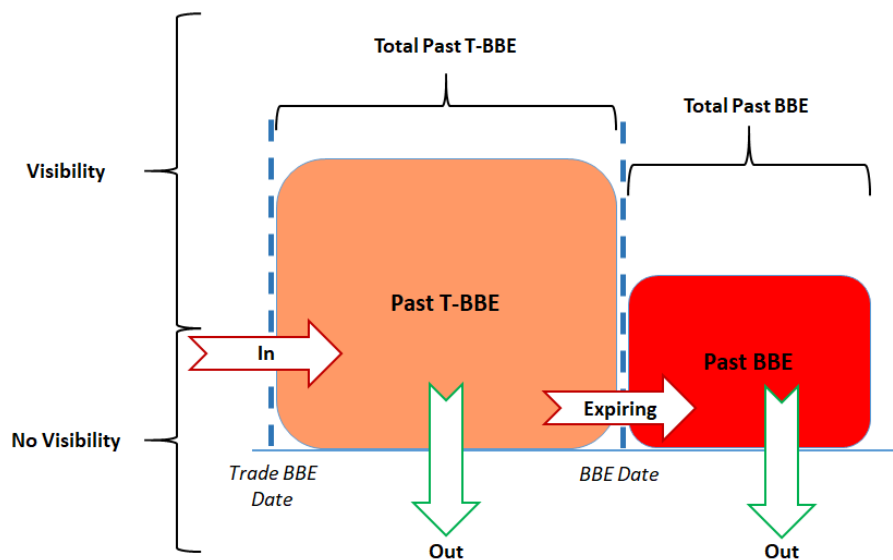


Fig. 5.4: Visibility at the KHC.

Fig. 5.5 is a Pareto chart of the total aged stock average value per category in 2018. Each bar represents the total average value of each category while the line shows the cumulative total. As shown in Table 3.4, the top five categories produced and sold in 2018 were: Ketchup, Beans, Soup, Mayonnaise and Infant Wet Food. As it would be expected, there should be a relation between the top categories produced/sold and the top categories contributing to commercial losses. However, this is not the situation

presented at the KHC. The riskiest categories in terms of commercial losses in 2018 were those related with Infant food. The reason behind is the business strategy that KHC has in some BUs and the volatility of the demand.

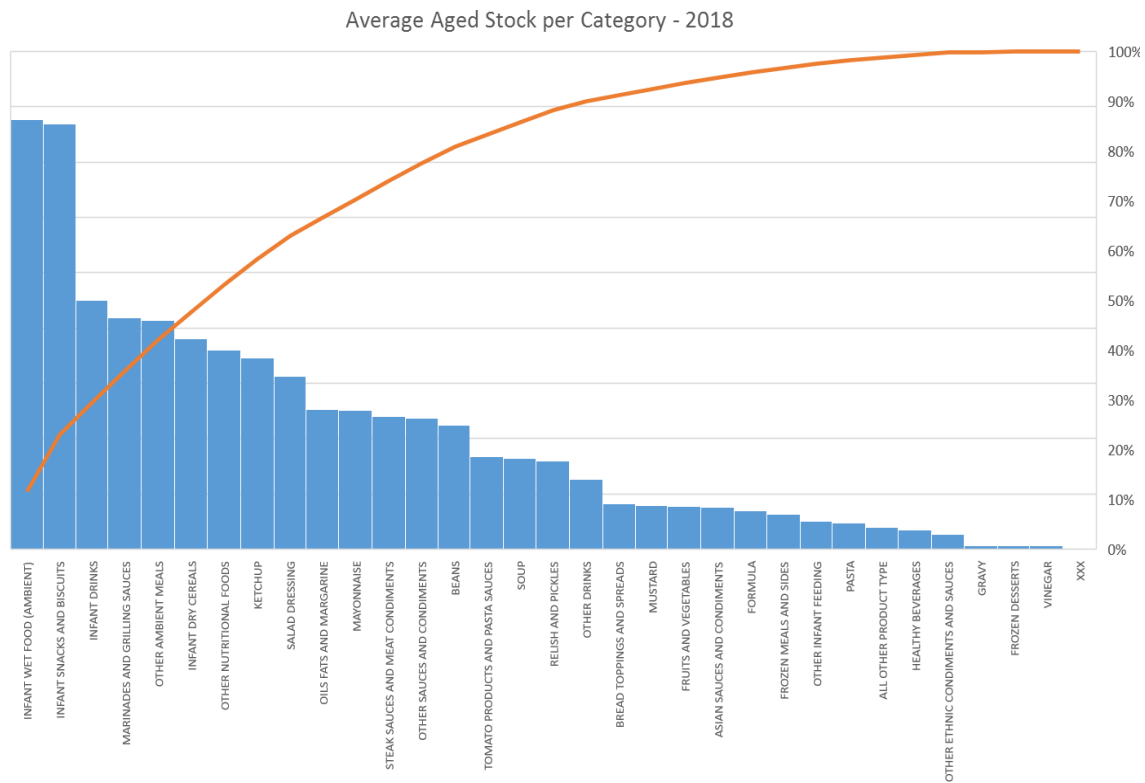


Fig. 5.5: Pareto chart of the average Aged Stock per Category in 2018 (the KHC internal data source).

5.3 Supply Chain Losses Drivers

The following section will analyse the main causes (drivers) behind the generation of commercial supply chain losses. Fig. 5.6 shows these drivers as well as when they happen in the life-cycle of a product. Table 5.1 summarizes the source of information from which these drivers have been deducted. The combination of literature review, stakeholder's interviews and data collection brought this distinction.

Table 5.1: Sources of information for Supply Chain Losses Drivers.

Driver	Sources of information
Forecast accuracy	Giroto et al. (2015), Priefer et al. (2016), Bilska et al. (2016) , Papargyropoulou et al. (2014), Data collection, Interviews
Excess production	Priefer et al. (2016), Bilska et al. (2016), Data collection, Interviews
Production Issues	Bilska et al. (2016) , Data collection, Interviews
Short (trade) shelf life	Giroto et al. (2015), Falcone et al. (2017), Garrone et al. (2014), Data collection, Interviews
Production parameters	Interviews
Logistics Issues	Bilska et al. (2016), Garrone et al. (2014), Interviews
Quality Blocked Stock	Priefer et al. (2016), Bilska et al. (2016), Papargyropoulou et al. (2014), Interviews
Wrong Stock Deployment	Interviews
Liquidation & Donation Efficiency	Priefer et al. (2016), Data collection, Interviews
Product delisting	Bilska et al. (2016), Data collection, Interviews

Under sales (*Over-forecasting*)

Given the volatility of the demand in the markets where the KHC operates, it is difficult to match the demand with the supply. Currently, the forecast accuracy of the company in Europe per month is XXX%. Once there is an error in the forecast, it can mean the product was either over-forecasted or under-forecasted. In a similar way to the case of the Infant food in BU-4, the strategy of the company in the coming years is to grow and keep earning market share in the categories in which the KHC is competing.

It is difficult to measure how much of the total commercial supply chain losses happened due to the over-forecasting as no root-cause analysis was made by that time. This driver was already mentioned in the literature review (Table 2.2) by Priefer et al. (2016). However, this driver was considered under those factors in the distribution and wholesale/retail stage. For this project, it has been taken into consideration at the manufacturing stage. Inaccurate forecast does not only happen at the retail/wholesale but also before this stage. The KHC forecasts the demand of all the retailers buying their products, hence, this driver should also be considered.

Excess production

As explained in previous chapters, excess stock is the stock which will not be covered by the expected demand and will pass the trade window before it is sold. The production of this surplus always leads to a CMA hit and negatively affects the commercial losses. If the excess production is due to over-forecast then the root-cause behind this loss is the over-forecast and the excess production is just the result of it. Excess production is related to the decisions made by the supply planning team. It can be since the supply planning team is producing more than the forecast or the supply planning software (JDA⁶) is updated with wrong parameters. Excess production will be discussed in detail in the next chapter, but some of the reasons behind the excess production are:

- Supply planner and demand planner agree on a new production without updating it on the supply planning software. The standard process is not followed and the chances of excess generation increase.
- Production is based on the suggestions made by JDA. If the parameters updated on the software were not reviewed and corrected by the supply planner, wrong productions could be planned.
- Production constraints. Given the existing constraints at the production sites, especially those sites with highly utilized lines, the supply planner did not have manoeuvrability to decide where to produce. Stock built needed to happen and it would lead to excess if it was not planned accurately.

This driver is one of the top issues at the KHC. Next chapter will focus to bring a solution to the generation of excess stock but also measure which percentage of the stock passing T-BBE was caused by excess production.

Production Issues

The Minimum Order Quantity (MOQ) is the lowest number of cases the factory would accept producing. If the supply planner plans a production where the number of cases is lower than the MOQ, the factory will refuse as the cost of production will be too high. In terms of supply chain losses, it could be the case when the MOQ is too high that, even by producing the same quantity as the MOQ, this quantity exceeds the expected demand. This scenario is likely to create excess stock which will not be sold through normal channels.

The production cycle is defined as the number of weeks separating two productions for the same items. Generally, the production cycle for most of the SKUs at the KHC is four weeks. The connection between the production cycle and commercial losses is the result of those production cycles which are more than four weeks. When this is the

⁶ JDA: Supply chain management software used by the Kraft Heinz Company for several activities such as supply planning, demand planning or manufacturing planning.

situation given, the supply planner faces two issues. Firstly, it is very challenging to cover the coming demand for more than four weeks based on one production. There might be variations in the demand forecast which cannot be considered if they production cycle is more than four weeks. Secondly, if the on-hand stock plus the new production is considered, it could be the case in which the sum of both quantities will exceed the expected demand in the trade window⁷ time, and some of the new stock will past the T-BBE date.

These production issues are approximately behind the 5-8% of the total commercial losses suffered in Europe in 2018.

Short Shelf life/trade Shelf life

One of the root causes of commercial losses is the short shelf life of some of the products in the catalogue. If a product has a short shelf life, the trade window will be even shorter. This situation shortens the time in which the company can sell the product. Furthermore, there is a different scenario where the product does not have a short shelf life but it has a short trade shelf life.

Trade shelf life, similarly to trade window, is the amount of time a product can last before it can no longer be sold through the normal channel. Once the product is past the trade shelf life, it is still consumable and the company can commercialize with it. However, this must be done by following the food waste hierarchy or the liquidation process (Fig. 3.8).

The extension of shelf life is a complex process and not easy to achieve. The shelf life of a product is defined by the R&D team within the company. This team selects different test methods and determines the range of shelf life within which the product will remain safe. After that, the R&D sets a fixed number of days and communicates this to the other teams in the company. If the R&D team is requested to review the shelf life of the product, it can be extended by going on the higher side of the tolerant limit. Nevertheless, the R&D will never go above the highest limit for safety reasons.

Regarding the products with a short trade shelf life, this is an issue which involves the buyer as well. The trade shelf life can only be negotiated by negotiating with the customer the required minimum shelf life they ask for. If negotiations can take place and the customer accepted to buy a product with a lower remaining shelf life, this would reduce the number of products which enter the liquidation process in the company.

Production Parameters

The production parameters can directly affect the generation of excess stock. If a company operates in a volatile market, it would tend to increase the target safety

⁷ Trade window: Number of weeks between the production date and the Trade BBE date.

stock. As the company aims not to be out-of-stock and the demand is very variable, it could happen that the company finds in a position in which the excessive safety stock becomes excess stock if the demand reduced.

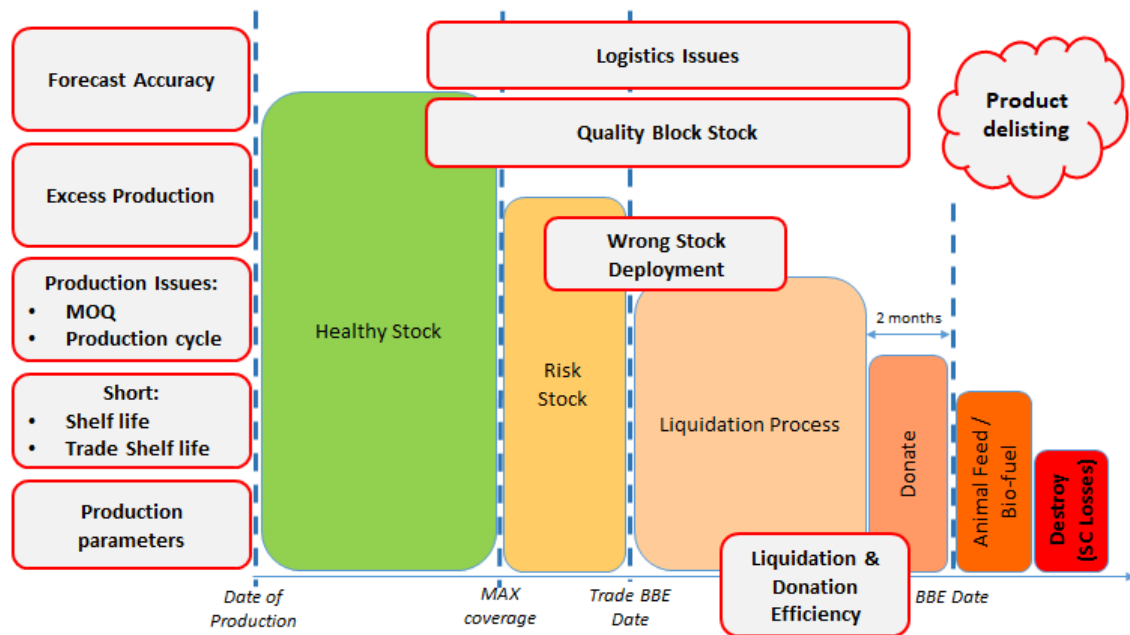


Fig. 5.6: Commercial Supply Chain Losses Drivers.

