



**Application of reverse logistics in cardboard packaging operations
for food industry**

Saúl Contreras Aguilar

Haaga-Helia University of Applied Sciences

Degree Program in International Business

Research-based Thesis

2024

Abstract

Author(s) Saúl Contreras Aguilar
Degree Degree Program in International Business
Report/Thesis Title Application of reverse logistics in cardboard packaging operations for food industry
Number of pages and appendix pages 38+3
<p>This thesis explores how multinational companies implement diverse sustainable practices in the supply chain. Precisely, the author researched about some important companies in the industry to understand their performance in the reverse logistics area.</p> <p>This paper is a research-based investigation where the author made a detailed analysis by diverse qualitative and quantitative research methods to demonstrate the environmental awareness of these companies. In the theoretical framework, the author defined the concept of reverse logistics, and addressed to related topics such as recycling and other environmental practices for the cardboard package.</p> <p>In the thesis process after going through the background of the food companies and their sustainable practices the results of the research are going to be shown. The approach to their results show the importance and the impact of this sustainable goals, such as encourage more users to apply this strategy and demonstrate the direct benefits. Besides, as can see the challenges and potential oppositions in halfway.</p> <p>The reverse logistics model has been adapted to the multinational operations in numerous systems. By this study many companies show their strategies and by the data collection can be seen the benefits of sustainable models. This thesis is held by numerous testimonies that sustainability through reverse logistics benefits the environment and remains profitable.</p>
Key words Reverse Logistics, Circular Economy, Packaging, Sustainability, Supply Chain

Tabla de contenido

Introduction	1
1.1Background	1
1.2Research Question.....	2
1.3Demarcation.....	4
1.4International Aspect	5
1.5Benefits.....	5
1.6Risk & Risk Management	6
1.7Key Concepts.....	7
Reverse Logistics	8
2.1 Definition	9
2.2 Reverse logistics process	9
2.3 Cardboard Packaging	13
2.3.1 Recycling cardboard methods.....	13
2.4 Food companies and their cardboard consumption.....	14
2.5 Environmental impact.....	15
2.6 Waste Reduction	16
2.6.1 Food companies and their waste initiatives	17
3 Research Methods	19
3.1 Data Collection & Research Design	19
4 Results	24
4.1 Cardboardboard Industry Expert's Results	24
4.2 Purchasing Managers Results	29
5 Conclusions	31
Appreciations	33
Sources	35
Appendices	37
Appendix 1. List of figures and tables	37
Appendix 2. Research Tools	38

Introduction

The term "sustainable cardboard packaging" describes the application of cardboard, a biodegradable and renewable material, to packaging solutions that reduce its adverse effects on the environment. Reducing waste, greenhouse gas emissions, and resource usage, sustainable carton packs are an eco-friendly substitute for traditional packaging materials. The need for creative and environmentally friendly packaging options, like cardboard, is projected to increase as consumers become more conscious of their impact on the environment and businesses strive to implement more responsible practices. Through the implementation of such programs, both individuals and industries may contribute to building a more environmentally conscious and sustainable future for future generations. There are other advantages to using more environmentally friendly packaging across the supply chain that go beyond just saving the environment.

One of the key components of the supply chain, packaging involves a number of processes in the between. Developing unique and creative packaging techniques enhances a company's internal financial elements. Consequently, businesses whose mission is to maximize profits while minimizing waste have made creating a reverse cardboard packing process a top priority. A thesis can analyze different reverse logistics models and identify ways to streamline these processes.

One final thing to think about is reverse logistics, which is the process of bringing waste back into the supply chain. The idea established by this project is to diminish the waste created by outstanding companies apart from generating different opportunities for companies to utilize the materials once again and adding value to a product that has been wasted, offering profitability to the consumers of this resource and motivating recycling agents to continue promoting these practices.

1.1 Background

The introduction of reusable packaging is a system change for the producer, retailer and consumer. According to this project research, a crucial step for creating an active reverse supply chain for packaging gravitates on logistics. Cardboard is an outstanding alternative in the manufacturing industry for package, due to the resistance, cost, and particularities of the material. It is useful for food and other daily consumed products. Despite recycling

packaging benefits companies on profitability, create a particular route to reintroduce packaging waste goes together with multiple expenditures and jeopardize the actual systems on supply chain. Consequently, numerous techniques that encourage sustainability and environmental awareness will be taken into account considering rentability and the principal goals of the supply chain management as the applicable environmental policies.

This thesis is relevant because the innovation along the supply chain flows into giving an added value to the process of an elemental activity in the business world. This is possible by the way which companies handle their structural logistics as well as the way they control their expenditures, waste, and quality. Besides, the introduction of renovation techniques such as recycling and reuse of material captures the attention of many collaborators in the business world making these alternatives a trend on the industry and the future for a sustainable supply chain.

Regarding innovation, companies must not forsake about profitability when introducing new forms of developing their standard operations. For that reason, is why the implementation of a good reverse logistics strategy must be meticulously made, as well as the necessary tests and analysis so the product must not be affected in a quality manner and every step function optimally along the supply chain.

1.2 Research Question

This paper section regards the effectiveness of reverse logistics for cardboard packaging while creating a deep analysis of the recovered information through certain questions previously developed for complete research.

For a superior development of the topic, the author has created precise questions to initiate structured research about the selected topic. However, it should be noted that these questions will integrate solid information provided by the experience of the selected experts, supporting the author's theory on the chosen topic.

This thesis will be supported based on the following research question (RQ)

RQ How to apply efficiently reverse logistics in multinational food company's cardboard packaging operations?

Derived from the research question, five investigative questions (IQ) will be employed with the goal of guiding this investigation.

IQ 1 What is the economic feasibility of incorporating reverse logistics in cardboard packaging operations?

IQ 2 Which factors contribute to the overall environmental footprint in the reverse logistics process?

IQ 3 Which is an effective strategy to implement reverse logistics on cardboard packaging manufacture for food industry?

IQ 4 What is the environmental impact of implementing reverse logistics in cardboard packaging operations compared to traditional disposal methods?

IQ 5 What are the main challenges and barriers faced by companies when implementing reverse logistics for cardboard packaging?

Table 1. Overlay Matrix (Author, 2023)

Investigative Questions (IQ)	Theoretical Framework	Methods	Results
IQ 1 What is the economic feasibility of incorporating reverse logistics in cardboard packaging operations?	2.4, 2.6	Webropol Survey Digital Interview	p.24, p.25, p.29
IQ 2 Which factors contribute to the overall environmental footprint in the reverse logistics process?	2.2, 2.3,2.5,	Webropol Survey Digital Interview	p.28

IQ 3 Which is an effective strategy to implement reverse logistics on cardboard packaging manufacture for food industry?	2.2, 2.4, 2.6	Webropol Survey Digital Interview	p.24, p.26, p.29
IQ 4 What is the environmental impact of implementing reverse logistics in cardboard packaging operations compared to traditional disposal methods?	2.5, 2.6, 2.6.1	Webropol Survey Digital Interview	p.27
IQ 5 What are the main challenges and barriers faced by companies when implementing reverse logistics for cardboard packaging?	2.3.1, 2.4, 2.6	Webropol Survey Digital Interview	p.27, p.29

1.3 Demarcation

The purpose for this paper, is to analyze the topics involved during this project. Focusing on the international aspect of the industry of cardboard packaging as reverse logistics and circular economy, the author is planning to maintain the guideline for this project over these topics. Furthermore, topics of a compact introduction to the project will be addressed such as sustainability and environmental awareness which are important part but focusing on the manufacturing and distribution aspect of a very interesting resource for the supply chain which is the cardboard packaging.

The scope for this area is that the author researches operations' behavior regarding sustainability and how some aspects such as profit, transportation, and manufacture are affected by the recycling processes.

The industry this project is trying to reach is the international food, cereals, processed foods industries, more about the way this companies reduce waste and get benefit along the supply chain, being profitable due to diverse strategies.

Another meaningful field of this research is considering and analyzing if the reverse logistics is a profitable strategy for suppliers and consumers and which are the benefits of introducing it to their usual activity.