The next four drivers cannot be prevented before production. They are the result of the combined performance of different teams inside the company.

Wrong Stock Deployment

Wrong stock deployment can be defined as the stock which is not in the correct warehouse at the right time. This driver was one of the root causes which were not considered in the articles studied in the literature review (Chapter 2). Those articles were only implementing the food waste hierarchy in small regions. For this project, the KHC is operating in a much bigger region and the warehouses and factories are spread all over it.

Once the stock is produced to cover the demand of one, or various Business Units, it needs to be shipped to the local warehouse of that BU. Sometimes, forecast changed and less stock than the produced is requested to be shipped, this leaves some stock back in the first warehouse. During the liquidation process, the BUs only check the aged stock at their local warehouse. Therefore, the BUs were not considering any of their stock outside their local warehouse for liquidation. This issue is estimated to be 5% of the commercial losses in 2018.

Logistics Issues

This driver is related to the different tasks which are carried out in the various warehouses the KHC have in Europe. It represents approximately 1% of the root causes

behind commercial losses. One of the logistics issues the company has in terms of commercial losses are the part pallets. Once the stock is produced and brought to the warehouse, it sits there until it is sold or move to another warehouse for a different BU to sell it from there. In this process, some cases are repacked per the order of the receiving BU. This sometimes leaves some pallets not full, so-called “part pallets”. If the part pallets are not reworked into full pallets, they will not be shipped out. This part pallets needs to be taken into the routines of the logistics team to avoid them not to be considered in the clearance process.

A second issue in terms of logistics is that the Kraft Heinz warehouses in Europe do not follow FEFO, but FIFO. The logic behind is that the logistics team will ship out the stock which arrived earlier in the warehouse. This is a wrong process which can increase the likelihood of commercial losses as food warehouses should follow FEFO as explained in the literature review. On top of that, the different trade windows for each BU complicate the whole logistics process.

Quality Block Stock

One of the issues which were not measured but the demand team highlighted during the interviews was related with the quality blocked stock. As it was illustrated in Fig. 3.6, it might happen that some product is not complying with the stipulated quality requirements and it gets blocked by the quality team. If it is the case in which the stock cannot be recovered and is sent for destruction, it will not be part of the commercial losses budget. The reason why the quality block stock has been highlighted is related with the fact that there are some situations in which the stock is release from quality once it is already too close to the T-BBE date for the commercial team to take actions on that product.

Liquidation/Donation Efficiency

This driver is not one of the root causes behind the generation of SCL but it has big impact on the result of the company. As the food waste hierarchy was implemented as suggested in the literature, the KHC would expect to achieve high liquidation and donation efficiency (Fig. 2.8 and Fig. 2.9). Nevertheless, the company is not achieving such high percentages of efficiency. Given this situation, it was of interest for the goal of this project to understand what constraints or limitations each of the BUs were having during the clearance process. For that, one demand planner of each BU was interviewed with the same questions. The main findings which justified the low clearance efficiency were:

- Most of the BUs struggle to clear the stock produced for the *CONFIDENTIAL INFORMATION*.

Even though most of the BUs are struggling to clear these products, BU-9 affirmed to be able to clear foodservice stock above COGS.

- BU-2 has major difficulties to donate any stock as the foodbanks in this region are full. In terms of liquidation, this BU also struggles to sell their stock through secondary channels. BU-1 is also struggling to liquidate and donate stock.
- The company did not have any biofuel contact to clear the stock through this channel. It is starting to send some stock to a company in BU-10 who uses *CONFIDENTIAL INFORMATION*. Regarding animal feeding, BU-4 is the only business unit using this channel to prevent supply chain losses. BU-4 could send any stock for animal feeding if it belongs to a few specific categories. Despite this situation, the BU-4 has a very low liquidation performance. BU-4 is not able to sell big amounts of food at the early stages of the liquidation process. Most of the clearance is done by donation and animal feeding, which has a highly negative impact in the CMA of the company.

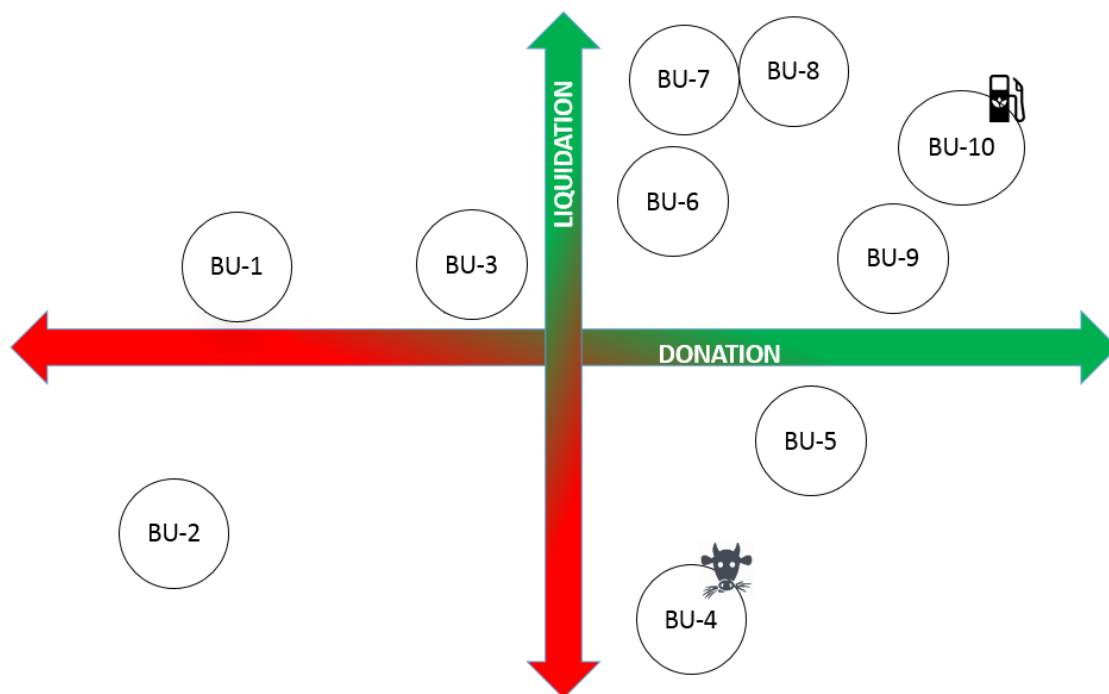


Fig. 5.7: Donation and Clearance performance by each BU.

By interviewing each of the BUs individually, it was clear the main constraints and difficulties they were facing. These interviews also helped to realize there was room for improvement. The situation analysed above is opposed to the conclusion Garrone et al. (2016) arrive in their publication. Not only the factors considered by the authors influence the liquidation efficiency of a company, but there are other constraints needed to consider. This is the gap not covered by the literature and this project aims to review.

In the future recommendations section, a change in the actual process will be proposed to overcome some of the difficulties mentioned. A central team will be proposed to pick up the clearance process from the BUs. This solution could help to

bridge the gap between the opportunities one BU have and the difficulties other are facing.

Product delisting

This last driver is under a different classification than the drivers above. In a Run-In-Run-Out situation, the company is delisting an old item as it is being substituted by a new item. In other cases, the company decides to just delist the product as it is causing some type of losses. When a product is delisted, the company will stop commercializing with this product. It might happen that the company ends up with some remaining stock. If the company does not plan the delisting correctly, by the time the product is no longer sold, the company will have a surplus of it which will only be able to sell through the secondary channel. Eventually, this would become under the commercial losses budget. For that, the company is already developing and running a process to prevent supply chain losses due to this issue.

The main reason why product delisting causes supply chain losses is because of the R&P materials which are not consumed. Even though a final production is planned so no FG excess is remaining, there might be an excess of R&P materials. Therefore, this driver is contributing to the R&P supply chain losses (Fig. 5.1). This driver will not be considered in this thesis project as:

- The scope of this project is covering the commercial losses of finish goods at the KHC. Hence, R&P materials losses are not part of the scope.
- It is not the main issues for commercial losses compared to the drivers of the finished goods. Moreover, it is a complex process where many factors into consideration. NOD and RIRO would be a topic on their own for a master thesis topic.
- *CONFIDENTIAL COPY.*

5.4 Supply Chain Losses Stakeholders

The KHC is a multi-brand, multichannel and multinational company which makes the issue of reducing supply chain losses a big challenge. To understand who the main actors involved in this process are, the main stakeholders related to SCL will be described as well as their interests and objectives. Given this analysis, misalignments of interest will also be defined, which can cause potential barriers.

Category Analysts. The category analysts have as the main objective to increase the profit of the company. The aim to increase the NSV of each transaction and make it as bigger as possible compared to the COGS value. They analyse when a product of their category portfolio is reducing the profit and the company is suffering losses. They have the power to see which products are more rottenly passing the T-BBE date and, therefore, sold at a lower price. If a product is continuously affecting bringing a negative CMA, they can decide to delist that product from the portfolio. They have the

interest to reduce the number of product which is often contributing to the commercial losses of the company.

Demand Planning. The demand planning team has a high power regarding the reduction of supply chain losses. Depending on their forecast accuracy, they influence the amount of excess stock the company has. They have commercial losses as a KPI so they have a great interest to reduce this number. Nonetheless, they also have CFR⁸ as their KPI. These two KPIs have different objectives and one action which can improve one KPI could worsen the other. The need to balance the prevention of out-of-stock situation while preventing to over forecast and generate excess stock.

FSQ team. The FSQ (Food Safety Quality) team analysis every production once finished to check if the products are compliant with the safety and quality standards of the company. As explain in the previous chapter (Fig. 3.6), after production, that batch is put into quarantine to test if the product can safely reach the customer. If there is a quality issue, the product is blocked by the quality team. The FSQ team is interested in making sure the products satisfy the quality standards of the company so any of the products are sent for destruction. This team have a limited power as they are constrained by the quality standards which always need to be met.

Logistics. The logistics team is charge of planning the transportation of products between the warehouses and factories. Their main goal is to optimize these parameters by designing the most efficient network transportation. They also consider the truck load and the team always aim to fulfil the track load to reduce the costs. This team have a very little involvement with the loss reduction process. They have a low power and interest on this issue.

Managing director of the Business Units. The manager director is the highest position in each of the BUs. The have the duty of making their BU keep growing and increasing their number of sales. They have a lot of power on what happens in their BU and, therefore can influence SCL. Despite their power, they are more concern about the selling than reducing commercial losses. That is why the chart shows they have more power than interest on this topic.

Marketing. Similarly, to SC Development, marketing will also focus on growing the business. The people from this department will decide the product mix of each Business Unit to keep expanding in each region. They were positioned with high power as they can influence how often the portfolio of the company changes. If the company adds and delists products in a high frequency, it increases the probability of ending up with obsolete R&P material. If the R&P materials are not consumed before they are no longer used, it will affect the commercial losses of the company. Nevertheless, they were positioned as their main KPIs are related to increasing the profit of the company.

⁸ CFR (Case Fill Rate): It measures the number of cases delivered in comparison with the number of cases ordered.

R&D team. The R&D team works developing new products for the KHC portfolio. They develop new recipes or study how to make them better for the customer demand (i.e. developing ketchup with 50% less sugar). The R&D team also tests the new products and established their shelf life based on safety reasons. This team is not involved in any of the routines regarding loss prevention. They can only retest the product to see if the shelf life can be extended. However, extending the shelf life of a product is not an easy process as it is limited by safety reasons.

Sales – Customer Service. This department is in close touch with the customer. They work to bring new customers while offering the best possible service to the current customers. Initially, they would not be much related with SCL neither they are interested in improving this KPI. However, they have a high power regarding commercial losses due to their involvement in the clearance process. They are not only involved in selling to normal customer but they also sell the products through the secondary channel.