1.4 International Aspect

The author is not aiming to choose a commissioning company for this thesis. However, the international part will be handle by developing and researching the distribution and manufacturing process for cardboard boxes supply chain by cardboard companies in global operations and their relationship through this process with their international customers in the food industry. The author is going to analyse technical processes for creating a optimal reverse logistics.

1.5 Benefits

In substance, the principal benefits must be for the author, who is going to be in-depth in the topics developed during this thesis. Furthermore, the lecturers are going to be connected with the same information that is explained by the author as well as companies who are beginning to implement these strategies innovating and researching for outstanding results. This paper supports the current tendency on the international business aspect that is environmental awareness and creating a sustainable process over the supply chain to efficient cost, waste and pollution.

This technique which is about to analyze, benefit manufacturing packaging companies, people who work on the industry, and students interested in sustainability and logistics, acquiring a complementary and innovative point of view exhibited in this paper.

Supported by the results obtained throughout this research, readers will be able to obtain a peripheral vision of reverse logistics along the supply chain in conjunction with various conclusions supported by interviews with industry experts and outstanding information recovered.

1.6 Risk & Risk Management

In this part, the author created a chart where the possible risks during the investigation are analyzed in matter of severity and occurrence. This fields are going to be rate on a scale from 0-10 where 0 is “Never” and 10 is “certainly to happen”.

The author is considering on this chart certain difficulties that could be faced during the process of this project development. In consequence, the analysis of certain risk on the process will contribute to the prevention of inaccuracies that could difficult the research.

Table 2. Risk Matrix (Author, 2023)

Risk Impact	Severity	Occurrence (0-10 scale)	Prevention
Limited access to resources (financial data, information about the topic)	High	3	Plan research around available resources. Choose a familiar topic for investigation.
Barriers for contacting companies	High	5	Use different channels for reaching contacts from the industry.
Expanding the scope of the research beyond manageable limits	Medium	7	Define the limits of the thesis at the outset and adhere to the reseach question
Underestimating the time required for each research phase	Low	8	Develop a realistic timeline and set achievable milestones.

1.7 Key Concepts

Certain and specific concepts must be defined for a clear understanding of the general topic. These words are considered by the author critical for creating a perspective for this project. These are terms that are associated directly with the topic and must be found frequently through the document, consequently giving context about them and attaching a proper definition is considered fundamental.

Sustainability. Is the act of using economically sound practices that reduce negative impacts on the environment, while conserving energy and natural resources. (Stanford University, 2018)

Packaging. Is the technology used for enclosing or protecting the products for its distribution and consumption towards its lifecycle. (Cambridge Dictionary, 2023)

Circular Economy. Is a system where resources can be obtained based on the regeneration of materials and products. (United States Environmental Protection Agency, 2023)

Reverse Logistics. Refers to the supply chain process of returning products from end users back through the supply chain to either the retailer or manufacturer. (Association for Supply Chain Management, 2023)

Reverse Logistics

In this chapter, the author will provide an overview of the main topic that is reverse logistics, besides is deepen into the implications of this process including the techniques implemented by the food companies for reducing waste regarding cardboard packaging. A solid theoretical basis is required for the food industry's successful application of reverse logistics. The theoretical foundation for this thesis's inquiry laid out in this chapter.

For a better understanding of the topic the following chart was created. All the gathered data is based on this diagram, the general topic and the main concepts to develop the subtitles of this chapter.

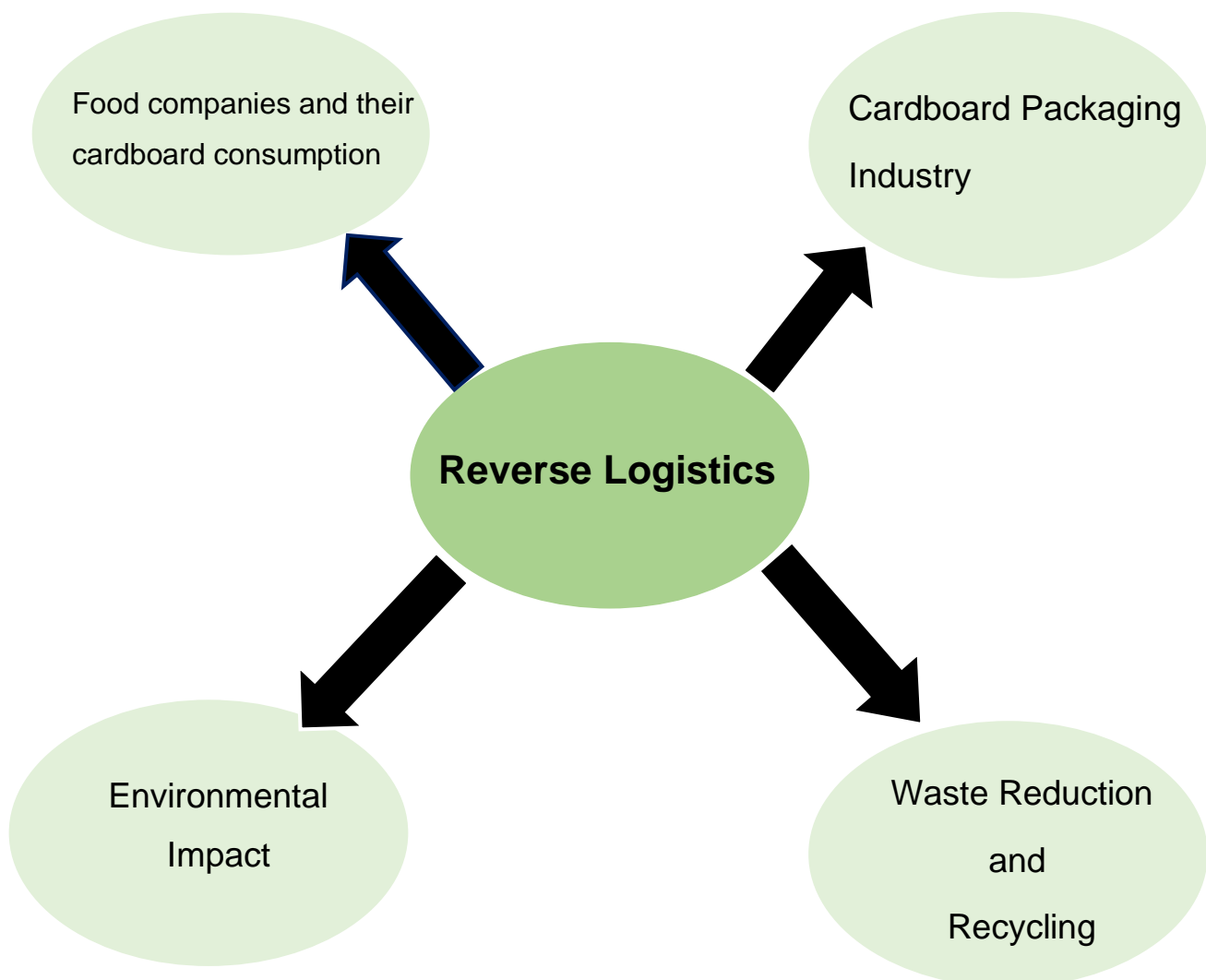


Figure 1. Theoretical Framework (Author, 2023)

2.1 Definition

Previously going forward in the specification of the topic, it is critical to understand what logistics involve. “Logistics refers to the overall process of managing how resources are acquired, stored, and transported to their final destination. Logistics management involves identifying prospective distributors and suppliers and determining their effectiveness and accessibility.” (Investopedia, 2024)

Reverse logistics refers to the process of moving goods from their final destination back to the manufacturer or a designated location for the purpose of return, repair, remanufacturing, recycling or disposal. Unlike traditional logistics, which focuses on the movement of products from manufacturers to end users, reverse logistics deals with the flow of goods in the opposite direction. (Association for the Supply Chain Management, 2024).

2.2 Reverse logistics process

The following diagram explains the general steps of the process in reverse logistics.