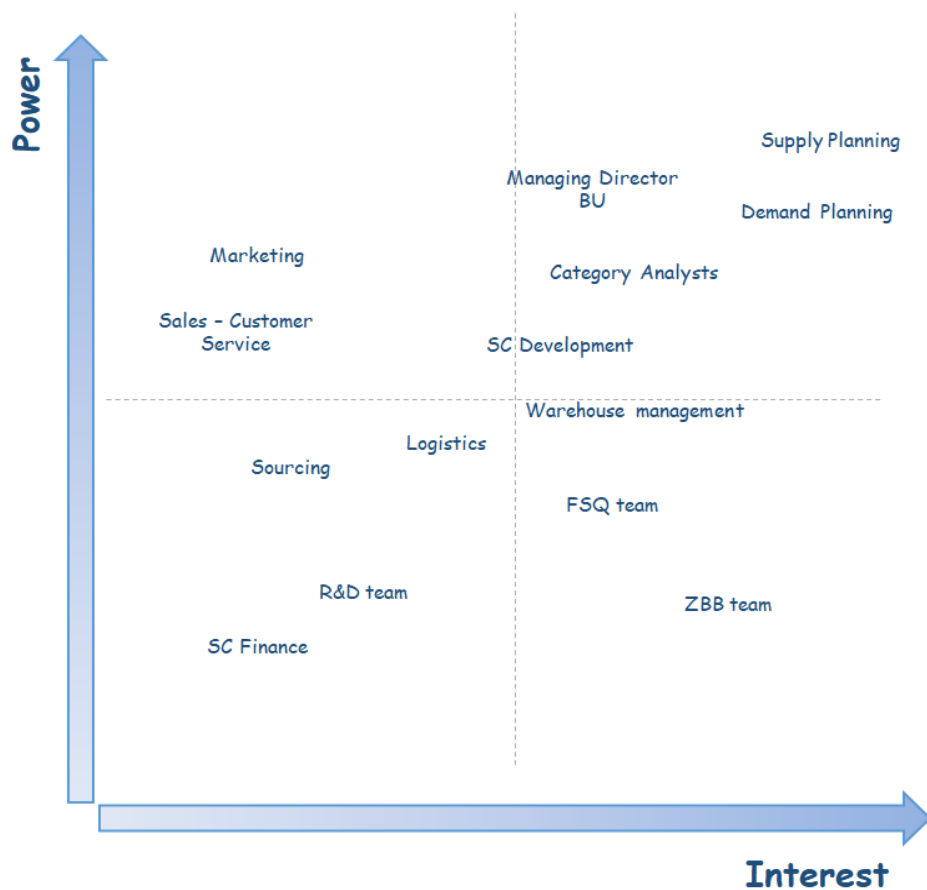


Fig. 5.8: Power-interest matrix of stakeholders.

Sourcing. Under this group, two different teams have been gathering: Procurement and Manufacturing. Procurement buys R&P materials from external suppliers and manufacturing converts these products into FG. They are also part in the decision of the MOQ and production cycles of the product. However, they do not have a high interest in reducing commercial losses as their main KPIs are related to production. They

are interested in the reduction of manufacturing losses but this is not cover by the scope of the project.

Supply chain Development (SC Development). This department oversees developing the capabilities of the company. In other words, its focus is on helping growing the business. As an example, if the company aims to grow in the foodservice business, SC Development will work to bring this growth by developing the needed new products as well as designing the supply chain of these products. This department will analyse which product is needed to develop, in which of the factories can be developed and if the current supply chain can allow to deliver this product. SC Development will work closely with marketing, supply planning and manufacturing to make sure the KHC can bring the new product from the factory to the customer, where these two are.

In terms of supply chain losses, they main power this department have for the reduction of SCL is regarding MOQs. SC Development works closely with the manufacturing team for new launches. While deciding the MOQ of a new product, the SC Development can influence this number. As explained below, it can be some scenarios were the MOQ is higher than the demand forecast. When this takes place, just by producing the minimum amount, there is some of that stock which will past T-BBE.

Supply Chain Finance (SC Finance). This department performs accounting activities. SC Finance develops the profit and loss (P&L) statement. This financial stamen summarizes all the expenses and earning made during a period. This team has a low power and interest on commercial losses.

Supply Planning. Supply planning is in a similar situation as demand planning, this team also have commercial losses and CFR as its KPIs. This department oversees planning the needed supply to fulfil the demand based on the forecast. The reason why supply planning has been placed in a higher power position compare to demand planning is because this team can prevent the generation of excess stock before its production. Excess stock is the result of a mismatch between the demand forecast and the actual sales volume. Over forecast can only be known why the time the product is not sold. However, excess production by the supply planner can be prevented before happening. The members of this time can take actions to prevent the generation of excess stock and only produce to fulfil the demand forecast shared by the demand planning team.

Warehouse management. In each warehouse, there is a team managing the stock stored there. Among their duties, they receive the stock and store it and they prepare the shipments for customer or other warehouses. As part of their KPIs, the storage cost is one of them. If the company has a great amount of excess stock, it would necessary need a bigger capacity in the warehouse. As this team would be positively affected by the reduction of excess stock, they are highlight interested in the reduction

of the aforesaid. Nonetheless, they can only prepare the shipments once requested so their power for the food loss reduction is limited.

This team is also involved in sending the expired stock of the warehouse for destruction. Once approved, they arrange the destruction of the Past BBE stock. The warehouse management team is interested in destroying the expired food and liberating the space in the warehouse for fresh productions. However, they need the approvals from the BU before destroying anything. This process is sometimes slower than expected, which limited the power of this team. Contrary to other teams which have high interest and low power, as the ZBB team, this team has a higher power. They can face the issue of part pallets by running a routine process in which these part pallets are reworked into full pallets to be shipped. Finally, this time have the possibility of following a FEFO methodology which would help to reduce the aged stock. Nonetheless, changing their systems from FIFO to FEFO is not currently one of their priorities.

ZBB team. The Zero-based budgeting (ZBB) team of each BU has the duty to explain the expenses of their BU for each new period. Ideally, they should inform how each BU is reducing their expenses while keep growing. Commercial losses are an extra expense the BU face. As the ZBB team aims to reduce the expenses, they have a great interest in reducing the commercial losses. However, they are not part of any decision-making process which can improve the loss prevention. Hence, they have a low power to contribute towards the depletion of SCL.

5.5 Conclusion

Chapter 5 analysed the main causes of SCL at the company. Firstly, the problem was defined and quantified based on the historical data source of the Kraft Heinz Company. Before moving to the analysis of the SCL drivers, the first issue regarding visibility was highlighted. According to the current situation at the company, the only measure taken was the amount of aged stock per week. Nevertheless, there was no visibility on the amount of stock passing the T-BBE/BBE date per week (Fig. 5.4). This visibility is needed to understand the performance the company in preventive new stock entering the liquidation process.

Once the analysis of SCL drivers was carried, these were divided in those occurring before production and after production. It was not possible to quantify the percentage of contribution each driver had to the total SCL of the company in 2018 as there was no RCA done by the time of passing the trade window or the expiration date. The second analysis conducted was related to the stakeholders of the company. Each of the different teams in the company was studied and placed in the power-interest matrix (Fig. 5.8). These two analyses are combined in Fig. 5.9. This figure illustrates the different root causes behind the generation of SCL. Moreover, these drivers are positioned in the product shelf life. Finally, the drivers have been linked to those stakeholders who have a higher power to prevent them from happening.

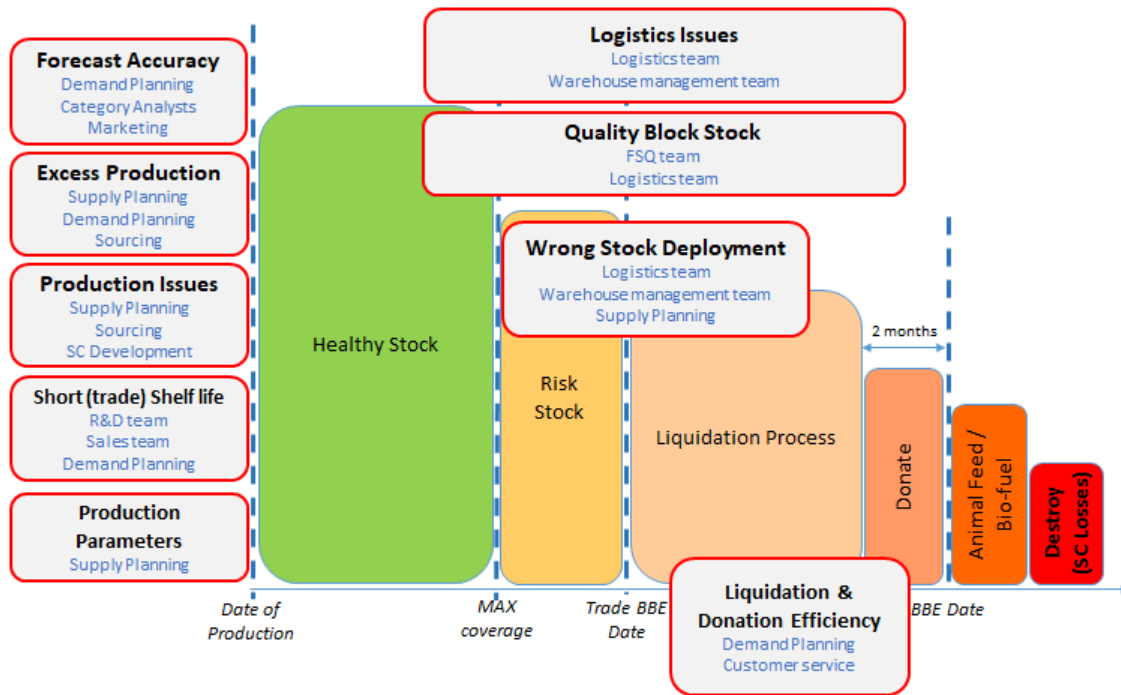


Fig. 5.9: Supply Chain Losses full analysis.

Before moving into the developing stage, four components need to be considered:

- The gaps uncovered in the literature mentioned in Chapter 4.
- The lack of visibility to efficiently address the performance of the company.
- The drivers generating SCL at the company.
- The range of influence this thesis project can have in the different stakeholders in the power-interest matrix (Fig. 5.8) as a member of the SC Hub. Demand and supply planning teams are the two stakeholders with the higher interest and higher power so the improvement part should be focused in actions carried by these actors as well as top management positions in the supply chain Hub.

6. Improving the food loss reduction process

Taken into consideration the literature review and analysis conducted in the previous chapters, Chapter 6 focuses on developing a series of improvements with the aim of reducing the commercial losses of the company. The improvement of the current food loss reduction process is split in two types of actions.

Firstly, the corrective actions will be created to have a better visibility and control of the current performance of the company. This will be possible by improving the visibility of the movements of the aged stock. This enhancement of the current visibility will be developed by monitoring the new stock passing the T-BBE/BBE date and the stock being cleared. This would lead the company into a better visibility on the performance in the loss prevention process. By working with the current inventory data, it will also be possible to tackle other issues related with visibility as well. A new tool will be created to bring the needed visibility of the stock wrongly located. If the different BUs can easily check the physical location of the stock outside their local warehouse, they can act promptly and prevent new commercial losses

The preventive action will focus on improving the current excess production review process at the company. This process aims to ensure the supply planner produces to cover the demand while ensuring anything of what they planned will pass the trade window. This preventive process will be enhanced by linked to the data measured by the corrective actions. Future productions will be reviewed based on the KPIS. If excess stock was produced for one item in the past, the new productions will be considered more caution. The link of future productions with actual data will justify the relevance of the excess production review process and win the trust of the stakeholders.

6.1 Corrective actions

This section takes into consideration the on-hand stock of the company. The corrective actions aim to reduce the amount of stock passing T-BBE and BBE. As explained before, this project is developed from the hub perspective. Hence, it is needed to know the scope and limitations of the actions. Those activities ran independently by each Business Unit cannot be modify centrally.

Regarding the drivers considered to take place after production, Fig. 5.6 showed the following issues⁹:

- 1) Under sales.
- 2) Logistics Issues.
- 3) Quality Blocked Stock.
- 4) Wrong Stock Deployment.
- 5) Liquidation & Donation Efficiency.

⁹ NOD and RIDO are out of the scope of this project.

Under sales is the main driver causing supply chain losses among the after-production drivers. This issue takes many factors into consideration and it is a complex matter. If a product is undersold due to over-forecasting, forecast accuracy is the main driver. However, it can be due to multiple reasons related to the customer service or marketing teams. Increasing the number of sales at the KHC is an objective out of the scope of this thesis project and it will not be analysed. In terms of the logistics issue, the logistics and warehouse team are the only stakeholders who can bring a change to the current situation. The problem can be highlighted to them but it is under their range of action to improve the situation. Similarly to the logistics issues, quality issues are under the quality team influence range. Nevertheless, their actions are limited by the quality standards of the company and any quality issue must be addressed with due seriousness.

Therefore, the two drivers in which there are possibilities of improvement are: Wrong stock Deployment and Liquidation & Donation efficiency. Both drivers are related to the current visibility of the on-hand stock of the company. One of the features not covered by the literature regarding loss management is how to manage the stock when this is spread among different warehouses across a big region such as Europe. Having a high level of visibility and control of the stock allows actions to be triggered faster and in a more effective manner.

Given the need of bringing the needed visibility to the stakeholders involved, a dashboard will be developed. Firstly, new KPIs will be created and measured to understand the amount of stock passing the T-BBE/BBE DATE as well as being cleared. Secondly, a report will be developed in which each BU and supply planner knows each item wrongly located and owned by them.

6.1.1 Commercial Losses New KPIs

As it was stated in the analysis, the KHC follows the food waste hierarchy suggested in the literature. Each BU follows the process as indicated in Fig. 2.7. This process is run independently by each BU. From the hub point of view, the goal is to reduce the commercial losses across EMEA.

The current visibility only allows top management positions to have an overview of the total aged stock in each BU. Regarding each region; they are provided with the list of aged EPNs owned by them. Fig. 6.1 summarizes the visibility both top managers and BUs have on aged stock. Given this situation, to make an efficient liquidation process, it is needed to measure the value of the green and red arrows in Fig. 6.1.

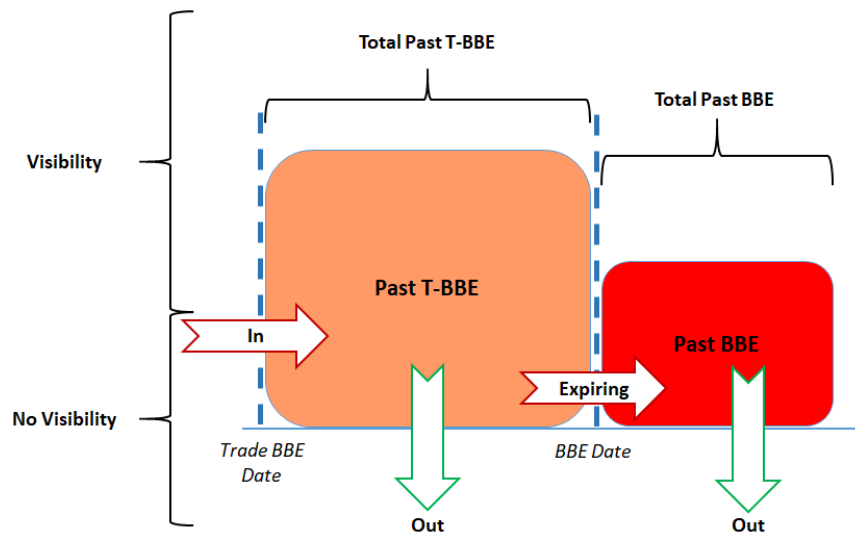


Fig. 6.1: Current level of visibility at the KHC.

Based on the current visibility, the existing KPIs at the KHC measures the amount of aged stock the company has. Each month, this number could decrease or increase, hence, the KPI would show an improvement or decline in the performance of the company. Nonetheless, the project suggests that these metrics are not enough to know the performance of a BU. In addition to the current visibility, this project has the objective to upgrade the visibility to provide three extra measures (Fig. 6.1):

- New Stock passing T-BBE per week.
- Stock being cleared from Past T-BBE per week.
- Stock expiring and becoming Past BBE per week.

By capturing the flow of stock through these three gates, it is possible to conclude how good the actual performance of each BU is. The ideal scenario to reduce commercial losses would mean that a BU is constantly decreasing the amount of stock passing T-BBE while increasing the amount of stock cleared without new expired products.

Fig. 6.2 shows two different theoretical scenarios in which the aged stock is reduced. Scenario a) indicates the company is constantly reducing the inflow of stock passing T-BBE while increasing the outflow of stock Past T-BBE. Scenario b) also shows a reduction of aged stock driven by a higher liquidation performance but a constant inflow of stock passing the trade window.

Scenario a) is the most profitable scenario for a company. If the inflow is reduced, it means less stock will need to be sold below the COGS value at some point. Scenario b) is not desired by a company as it means that the company is not able to sell the stock at a normal price but at a lower than the suggested. Even though scenario b) shows a higher liquidation performance, it is because there is a weekly higher amount of new stock to clear.

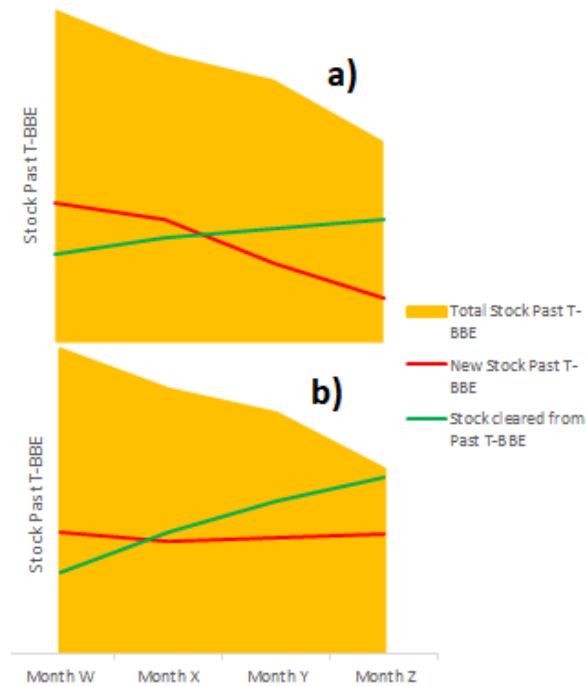


Fig. 6.2: Two different scenarios of commercial losses management performance.

Given the objective to track and measure these new variables, this project aims to create a dashboard which allows monitoring the evolution of three new KPIs (Table 6.1). These three new KPIs bring a better visibility and improve the prevention of future commercial losses.

Table 6.1: New KPIs for monitoring commercial losses performance.

KPI	Definition	Calculation	Format	Granularity
New stock Past T-BBE	The COGS value of the stock which passed the trade window.	Sum of new stock value	Year to Date	SKU
New stock Past BBE	The COGS value of the stock which reached its expiration date before being cleared.	Sum of new expired stock value	Year to Date	SKU
Clearance execution before BBE date¹⁰	Total stock which was cleared between the T-BBE and the BBE date by any clearance channel.	Sum of clear stock COGS value	Year to Date	SKU

6.1.2 Commercial Losses dashboard

As part of the design of these three new KPIs, a dashboard for monitoring each of them is created. Fig. 6.3 shows the dashboard for the new stock Past T-BBE. This dashboard is created with the goal of allowing the user to customize the output according to different parameters.

The design of the dashboard was decided based on other dashboards the company already has. The current CFR dashboard at the company was used as the starting point to create the layout of the dashboard in Fig. 6.3.

¹⁰ This KPI is a combination of the liquidation execution and donation execution KPIs. It can be named clearance execution.



Fig. 6.3: Commercial Losses Dashboard - New Stock Past T-BBE.

The dashboard in Fig. 6.3 includes multiple filters and charts which shows the new stock value from different angles. Among the different charts, it is included a monthly evolution of the KPI value as well as four weeks moving average chart. The latest chart is added instead of a weekly evolution since most of the clearance tends to happen at the end of the month. Therefore, it is easier to visualize the evolution of the inflow by calculating the last four weeks' average instead of showing the weekly evolution. Below these two charts, seven different charts are included:

- Ranking of the supply planners with the highest value of stock passing T-BBE planned by them.
- Ranking of the BUs with the highest value of stock passing T-BBE owned by them.
- The top five categories adding new stock for clearance.
- The value of stock passing T-BBE in the three main channels: Retail, foodservice, others.
- The value of stock passing T-BBE in external factories, internal factories and repacking sites. Moreover, for each of these three types of locations, the dashboard includes a ranking of the factories.
- In addition to these charts, a list of top ten EPNs passing T-BBE is added.

The special feature of this dashboard is that it already includes the RCA behind the inflow of stock in the clearance process. This peculiarity is possible due to:

- The data is tracked at batch level.
- Once a new batch passed the T-BBE date, the date of production is sought.
- Once the date of production is known, the sales forecast published in that month is captured.
- The date of production and the T-BBE date are compared to know the number of months in the trade window.
- For those months between the production date and the T-BBE date, the actual stock sold is captured.
- The sales forecast for the trade window published by the time of production is compared with the actual amount of stock sold during the trade window.
- The primary root cause is based on:

$$SF \text{ for the trade window} - \text{Actual Stock sold} \begin{cases} \leq 0 \rightarrow \text{Excess production} \\ > 0 \rightarrow \text{Over-forecasting} \end{cases}$$

These calculations also quantify some the drivers analysed in the previous chapter. During the analysis of 2018 commercial losses at the KHC, it was estimated that the over-forecasting/under selling at the KHC was between 60% and 70% of the total commercial losses in the company. This dashboard measures this % year to date, which is 61% for 2019.

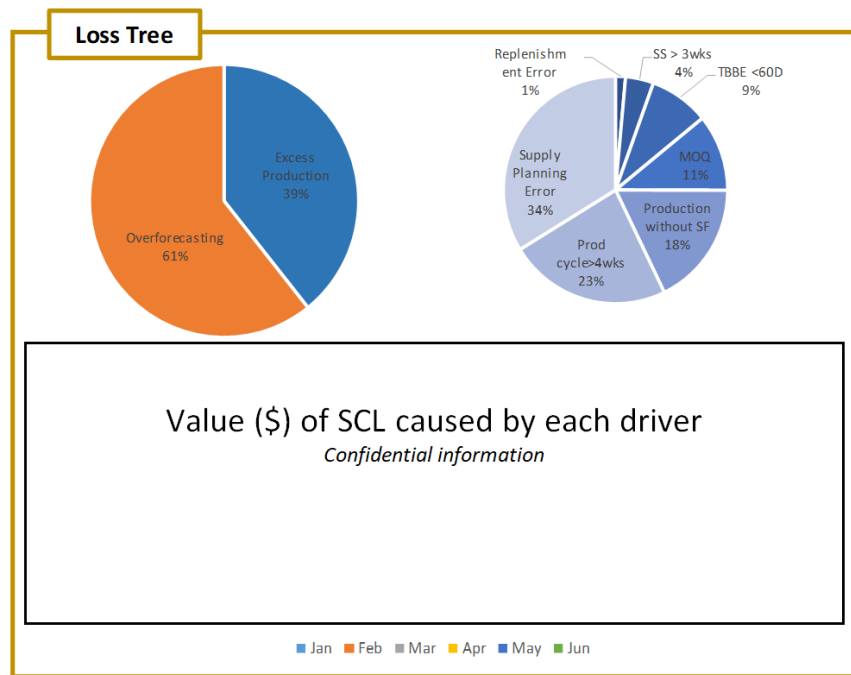


Fig. 6.4: Primary and Secondary RCA for New Stock Past T-BBE.

Furthermore, this dashboard digs into the excess production root cause by developing a secondary root cause analysis (Fig. 6.4). The secondary RCA analyses the reason behind all the new stock which passed T-BBE due to excess production. Seven possible root causes are given which are related to the reasons shown in Table 6.2 and the drivers analysed in the previous chapter:

1. Production cycle > 4 weeks.
2. Production without SF.
3. MOQ.
4. TBBE < 60D (Trade window less than 60 days).
5. Safety Stock coverage > 3 weeks.
6. Replenishment error (wrong stock deployment).
7. Supply planning error. Any stock which passed the T-BBE without being over-forecasted or belonging to any of the issues mentioned above.

The dashboards created to monitor the new KPIs are considered to be very helpful to understand the issues in detail. Given the number of filters included, the user can customize the data to know by, for example, by category or factory, which are the drivers or BUs more affected.

As an example of the multiple possibilities that the dashboard offers to the user, Fig. 6.5 compares the loss tree of BU-4 and BU-7. BU-4 is a business unit which strategy is mainly focused on expanding the business in this country. Thus, BU-4 tends to be optimistic with the sales forecast and prevent any out-of-stock situation. Therefore, it is logical that most of the stock passing T-BBE in this region is due to over-forecasting. On the contrary, BU-7 is a business unit where all the process and routines are well-

established and the BU does not have growth as the most important objective. Given this, this BU has a better control over their forecast demand and the percentage of stock passing T-BBE due to over-forecasting is lower than average.

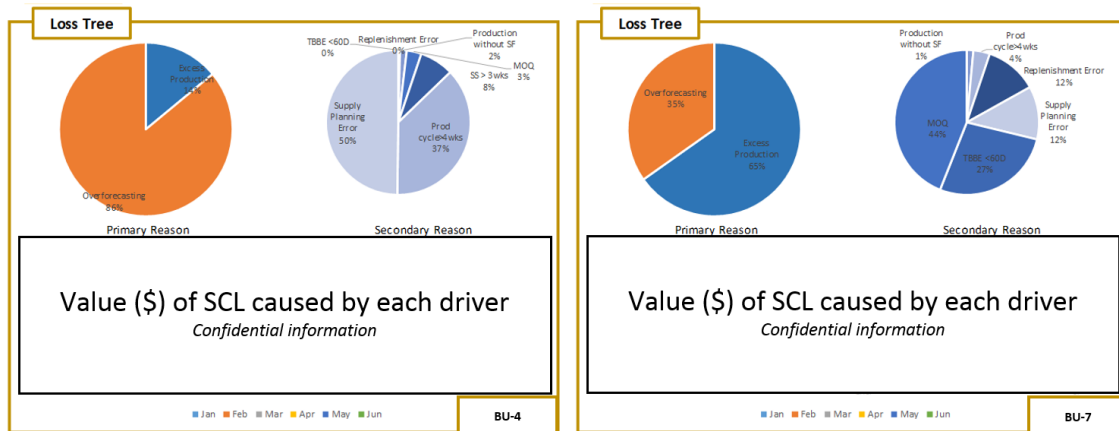


Fig. 6.5: Loss tree comparison between two BUs: BU-4 and BU-7.

6.1.3 Wrong stock deployment visibility

While analysing the current situation at the KHC, the stakeholders were asked regarding the drivers which were found to cause commercial losses. The two main stakeholders related to this driver were supply planners and demand planners. Once the demand planners were interviewed, the claim they had no visibility of the stock outside their local warehouse. The SC Hub was not providing this information; hence, the demand planning team could not include the wrongly located stock in their clearance process.