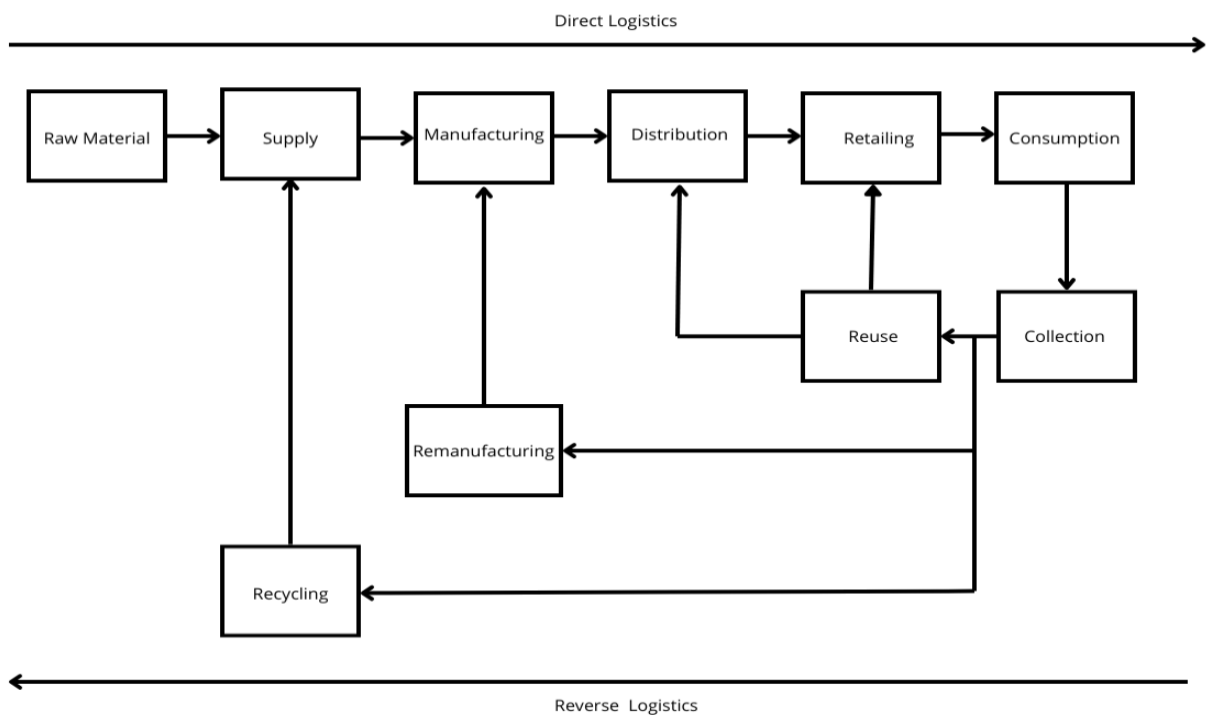


Figure 2. Reverse logistics flow chart (Author, 2023)

The author is going to summarize the steps involved on reverse logistics as well as the implications in between.

1. Return Initiation:

The customer initiates the return procedure at this point. This could involve returning the item to a physical store, contacting a customer service agent, or obtaining a return authorization online.

2. Transportation Returns:

The consumer must return the product once the return is approved. This also could involve:
Prepaid Return Labels: Customer may use a prepaid shipping label provided by the company.

Drop-off locations: Approved drop-off sites, such as affiliated stores, are where customers can return merchandise.

Returns at the customer's expense: The consumer is responsible for packaging and shipping the return at his or her own expense.

3. Examining and Arranging:

When returned goods arrive at the company's location or a specified processing site, they are examined and arranged.

This includes: Verifying the state: evaluating the returned item's state (functioning, damaged)

Identifying the cause for the return (such as an incorrect item, a damaged product, or an undesirable item).

Product categorization is the process of grouping the things for additional processing into distinct groups.

4. Restock or repurpose:

The objects are sent down distinct paths based on their condition and the cause for return:

Restock: The item might be put back into stock for future sales if it's in good shape.

Remanufacturing/Refurbishment: Certain products can be made again and sold as "like-new" after being remanufactured, refurbished, or repaired.

5. Recycling or Disposal:

Products that are irreparably damaged or unfit for resale include:

Recycled: Turned into fresh resources that can be used again.

disposed of appropriately: observing environmental laws when disposing of garbage.

6. Analysis of Data:

During the reverse logistics process, information is gathered about the following:

- Product or category-specific return rates

- Causes of reversions

- Costs and processing durations

To find opportunities for development in the product design, customer service, or reverse logistics system, this data can be evaluated.

It is important to highlight that these steps can vary depending on the specific industry, company policies and the particularities of the product.

There are difficulties with reverse logistics. Monitoring the profitability of the reverse logistics process is one of the most popular. Returning products to a distribution center may not always be financially advantageous because the cost of shipping may exceed the value of the products.

Having the necessary infrastructure to monitor the status of a product's warranty is another common problem. It is also essential to ensure that any repair procedure is economical.

The author included certain principles of his selection according to what in his theory is considered efficient for this process. These important aspects must be studied since they are guidance and they comprise the overview of what can be favorable in reverse logistics application. Besides, the author is going to provide a brief epilogue of each principle aiming to give an analytic emphasis.

Product Return Management: Provide easy to use, unambiguous routes for consumers to return merchandise. This entails putting in place an easy-to-use returns policy, giving pre-paid return labels, and providing a variety of return choices.

Reverse Supply Chain Visibility: Put in place the tools and procedures necessary to monitor returned goods all the way through the reverse supply chain. To guarantee visibility and transparency, this also includes real time tracking, inventory management software, and interaction with partners and suppliers.

Sorting and Disposal: Quickly arrange returned goods according to their condition and available destinations after receiving them.

Repair and Renovation: Whenever possible, set up procedures and infrastructure for the restoration and maintenance of returned goods. This include evaluating the returned goods' state, fixing any flaws, cleaning and packing them, and getting them ready for resale.

Recycling and Disposal: Create procedures for recycling or properly getting rid of things that can't be fixed up or sold again in an ecologically friendly way.

Planning and Management of Inventory: To optimize inventory levels for returned products, keep precise inventory records and use demand forecasting. This keeps extra inventory to a minimum and guarantees that reconditioned goods are promptly ready for resale.

Logistics and Transportation: To reduce expenses and environmental effect, optimize modes and routes of transportation. In order to maximize reverse logistics transportation, this entails grouping goods, employing effective transit techniques, and collaborating with carriers.

Customer Support and Communication: To ensure visibility and transparency, keep customers updated at every stage of the reverse logistics process.

Companies can increase productivity by data collection and analysis, gathering and examine operational data related to reverse logistics in order to pinpoint areas that could use further development.

Businesses can lower costs, increase customer happiness, decrease waste, and promote sustainability throughout the supply chain by putting these principles into practice and streamlining the reverse logistics process.

2.3 Cardboard Packaging

Wood pulp, which can come from ethically managed forests or recycled cardboard and paper, is typically used to make cardboard. Cardboard packaging refers to containers, boxes, or packaging materials made from cardboard, which is a thick paper-based material that is typically constructed from several layers of cardboard. Cardboard packaging is widely used in various industries for packaging and transporting goods due to its versatility, lightweight nature and cost-effectiveness. It provides protection for products during shipping, storage and handling, while also serving as a medium for displaying information and branding.

2.3.1 Recycling cardboard methods

Choosing the best recycling solution can boost productivity and reduce the need for physical work. According to the research about recycling methods, the author found many clear aspects to consider in the waste reduction methodology. There are three guidance for companies who are studying alternatives.

The first is to encourage employees to recycle

Second is to switch to minimal packaging designs

Finally, the third is to use sustainable raw materials for packaging

These three main objectives can become a challenge for companies that are beginning in the industry as consequence of their need to maintain their expenses in the minimum range,

the ignorance of the benefits that sustainability contributes to business status and supply chain activity.