The supply planners explained that once the stock is past T-BBE, as it is not saleable through the normal channels, it gets blocked in the software SAP. When the supply planner requested the logistics team to ship the stock, the planners were only considering the unblocked stock. For this reason, once the stock was passing the T-BBE date, it was not considered for clearance unless it was in the right warehouse.

This driver is due to the lack of visibility both sides had on the topic. The stakeholders are not looking at this problem; hence, the commercial losses caused by this matter are not faced. To bring an improvement to the current situation, a new report is developed to gather all the wrong located stock. From SAP, the data is extracted and compiled. The data extraction was added as part of an existing routine inside the company, thus no extra time is needed to run the process.

6.1.4 Wrong stock deployment dashboard

A dashboard as shown in Fig. 6.6 is created to enable the needed visibility. On the left side of the dashboard, the stakeholders can filter the data per their needs. These filters are linked to four tables:

- Table A shows the value by each BU.

- b) Table B shows the value by supply planner.
- c) Table C shows the value at each wrong warehouse. Each warehouse is defined by a four-digit number.
- d) Table D gives a detailed list of the EPNs which are wrongly allocated. It shows between which two warehouses needs to be moved.

In the interest of showing the most relevant data and avoid creating a very long list of EPNs to check, the file includes three types products:

- **Past BBE.** They should not be moved as they will not be liquidated and it would only increase the transportation costs of the company.
- **Past Trade BBE.** Stock which is already past T-BBE and should be moved to the right warehouse to be liquidated. Nevertheless, the BU needs to address if it is worthy for the company to move the stock to their local WH.
- **< 2 months to T-BBE.** It is agreed with the stakeholders to include the health stock which has less than two months of trade shelf life. In this way, the stock which might pass the T-BBE at the wrong location is reviewed on time.



Fig. 6.6: Dashboard for wrongly located stock visualization.

6.1.5 Implementation of corrective actions at the KHC

The implementation of the two main improvements as part of the corrective actions was quite different. Regarding the commercial losses new KPIs, the first step was to present the dashboards to the stakeholders. Once their feedback was gathered and implemented, the dashboards were finalized. The layout of the dashboards was based on existing dashboards which the stakeholders are already used to work with. Thus, the dashboard was adapted to make it as user friendly as possible.

The dashboards were also presented to the Head of S&OP in EMEA with the purpose of including it in the weekly and monthly performance review meetings. These meetings occur between the Head of S&OP in EMEA and the Head of S&OP of each BU. This weekly performance review as well as the monthly performance review last one hour and the performance of different topics in the last week/month is reviewed. One of these topics is supply chain losses. The proposal was accepted given the degree of visibility and the possibilities of customizing the data. Therefore, the new dashboard replaced the current data base for reviewing the SCL performance.

To make the file implementable, all the calculations were automated once the data was included in the file. The data was already being extracted as part of an existing routine. Therefore, the file was possible to update on a weekly basis without becoming a time-consuming activity.

The gained visibility allowed combining the old measurement of the current blocked stock with the new KPI measures. Fig. 6.7 shows the evolution of aged (blocked) stock year to date as well as the evolution of the new KPIs.

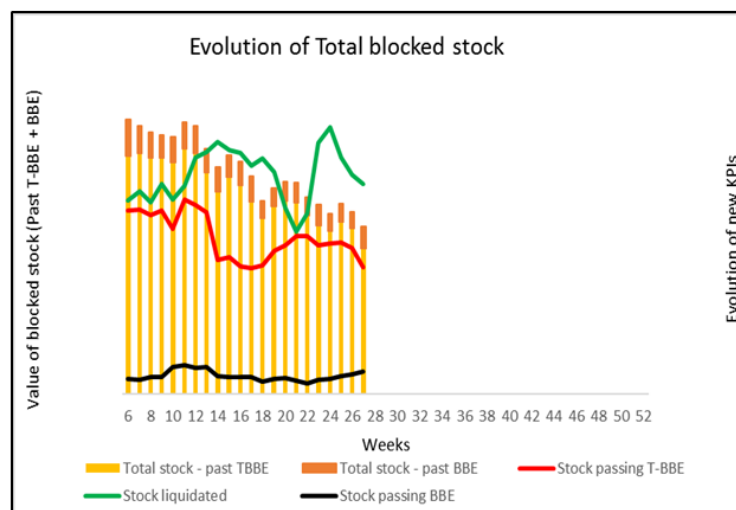


Fig. 6.7: Evolution of total blocked stock + new KPIs.

From the chart on Fig. 6.7, it can be concluded that the amount of stock expiring across the KHC warehouses in Europe is roughly constant since the beginning of the year. Moreover, if the amount of stock weekly cleared is compared to the amount of stock weekly passing the trade window, the company is performing correctly as the green

line in Fig. 6.7 is higher in value than the red line. Nevertheless, if the theoretical scenario analysed in Fig. 6.2 is considered, the company is not constantly reducing the amount of stock passing the T-BBE date (red line). Therefore, this analysis suggests the company still have room for improvement. Preventive actions need to take place to bring a change to the red line and make it constantly decreasing.

Regarding the wrong located stock, the file was created and shared with the stakeholders at the company. The file was updated weekly and shared with the stakeholders via email. Whenever a stakeholder needed to check the wrongly located stock, this person could use the file and take the needed actions. Similarly to the commercial losses dashboard, the extraction of data was already part of an existing routine. The file was updated on a weekly basis without becoming a time-consuming activity. Once the file started to be used, it raised the issue of part pallets.

At the company, supply planning team oversees requesting to move the stock between warehouses or factories, the warehouse management team is in charge of preparing the stock to be shipped out of the warehouse and the logistics team is in charge of arranging the transportation and the truck routes. Once the supply planning team started to consider the wrong located stock and request it to be moved, it was found out that most of the wrongly located stock were part pallets. To make transportation efficient, a truck should be loaded with full pallets so no empty space is left. If a truck was loaded with part pallets, the truck would not be loaded at its maximum capacity, hence the cost of transportation per case would increase.

This situation highlighted the issue of developing a process to rework part pallets into full pallets. Until this time, all the part pallets were never considered and they were left at their current location. If they were not in the local warehouse of the BU, these would not be sold and they would end up expiring hence becoming SCL. Given the pressure to reduce SCL, the S&OP highlighted this issue to the warehouse management leaders and these agreed to take actions on it. The two main warehouses of the company started to develop a routine in which, once a month, the part pallets will be reworked into full pallets and sent to the right warehouse.

6.2 Preventive actions

Preventive actions are denominated those routines or activities which can prevent the generation of excess stock. With these actions, the goal is to look at those drivers in Fig. 5.6 which are happening before production.

- 1) Under sales.
- 2) Excess production.
- 3) Production Issues.
- 4) Short shelf/Trade shelf life.
- 5) More than 3 weeks of safety stock.

The food loss reduction improvement, in terms of preventive actions, aims to develop a process where drivers 2), 3) and 5) are faced. As described previously, this project is developed as part of the supply chain hub (SC Hub). There are some activities which are not carried by the SC Hub team but are related to abovementioned drivers. Demand forecasting is developed by the demand planning team of each of the BUs. The SC Hub team is not forecasting the demand so the team cannot directly take actions on this. However, the SC Hub team is in charge of supply planning. Each BU forecasts the demand of their market and the supply planning team plan the new production to cover the demand for the entire EMEA zone.

Similarly to under sales, short shelf life is a driver with a very little room for improvement. As explained in the previous chapter, shelf life is fixed by the R&D team. Shelf life is a sensitive issue due to safety reasons and it cannot be extended without carrying a deep analysis. Short trade shelf life is, once again, related to the internal activities carried by each BU. Trade Shelf life is constrained by the negotiations between each BU and their customer. Hence, the only possible way to extend the trade window is to renegotiate the minimum remaining shelf life required by the customer.

The only three drivers where the SC Hub team can influence more are those more related with supply planning and production. Therefore, this thesis project aims to enhance the current excess production review process. The goal of this project is to link the data measure by the new KPIs with the preventive actions. Preventive actions forecast possible risk of supply chain losses in the long term. For the stakeholders, a risk in the long term is less engaging than in the short term. By connecting the current situation with the future situation, two timelines can be compared and the preventive actions can become reliable.

6.2.1 Current excess production review process

Currently, the KHC is reviewing the future productions to address whether or not excess stock will be generated. The goal of this process is to identify which of those productions will generate more stock than the expected to be sold. Before the detailed explanation is given, it should be considered that not all of which is flagged as excess production will become that in the future. This part of the project is an estimation of the future excess production. The variations in demand, among other factors, can result in a higher or lower amount of on-hand excess stock. This report takes into consideration two main factors, the coming planned productions and the future expected sales.

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Once all the above is known, it is already possible to know if a new production will generate excess stock. In those weeks where a new production is planned by JDA, the

difference between the projected OH Stock and the sales during operational trade window is calculated:

$$\text{Projected OH Stock} - \text{Sales Op. trade window} \begin{cases} \leq 0 \rightarrow \text{No Prod. passing } T - BBE \\ > 0 \rightarrow \text{Prod. passing } T - BBE \end{cases}$$

When a new production is taking place, the on-hand stock of the previous week plus the new stock produced in compared to the amount of cases which will be sold during the operational trade window. If this difference is higher than zero, it means that not all the stock will be consumed and some excess stock will reach the T-BBE date, contributing to the commercial losses of the company.

Before the analysis on the generation of excess stock is done, there are four different reasons which classify the type of issue behind:

- **Wrong T-BBE.** If the number of days in the operational trade window is lower than 0, it means that the master data in the software is wrongly updated.
- **MOQ.** The generation of excess stock is an MOQ issue if the MOQ of the production is not compliant with the MOQ policy of the company. The policy of the company is:

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If any of these two situations is given, the MOQ for the productions of that item needs to be reviewed.

- **Production without forecast.** New productions should only take place if the demand planner has updated the forecast to the system and new productions are needed to prevent the out-of-stock scenario. If the demand planner has not updated the sales forecast for the next 13 weeks, the sales during the trade window will be lower than the projected on-hand stock given the new planned production. Hence, it will show as an excess stock.
- **Supply planning.** If any of the aforementioned issues do not take place, and before going into detail, it will be considered that the excess production is due to a supply planning issue.

The excess production review process is developed as follows:

- Each week, the file is updated and shared with demand and supply planners by email.
- Each supply planner must go to the file and check the productions planned under their name which will generate excess stock. They need to fill the reason behind the excess production based on Table 6.2. The file automatically suggests the action needed and the responsible actor to take this action. If supply planner is the responsible, they will need to take actions to prevent the issue. If demand planning is the responsible, the supply planner will communicate the demand planner to update/fix the demand forecast. If the

supply planner indicates the issue is related with the MOQ, S&OP team together with manufacturing team will need to analyse the issue.

- Supply planner leads will check the action tracker for the top 20 highest in value productions once filled by the supply planners. Supply planner leads, who are the more-experienced planners, will include those issues flagged in file considered for reviewing in their weekly meeting with supply planners.

Table 6.2: Reasons for excess production.

Reason	Action Required	Category	Responsible
Wrong Safety stock	Review SS and reduce it	Safety Stock	Supply Planning
Wrong Production cycle	Review production cycle and reduce it	Production Cycle	
Production planned manually	Cancel/Reduce production	Planned manually	
RIRO - SF on the wrong EPN	Item map to be updated	Wrong JDA parameters	
Wrong Stock build parameters	Production to be reduced	Stock building	
Wrong Sales Forecast (SF)	Sales Forecast to be updated	Under-forecasting	Demand Planning
Missing Sales Forecast	Sales Forecast to be added	Missing Sales Forecast	
MTO – production without SF	Order or SF to be added in JDA		
Samples produced without SF	Demand planner to publish SF in sample key account.		
MOQ can be reduced with cost impact	Analyse cost of MOQ reduction	MOQ	MOQ
MOQ cannot be reduced	Analyse delisting the product		
MOQ cannot be reduced - Kitchen MOQ			
MOQ cannot be reduced - R&P MOQ			
MOQ is too high	Ask factory for reduction possibility		
MOQ to be reduced without cost impact	Reduce MOQ - Yes		
No SF in next 13 weeks	Risk to be reassessed	No issue	No issue
Wrong T-BBB	To be corrected		

6.2.2 Improving the excess production review process

At the beginning of previous section, it was explained why this process is an estimation of the future excess stock that will be generated. Given the variations in demand, which can lead to either over selling or under selling, it might be the case that for some products the excess stock becomes higher or lower than what this file showed before its production. As this preventive action is forecasting the future risk of supply chain losses, it might be perceived by the stakeholder as unrealistic or inaccurate. If this is the case, stakeholders might lower their confidence in the preventive actions. Preventive actions need to be taken without hesitation to bring an improvement for the company in the months ahead.

The best way to build trust and engage the stakeholders in the process is justifying the risk forecast with current data. If the new KPIs are linked to the excess production review, the presence of robust data behind the calculations will validate the output. The high number of productions to review lowered the confidence in the file, hence, highlighted the need of improving the excess production review file.

The actual values were compared with the projection from the excess production file. It was clear that the file was highlighting a higher risk than the actual risk which is passing the trade window per month. To improve the file and make it more precise and realistic, the actual data was linked to the projections of the file. Therefore, the file was upgraded by incorporating the likelihood factor. Once an EPN is highlighted in the file as an issue in terms of excess production, the file reviews if this stock passed the BBE and/or T-BBE date anytime during the year. Per what the new KPIs have measured, a likelihood percentage is given to the production:

Table 6.3: Likelihood factor for excess production.

Has that EPN passed the T-BBE year to date?	Has that EPN passed the BBE date year to date?	Likelihood factor
No	No	10%
Yes	No	50%
No	Yes	75%
Yes	Yes	100%
NPD		

The amount of excess production is multiplied by the likelihood factor given in Table 6.3. In addition to the data measured by the new KPIs, if an EPN is a NPD, it is also given a 100% likelihood factor. As this product is entering the market for the first time, there are more possibilities of ending up with excess stock.

The implementation of the likelihood factor as part of the excess production review process was presented to the stakeholders related to it. Demand and supply planning teams are the two main stakeholders which have a direct influence of the outcomes of this report. The data used for the likelihood factor was explained and the received

feedback was reviewed. Their feedback was helpful to make it more accurate as well as making sure they understood which actions needed to be taken.

Fig. 6.8 summarized the current excess production situation of the week. This dashboard gives an overview of the excess production in the next 60 days. It was already part of the current excess production review process. Nevertheless, the likelihood factor was added to it. The dashboard is divided in four areas:

1. On the left side of Fig. 6.8 , different filters enable looking at the data from different perspectives. The stakeholders using this dashboard could easily filter the EPNs based on the reason codes, if the production is higher than the MOQ or the current MOQ is not in compliance with the company policy. These filters also allow each supply planner to focus on the SKUs they are responsible for.
2. On the top of the dashboard, four charts give a view of the issue from different angles:
 - **Production Passing T-BBE (production plan).** This charts shows, per the production plan of the current week, how much excess stock will be produce in the next nine weeks. A cumulative line of the total excess production is also added. The reason behind the excess production is also added.
 - **Production Passing T-BBE (by market).** It shows, according to the production plan of the current week, how much excess stock will be generated for each BU. It also includes the reasons behind it.
 - **MOQ to be reduced.** This chart shows the value of stock which will be passing T-BBE caused by the MOQ. It is split by internal factories, external factories and repacking sites.
 - **Excess Production Evolution.** Each week, the file is updated with the new data and a total value of excess production in the next nine weeks is obtained. This chart gathers how much stock was flagged to be passing T-BBE each week.
3. This table orders supply planners from highest excess production to lowest production. This list gives an idea which portfolios are more difficult to prevent excess production. It also allows the supply planer leads to focus on those supply planners who need higher support to avoid the excess generation.
4. The second table provides the list of top 20 EPNs behind the excess production. This table changes based on the filters selected in ① to customize the search. For each item, the BU, planner, manufacturing site and reason code is added together with the value of excess production. Moreover, the likelihood factor is included to show the importance of the highlighted issue. This factor means that, year to date; some of the old productions for the same item negatively affected the commercial losses of the company.

The implementation of this process helped to realize two things. Firstly, the excess production numbers were compared to the actual stock measured by the new KPI from the corrective actions (Table 6.1). Per the excess production file, the company was producing roughly \$XXX of excess stock per month. This number was compared to the amount of stock monthly passing the T-BBE measured by the new KPI. Fig. 6.9 is part of the dashboard shown in Fig. 6.3 if the user only selects over-forecasting as the reason code. This chart shows that in average the value of stock passing T-BBE monthly is around \$XXX.

Once the likelihood factor was incorporated in the file, the total amount of stock predicted to pass the trade window was more similar to the current on-hand stock measured. This improvement helped to reduce the list of productions to review as well as bring the focus to those productions which have a higher probability of generate excess stock. It also helped to boost the confidence of supply planners in the file as the projected excess stock was justified by the actual on-hand stock. All of this allowed increasing the trust the stakeholders had in the file as well as the importance given to the output of this tool. The likelihood factor was concluded to be a positive improvement as it increased the engagement of those stakeholders with high power and high interest per Fig. 5.8.

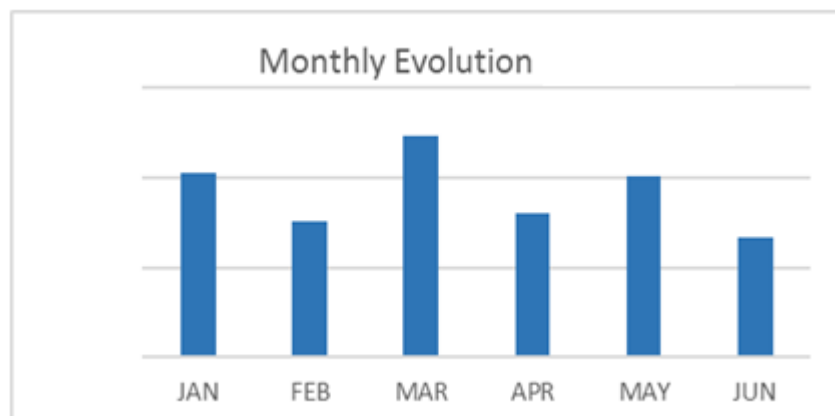


Fig. 6.9: Stock passing the trade window due to over-forecasting.

The second main output this file brought once implemented in the company is regarding the current MOQs. It was measured that around 40% excess production highlighted in the file is coming from the current MOQ. MOQ cannot be reduced automatically as there are several aspects needed to consider:

- If it can be reduced, it needs to be reviewed whether:
 - It can be reduced by reducing the MOQ of R&P.
 - It can be reduced directly.
 - It can be reduced by combining multiple SKUs.
 - It can be reduced with a cost and how big this cost is.

- If it cannot be reduced, the company must assess if it is profitable to keep this EPN in the portfolio or evaluate rising a NOD to delist it.

This process helped the company to develop a routine to prevent the generation of excess stock as well as highlighted the need of developing a new process for the review of MOQs. As part of the preventive actions, the next step after preventing excess production is the review of MOQ. The literature regarding food loss always proposes to prevent the generation of food surplus before following the food waste hierarchy. Nevertheless, it does not suggest which steps a FMCG company needs to take to prevent food surplus. This project aimed to cover this gap by developing and implementing an excess production review process at KHC based on the current stock of the company. It helped to have a better control of this production and develop the needed actions to prevent it. Moreover, it highlighted a second issue which is the MOQ needed for production. A company which aims to reduce their supply chain losses need to review and take actions on those production MOQs which are creating losses for the company.

6.3 Improvements at the Kraft Heinz Company

Lastly, the abovementioned improvements will be compared to the needs and features of the company. The implementation of the improvements in the long term will be addressed. The goal is to ensure that the company incorporates the new improvements as part of its routines and processes. This will help improving the performance of the company in the long term. For that, the responsible stakeholders must be clear. Moreover, it should be clarify the frequency of the suggested actions.

6.3.1 Implementation of improvements in the long term

The last step of the implementation is ensuring the new processes and routines are kept in the long term. Keeping a routine in place needs the engagement of the stakeholders and the engagement of the stakeholders is obtained by clearly stating the roles and duties of each of them. For that, the RACI chart is a responsibility charting tool which specifies the stakeholders involved their roles and tasks (Baugh, 2015). RACI stands for:

Responsible. The stakeholder doing the work to complete the task

Accountable. The stakeholders who have decision-making (and veto) authority.

Consulted. The stakeholders consulted for their inputs.

Informed. The stakeholders who are informed but do not have input.

		Loss Prevention Team Supply Planner Supply Lead Head of Supply Planning Demand Planning Team Head of S&OP EMEA Manufacturing Team Warehouse Management Team Logistics Team									
Excess Production Review	Updating the file	RA	C	C	I	C					
	Review of excess production	C	RA	A	A	C		C			
Wrongly Located Stock Review	Updating the file	RA	C	C		C					
	Requesting the shipment	I	RA	C		C					
	Preparing the shipment	I		C		I			RA		
	Arranging the transportation		I			I			C	RA	
	Including the stock in the clearance process	C	C			RA					
Commercial Losses Review	Updating the dashboard	RA	I	C	C	C	I				
	Review of comercial losses	I		I	RA	RA	C				
	Taking action to improve the new KPIs	C	C	RA	RA	RA	C	I			

Fig. 6.10: RACI Chart.

The three main processes designed as part of this thesis project are included in the RACI chart of Fig. 6.10. The loss prevention team is responsible and accountable for processing the data and updating the needed files. The steps needed to update the file were designed taking into consideration the current routines of the loss prevention team. Therefore, the extra steps to update the new files are not time-consuming activities as they are based on existing routines.

Demand and supply planning teams are responsible and/or accountable for most of the activities suggested from the outputs of the new files. For the review of excess production, the supply planning team (planners and leads) must review the productions highlighted by the file and modify the productions to prevent future excess stock. At the beginning of each week, the productions generating excess stock will be calculated and shared with the stakeholders. During the rest of the week, the involved stakeholders must review these productions and modify them in needed.

Fixing the wrongly located stock issue is a shared task among various stakeholders. Supply planners need to review which of their stock is located in the wrong warehouse. They will need to request to move the stock to the warehouse of the BU which can sell the stock, hence, prevent the SCL. The request will be made to the logistics and warehouse management team. The former will arrange the transportation of the stock and the latter will make sure the requested batches are shipped first. Additionally, the warehouse management team will review the amount of part pallets at their location and develop a process to rework the part pallets into full pallets. Given that, it will be possible to ship part pallets and prevent them to be a reason behind not moving the stock. Finally, the demand planning team must consider this stock and including it in their selling processes.

For the commercial losses review, the supply and demand planning team will review their performance of the week/month with the Head of S&OP. Based on the results,

actions will be planned to confront the main issues. Based on the RCA conducted in the file, the needed processes will be established to tackle the drivers highlighted. Table 6.4 illustrates how the developed improvements will fit in the routines of the company.

Table 6.4: Connection between improvements and routines.

Monday	Tuesday	Wednesday	Thursday	Friday
New Excess Production dashboard	Excess Production review process			Supply Leads review
Commercial Losses Dashboard	Wrong stock deployment dashboard	Supply Planners request shipment	Monthly/Weekly Losses Performance Review	
			Warehouse team prepares shipment	
Logistics team arranges the transportation				

6.3.2 Impact of the improvements in the company

The Kraft Heinz Company is a data driven company. Performance of, either individuals or teams, is measured by data. In other words, data is considered to be the only valid “source of truth”. Given this situation, this project has developed each improvement based on the data of current inventory. By measuring the remaining shelf life of each item, new KPIs were developed. These KPI improved the management of commercial losses by quantifying the performance of each BU more accurately. The new KPIs helped to successfully bring the focus to those BU which were letting more stock enter the liquidation process.

Additionally, the supply chain losses drivers of the company were quantified for the first time. The S&OP teams in the company had estimated the contribution of some of the drivers in the past. Once the commercial losses dashboard was developed, the drivers were quantified for the first time based on actual data. The discussion was no longer regarding which were the main SCL drivers as the focus moved into the needed actions to prevent them from happening. For each batch reaching the T-BBE date, the RCA was obtained automatically based on robust data.

One of the needed actions to prevent SCL was the current excess production review process. This process was not as efficient as expected due to the lack of engagement and inaccuracy on the risk forecast. This process was reviewing coming products and highlighting those which would create excess stock in the future. As this process was forecasting the risk of losses in the long term, there was not as much confidence as expected in the process. The likelihood factor supported this process with robust current data. This factor justified the need of reviewing coming production as previous productions for the same item had already generated excess stock in the past. All in all, this project contributed to enhance the loss prevention process by supporting it with

accurate data. The drivers were fully known and quantified, leading to the reinforcement of the preventive actions.

The main existing risk is related to the excess production review process. If the planned productions are reviewed too rigorously, it can lead to out-of-stock situation. In some situations, the demand planning teams under forecast the expected demand. If no extra stock is available, the company will not be able to meet the requirements of the customer. Planned productions need to be reviewed considering the possibility of supply chain losses as well as the possibilities of out-of-stock. In order to reduce the risk related to the excess production review process, the likelihood factor was developed to set the focus on those productions which are more likely to generate excess stock rather than out-of-stock situations.

The KHC aims to continually improve by improving efficiency and reducing any process which negatively affects the performance or profit of the company. As already stated, supply chain losses are a significant amount of money and resources that had initially been invested in the production of food but it does not achieve its goal of being delivered to the customer. A FMCG company which strives for excellence finds in supply chain losses a barrier to achieve it. Even though the amount of food destroyed is much lower than the amount of food sold, the Kraft Heinz Company has the aim of **zero food waste**. Achieving this target is only possible with the contribution of all the stakeholders in the company. The improvements developed in Chapter 6 have been developed in order to bring a clear visibility on the causes behind the generation of SCL. Moreover, it has been used to support those processes aiming to reduce the food waste of the company.

7. Conclusion

In this chapter, the project will conclude by presenting the final outcomes. Subsequently, the main research question and the sub-questions will be answered. The relevance of this project from a theoretical and practical point of view will be addressed. Finally, the recommendations for future research and improvements will be made.