2.4 Food companies and their cardboard consumption

In the food industry, reverse logistics is responsible for returning packaging materials and pallets. Companies also must deal with rejected food shipments. In the case of food industry, the majority of the emissions are created by the packaging material and manufacture of the previous. Rejections can create logistical challenges due to delays that lead to food spoilage and concerns over tampering. The Reverse Logistics Association ([opens in a new tab](#)) is developing secure, quick, reliable, login (SQRL) codes on packaging to provide detailed product information and address these logistical challenges. (NetSuite, 2024)

Regarding cardboard packaging, multinational food leaders such as Kellanova are the main consumers of this material. Kellanova recently announced its commitment to use 100% reusable, recyclable or compostable packaging by 2030. This company has many strategies for improving their sustainable packaging. "Recycling is an important part of our strategy as we need to ensure that our packaging is designed to be compatible with recycling infrastructure across the globe and ultimately divert packaging material from landfill. Working towards these goals can also have additional benefits related to carbon emissions reduction, which is another focus area for us as a company. For Kellanova, sustainable packaging involves much more than just recyclability. Even though we continue to improve the recyclability of our packaging, we are always looking at ways to reduce packaging where possible, as well as ensuring we select materials that help reduce food waste by keeping our foods fresher for longer" (Kellanova, 2024).

Other example selected to analyze is Domino's, which is a global company and the main package of their products is corrugated cardboard.

2.5 Environmental impact

While cardboard packaging offers several environmental benefits such as recyclability and biodegradability, its production, use, and disposal still have environmental impacts that need to be addressed through sustainable practices, efficient recycling systems, and responsible consumption habits. According to West Rock, who is one of the stakeholders selected for this paper analysis, established that 70% of millennials and 72% of Gen Z consumers would be willing to pay more for takeout orders to cover the cost of improved packaging that travels well and incorporates more sustainable materials.

The author considers that for contemporary generations, sustainability is a priority and a fundamental aspect regarding industry due to the considerable levels of emissions these causes.