7.1 Conclusion

This project was born from the need of the KHC to improve their supply chain losses performance compared to 2018. This company currently works with the aim to reduce the number of activities or processes which badly influence the profit of the company. As mentioned in the introduction, supply chain losses are an unnecessary waste of money and resources due to:

- It increases the costs related to inventory such as storage expenditures.
- To write off the stock adds extra costs as the company must pay for the destruction of those products.
- In some warehouses, expired stock reduces the capacity for fresh or new productions.
- It reduces the profit made by the company. In other words, the company invested different resources to manufacture a product which was never paid off.
- It does not align with the vision of the Kraft Heinz Company: *To be the Best Food Company, Growing a Better World*. To reach this goal, the KHC does not want to have any of their produced food thrown away.

Therefore, this project had the practical objective of improving the current loss prevention process of the company. It also aimed to prevent the KHC from destroying as much food as in 2018.

Based on the current situation, a literature review was conducted with the goal of analysing the state of the art in food waste management. The available literature discussed the food waste hierarchy as the most-up-to date piece of information. The food waste hierarchy was a series of successive steps to consider based on the remaining shelf life of the product. The goal of the food waste hierarchy is that the food is utilised instead of destroyed.

The current way of working at the KHC was analysed and compared with the latest literature. From this analysis, it was concluded that the literature was covering the issue of food waste in FMCG from a broad point of view. The available literature was not analysing which processes were needed to enhance the food waste hierarchy once implemented. Moreover, the literature was not covering which metrics or KPI must be tracked to bring visibility of the food waste hierarchy performance to high

management positions. Finally, the current study cases available in the literature have only implemented the food waste hierarchy in small FMCG companies operating in less extensive regions. The KHC is a multinational company operating in EMEA as a single unit. In EMEA, the company is divided in small business units, each of them working independently but interconnected. The current literature does not address the topic of the food waste hierarchy in a company which is divided in business units and how food loss could be managed for different BUs interconnected.

Given this situation, the need of addressing the gap in the literature was justified. The main causes behind supply chain losses were analysed as well as the stakeholders at the company. This analysis helped to understand which drivers can be confronted by the SC Hub. Furthermore, it helped to place each stakeholder in a power-interest matrix grid. Per the output of this matrix, the needed improvements were developed to engage the stakeholders with greater influence on the issue.

The first main contribution of this project was the creation of three new KPIs. These new KPIs bring a higher level of stock visibility. It also allows quantifying the performance of the company more efficiently. A dashboard for monitoring each of these three KPIs was created and a process around it designed. Moreover, a RCA was designed for each batch passing the trade window. Based on robust data, every batch reaching the T-BBE date was instantly analysed and linked to one of the main drivers of supply chain losses.

The implementation of these KPIs concluded by including it the weekly and monthly performance review meetings of the company. The enhancement of inventory visibility brought other two main contributions. A report was created to highlight the wrong located stock to the stakeholders involved. The new file helped to address one of the issues highlighted during the interviews.

The last main contribution of this project was the improvement of the excess production review by linking it with the new KPIs. The excess production review process analysed the future on-hand stock and compared it with the future planned productions. When a future production was generating more stock than the expected sales during the trade window, the process would highlight the excess production. To make the process more reliable and engage the stakeholders, the new KPIs were included and a likelihood factor was added. This likelihood factor emphasised the relevance of the issue and the important of preventive the excess production from happening. The process around the file earned the confidence of the stakeholders and it was incorporated to the main routines of the supply planning team.

7.2 Research question answer

It is important to address whether this work has answered the questions raised and the beginning of the project. This answer will lead to the fulfilment of the objectives. The main research question was presented in Chapter 1 as:

How can a FMCG improve the implementation of the food waste hierarchy to reduce their commercial food losses?

To answer the main research question, sub-questions were formulated, which answers are given below.

S-RQ1: What is food loss and how do FMCG companies deal with food surplus?

Even though food loss is defined different across the literature, all the definitions found highlighted the same features. In this project, the definition given by Buzby et al. (2011) was adopted as the explanation for food loss. Buzby et al. (2011) defined food loss as the results on the misuse of a significant amount of money and resources that had initially been invested in the production of that food as it doesn't achieve its goal of being delivered to the customer.

Gustavsson et al. (2011) addressed the relevance of food loss worldwide and concluded that food loss is a global issue. However, according to the development level of a country, food loss tends to happen more in a different stage of the food supply chain. Kummu et al. (2012) analysed food loss in these stages. The authors suggested that a great amount of food was wasted at the manufacturing and distribution stages. FMCG companies belong to these stages as they process the food received from the agricultural production and deliver it to retailers and wholesalers. Therefore, FMCG companies are involved in the generation of food loss and they must confront this issue.

The current state of the art in food surplus management is covered by the food waste hierarchy. It is a structured surplus food control system which proposed the following steps before the destruction of food (Papargyropoulou et al., 2014):

- Avoid surplus food generation.
- Sell the product through secondary channels. These secondary channels would accept a lower price but would demand a shorter remaining shelf life of the product.
- Distribute the food among food aid organizations or those affected by food poverty.
- Recycle food waste into animal feeding or biofuel.
- Dispose unavoidable food waste if the previous stages are not successful.

To successfully implement the food waste hierarchy, the company must:

- Have a process organized for all causes generating supply chain losses.
- Formally coordinate the process among the different departments inside the company.
- Measure the food surplus periodically and structurally.

Finally, the literature suggests that a company which aims to redistribute the food surplus among food aid organizations must reach these organizations pro-actively and regularly.

S-RQ2: How is the current situation at the Kraft Heinz Company compared to the state of the art in food waste management?

Chapter 4 addressed this question by comparing the theoretical approach explained in the first sub question with the current way of working. This chapter concluded that the theoretical approach had already been implemented at the company. It was also concluded that the available literature covered the topic of surplus management from a broad perspective.

The available literature was not analysing which processes were needed to enhance the food waste hierarchy once implemented. It was not covering which KPIs a company needs to track to measure their performance or which specific processes can be done centrally to coordinate food loss management better. Moreover, there was a lack of information regarding the implementation of the food waste hierarchy in multinational companies divided in various business units across a region such as Europe.

S-RQ3: What are the drivers behind the generation of supply chain losses at the Kraft Heinz Company?

The drivers behind the generation of supply chain losses at the KHC were analysed based on the interviews held with the stakeholders at the company and the historical data base. The supply chain losses drivers were split in two categories: before production and after production.

Given the strategy of the company to grow the business in Europe, the main driver was forecast accuracy. The company had the tendency of forecasting a higher demand to prevent out-of-stock situation in case of an increase in sales happened. In addition to the forecast accuracy of the company, other drivers before production were highlighted: excess production, production issues (MOQ and production cycles), short (trade) shelf life of some products and more than three weeks of safety stock.

The main causes contributing to the commercial losses of the company after production were related to the quality and logistics operations of the company and the clearance efficiency of the company. Contrary to the literature, even though the company had already implemented the food waste hierarchy as their way of working, the clearance efficiency was far lower than the suggested in the literature. Furthermore, the clearance efficiency among the different Business Units was quite diverse.

S-RQ4: What are the needed improvements to reduce supply chain losses at the Kraft Heinz Company?

This project developed three main actions to reduce supply chain losses. These actions were decided based on the action range of the SC Hub. Some of the drivers previously mentioned are more influenced by other stakeholders which are not part of the SC Hub. Based on this the situation, the thesis presented two corrective actions and one preventive action:

- Development of new KPIs to measure the performance of the food waste hierarchy more efficiently.
- Development of a new tool to create the visibility of the wrong located stock.
- Improvement of the excess production review process to control the generation of food surplus by connecting it with the new KPIs. Increase the engagement and trust of stakeholders in the process.

S-RQ5: What is the level of implementation for the suggested actions inside the company and how can it engage the needed stakeholders?

This last sub-question needs to be answered in two phases. The first part of the question raises the issue of making the designed improvements implementable at the company. To achieve this goal, the process has been developed based on the current routines of the company. The data extraction was already carried as part of a different existing process. The files were automated with Excel formulas so they will be updated automatically when the new data is added. As regards the long-term, a RACI chart (Fig. 6.10) was designed to clarify which stakeholders are responsible to carry the needed actions of the process.

The second part of the question raises the issue of engaging the needed stakeholders. It is of high importance that the stakeholders involved in the process trust it and act with due commitment. For that, the most reliable source of information is data. Each of the actions and processes around them has been developed based on the company data. The new KPIs are a realistic measure of the performance of the company as they are based on the current on-hand stock.

The engagement of stakeholders in the excess production review process is a complex task. This process is forecasting the risk of future supply chain losses even though the product has not been produced yet. For many stakeholders, this process might not seem reliable as there is no real data behind it. To prove the validity of the process, the excess production review calculations were backed up with the data measured by the new KPIs. By connecting two different timelines (future production vs current on-hand stock) the stakeholders increased their confidence on the process and acted more proactively towards it.

How can a FMCG improve the implementation of the food waste hierarchy to reduce their commercial food losses?

Based on the above answered sub-questions, a company firstly needs to implement the food waste hierarchy per the literature, it needs to find and establish business relations with brokers in the secondary channel and food aid organizations. It should also find which of their products valid for bio-fuel or animal feeding. Once this is implemented, the performance of the food waste hierarchy needs to be addressed. This will allow quantifying the efficiency of the food waste hierarchy. If the company is in a similar position as the KHC and is still suffering commercial losses, it would need to take an extra step beyond the food waste hierarchy.

Firstly, the company should address the level of inventory visibility. The new KPIs developed in this thesis could be adopted to improve the track and measures. By enhancing the current visibility, the company can easily realise which of their products or features (i.e. portfolio, manufacturing site) are highly contributing to their commercial losses. If a better control of the data is earned, all the processes and actions can be justified with numbers. This data will lead to the internal drivers of the company which are causing supply chain losses. If the issue is highlighted to be over-forecasting, then the company must review the forecasting routines and analyse what can be done.

As this project was developed inside the SC Hub of the company, it focused on the supply processes. Based on the data measured by the new KPIs, it was concluded that the company needed to improve the excess production review process. Engagement and trust of stakeholders is a key issue which needs to be considered when a process is set. The best way to build confidence and engage stakeholders in the process is by supporting it with current data. The company should be able to link their historical data base with the future productions to justify the importance of the process.

7.3 Relevance of the project

In the section, the relevance of this project for an academic and business point of view will be reviewed.

7.3.1 Academic relevance

Chapter 4 already highlighted the academic relevance of this project. The current literature was reviewed and the theoretical approach of the food waste hierarchy was compared to the current situation at the KHC. This thesis considered that the existing literature provides a series of guidelines to prevent food loss without detailed addressing any specific processes. The articles reviewed described the current stages of the food waste hierarchy. However, there was no clear information about processes or actions to prevent food from going through the different stages of the food waste hierarchy.

Moreover, the theoretical approach does not consider the sizes of the company in which the food waste hierarchy is implemented. The case studies found in the literature implemented this hierarchy in companies operating in smaller regions. This project highlighted the limitations the food waste hierarchy once implemented in a multinational company as the Kraft Heinz Company. The need of creating a series of KPIs to measure the performance of each Business Unit is addressed as well.

Finally, this project studies how the stakeholders of a company can become engaged into a new process. Forecasting the future excess stock of a company and making the stakeholders believe in it is challenging since a hypothetical scenario is considered. To give this hypothetical scenario the sufficiency power to engage the stakeholders, it needs to be linked with the current excess stock of the company. If the future is based on the current data, the stakeholder will become more confident with the results.

7.3.2 Managerial relevance

Since this project was undertaken at the Kraft Heinz Company, the managerial relevance has always been taken into consideration. This project dug deeper into the causes of commercial losses at the company. It lighted some issues not covered in the literature which were more specific due to the type of company. This project developed different supportive tools and designed a process around each of them. The process designed was carried taken into consideration the current routines at the company. This decision was taken to ensure the processes could still occur after the finalization of this thesis.

This project brought the visibility of stock into the next level and created a series of KPIs to improve the performance tracking. The new KPIs were of significant value to the Kraft Heinz Company and they were added in the performance review meetings of the company. Finally, the excess production review process was enhanced. This process was validated based on the current aged stock of the company. All of it allowed the process to be implemented as part of the routine tasks of the supply planners and the stakeholders became engaged to it.

7.4 Recommendations for future research

The recommendations for future research are based on the causes of commercial losses which were not covered by this project.

- **Forecast accuracy**

The combination of over-forecasting and under selling was the main reason for SCL. Therefore, the first suggestion for future research is on improving the forecasting process at the company. This was not covered in this project as the SC Hub does not perform this activity. It is suggested to create a forecast review process in which those items constantly over-forecasted are reviewed and adjusted on time. Moreover, foodservice products, due to the difficulties given during the liquidation process, must be forecasted with extra caution.

- **MOQ review process**

The second recommendation is based on the findings from the excess production review process. Once this process was implemented, the current MOQs were the cause of the 40% of excess productions. This significant percentage highlights the need of creating an MOQ review process. The company should address the current MOQs of the company to produce each item. It should be evaluated which MOQs are producing above the expected sales during the trade window, hence contributing to the commercial losses of a company. As the reduction of the current MOQs might have an impact on the production costs, this issue should be jointly reviewed between the manufacturing team, the S&OP team of each BUs, Procurement, SC Finance and the SC Hub.

- **Central Clearance team for the KHC**

The third future recommendation is based on the extra layers existing when the food waste hierarchy is implemented in a multinational company. In the literature of Papargyropoulou et al. (2014) or Garrone et al. (2016), the food waste hierarchy was tested in a different context as the one presented in a multinational company as the KHC. In the case of Garrone et al. (2016), the food waste hierarchy was implemented in companies where different Business Units did not exist. Nevertheless, once the food waste hierarchy is implemented in a company such as the KHC, where there is a total of 10 Business Units working at a high level of independency, there are more obstacles which prevent the company to reach the expected efficiency.

Fig. 7.1 shows the actual situation for each BU in terms of liquidation and donation. This chart was created after interviewing one representative of each of the BU. They were asked about the limitation and constraints their BU faces when a product needs to be cleared. Per the limitations of each of the BUs, these were placed in the axis of Fig. 7.1. As illustrated in the chart, not all the BUs were performing at the same level. In the supply chain losses analysis, it is already explained some of the key outputs of this analysis. As a summary:

- *CONFIDENTIAL INFORMATION.*
- Food banks in BU-2 are full and do not accept food with less than 90 days of shelf life.
- *CONFIDENTIAL INFORMATION.*
- BU-4 or BU-5 are only able to prevent supply chain losses by donating stock or sending it to animal feeding/biofuel. These BUs are not able to clear the stock earlier at a higher price.

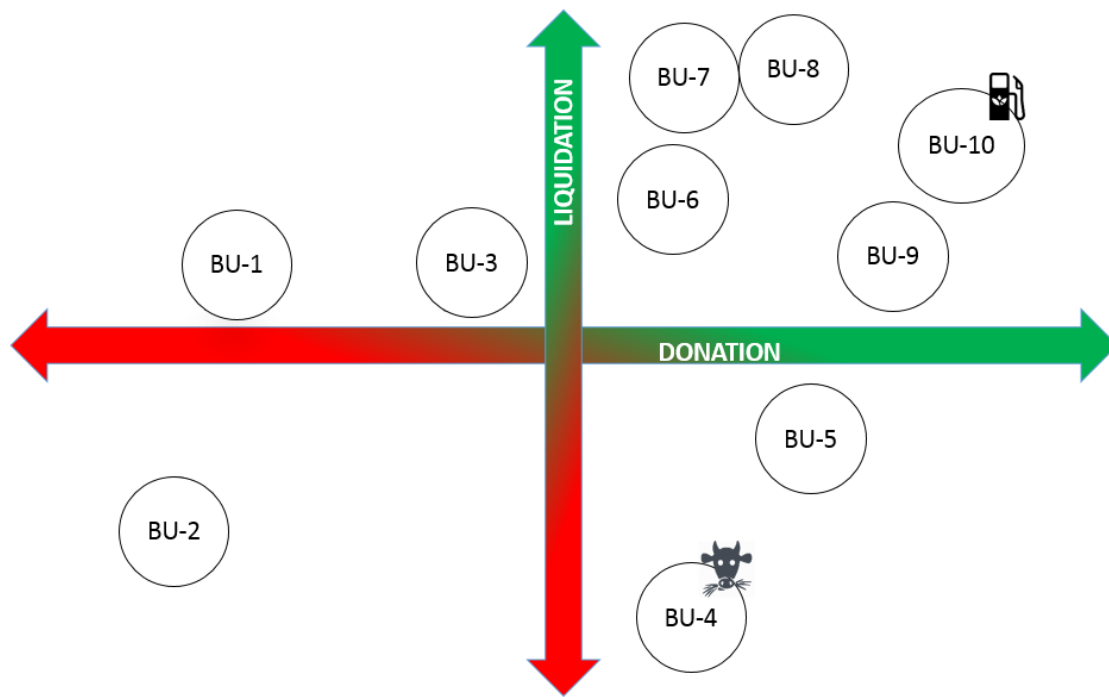


Fig. 7.1: Actual clearance efficiency at the KHC.

Taking the current situation into consideration, this project recommends the KHC creation of a central clearance team. This team has as an objective the reduction of the amount of stock destroyed.

Per the current way of working, each BU follows the food waste hierarchy but each of them decides the discounted price on their own. Each BU has their own objectives and limitations; hence they don't offer the same prices thought the liquidation process. Some of the BUs tend to be more conservative and offer less discount at an early stage while others can afford to offer higher discounts. By creating a central clearance team, the goal would be to improve the clearance efficiency, hence pursuing the zero food waste objective of the company.

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8. References

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9. Appendix

Appendix A: The food waste hierarchy in the literature

Below, two different views from the literature are presented.

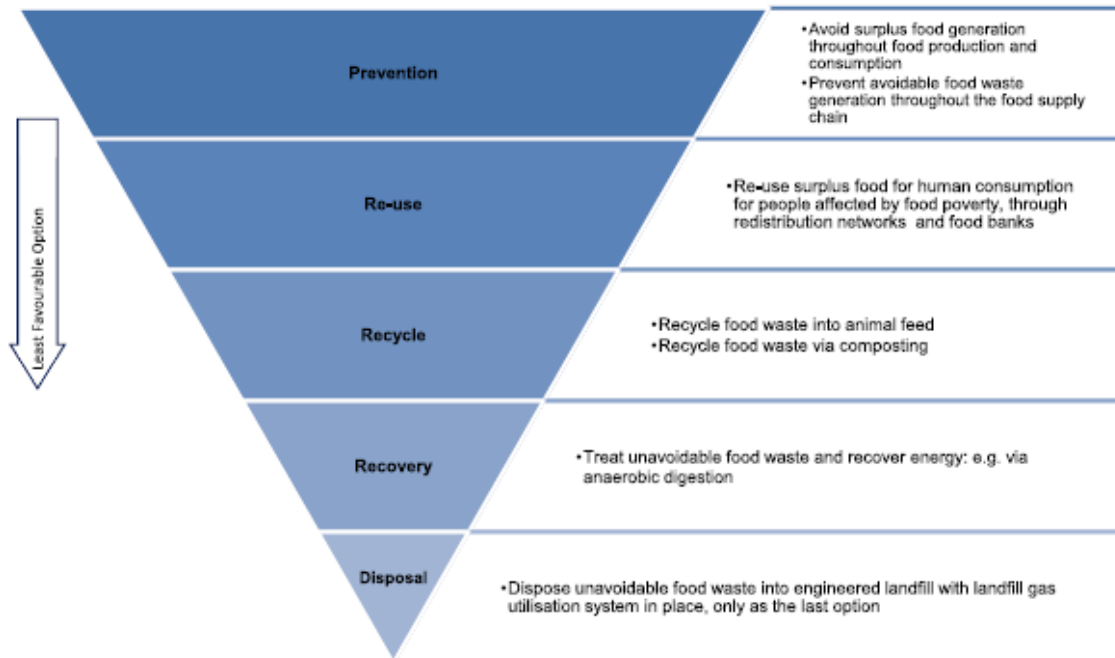


Fig. 9.1: The food waste hierarchy (Papargyropoulou et al., 2014).

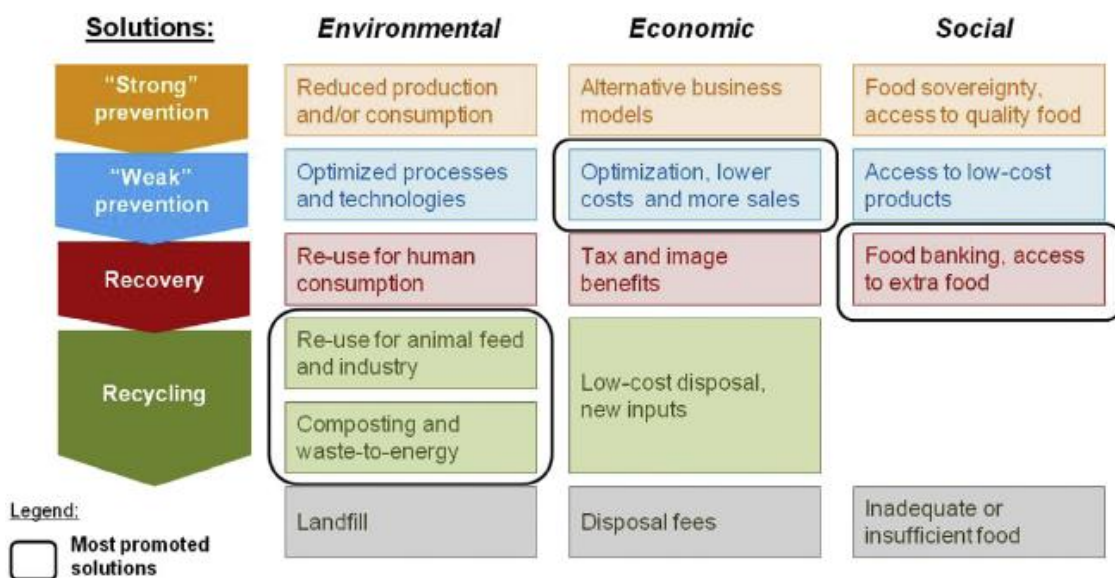


Fig. 9.2: Competing hierarchies of solutions to surplus food (Mourad, 2016).

Appendix B: The Kraft Heinz Company Brands in EMEA

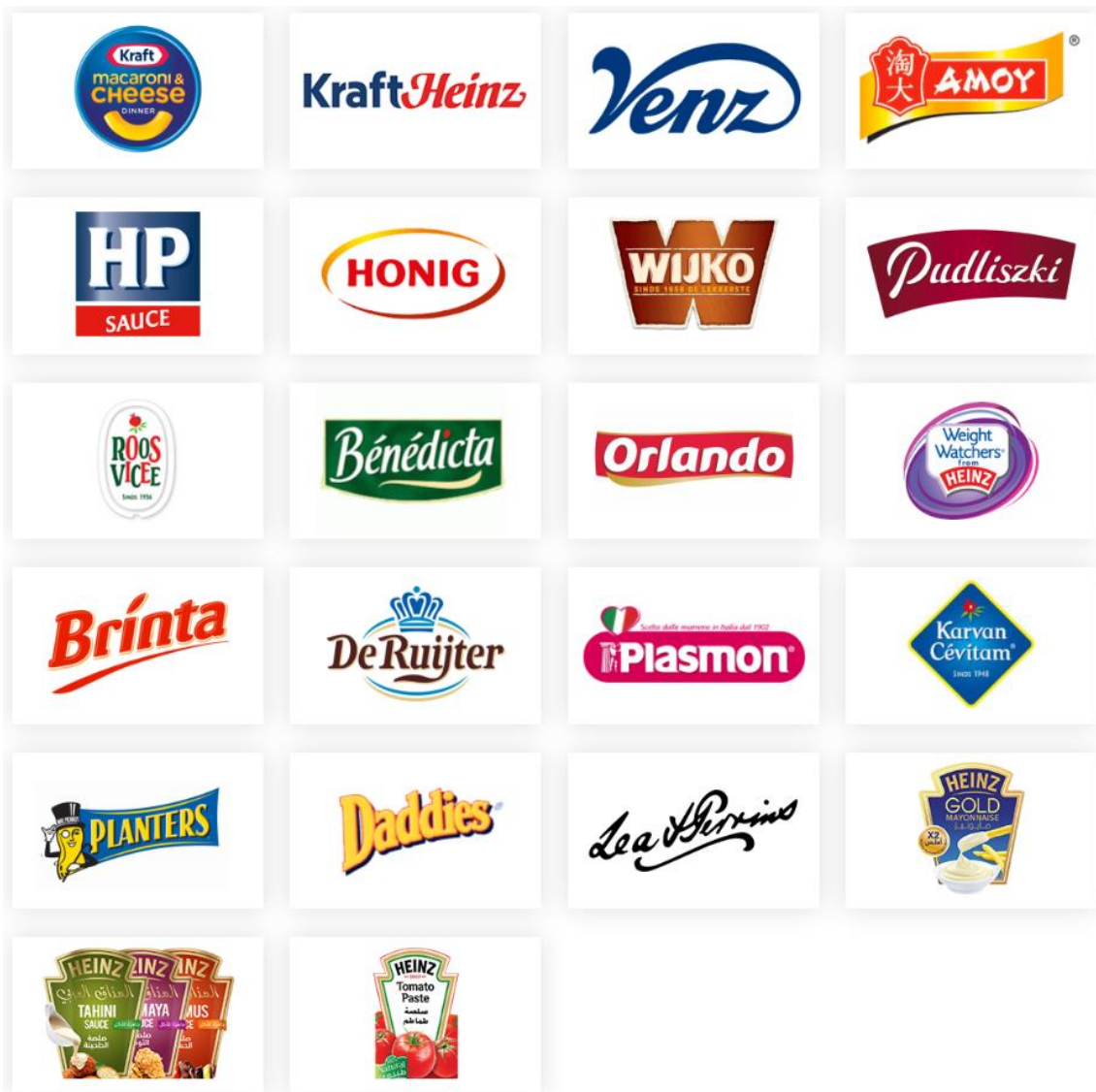


Fig. 9.3: The Kraft Heinz Company Brands in EMEA.