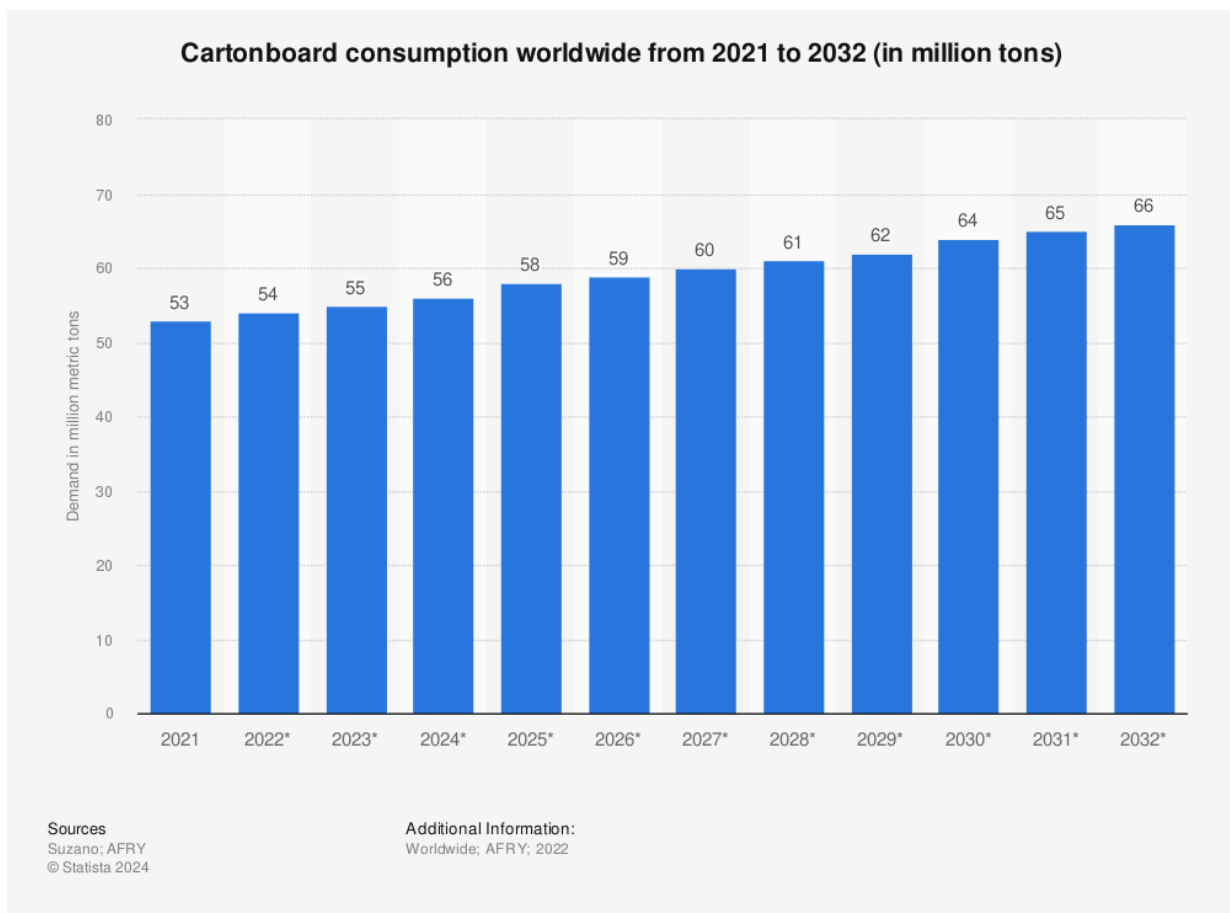


Figure 3. Cartonboard consumption worldwide from 2021 to 2023 (Statista, 2023)

“Global cartonboard consumption was estimated at 53 million tons in 2021. The demand for cartonboard is expected to increase further over the next decade, reaching 66 million tons by 2032.” (Statista, 2023)

The author chose this certain graphic to expose the forecast of waste in the past years and through the forward years. Understanding that the cardboard consumption increases as industry does. Considering the forecasting of cardboard consumption in the forward years, is why the author decided to research about the diverse methods that companies are implementing for reducing waste and becoming more sustainable, observing the detailed process

2.6 Waste Reduction

This concept is crucial for environmental sustainability and resource conservation. Waste reduction strategies can be implemented at different levels, including individual, household, community, business and industrial levels. Waste has a detrimental effect on animals, human health, and air quality. Toxic pollutants are released into the air when waste is burned in landfills to make way for more rubbish. In many countries, waste management and methods of use are important issues. Cardboard recycling is a common method of handling waste paper because the production process generates 80% of the waste mass. Printed paper contains toxic substances used to make inks and colors, and burning it to remove it releases carbon in the form of small grains that stick to the air and damage human respiratory systems. Environmental strategies aim to minimize landfill disposal in developed countries with limited land and strict environmental regulations.

“Packaging waste, as defined by the United States Environmental Protection Agency (EPA), comes from consumers discarding packaging within the same year they purchased the product inside. In 2018, the EPA reported packaging waste amounted to 82.2 million tons, which made up over 28% of all generated waste for the year.” (BoltBoxes, 2024)

Once more, the author is referring Domino’s as a direct collaborator with its cardboard supplier West Rock. Domino’s developed a new initiative to motivate consumers to recycle the pizza boxes correctly. According to a corporate representative, the main objective is to increase consumers awareness about sustainability. In addition to recycling statements,

West Rock which is leader in cardboard packaging manufacture placed a QR Code on the boxes that links consumers to an educational website that contains information about recycling boxes. It also comes with a web application that gives users local recycling rules for correct recycling process. The Domino's representative established This innovative box design debuted in August 2022 and is going to be preserved forever.

The author included this practice on this paper because in his consideration reverse logistics couldn't be possible or it could mean a difficulty if the material wasted is not well selected or in some cases polluted by toxic substances. For that reason, is fundamental the implementation of correct dispose of packaging waste.

2.6.1 Food companies and their waste initiatives

The author has gathered many examples of sustainable alternatives to implement reverse logistics. As a case to analyze the author recover information from multinational companies where they expose their strategies, benefits and challenges.

As main, the author recovered information from Nestle, which is a leader in the food industry and massive multinational company. Scrutinizing the public information on their sustainability report, the author located distinct and outstanding statistics for this paper.

"We have set new commitments to achieve 100% reusable or recyclable packaging by 2025 and to achieve net zero greenhouse gas emissions by 2050." (Nestlé, 2020)

Principally, Nestlé is having a clear scope of a time period where they want to become sustainable in the majority. Despite it is a long period of time, by the following steps they are implementing to their packaging operation they can accomplish it.

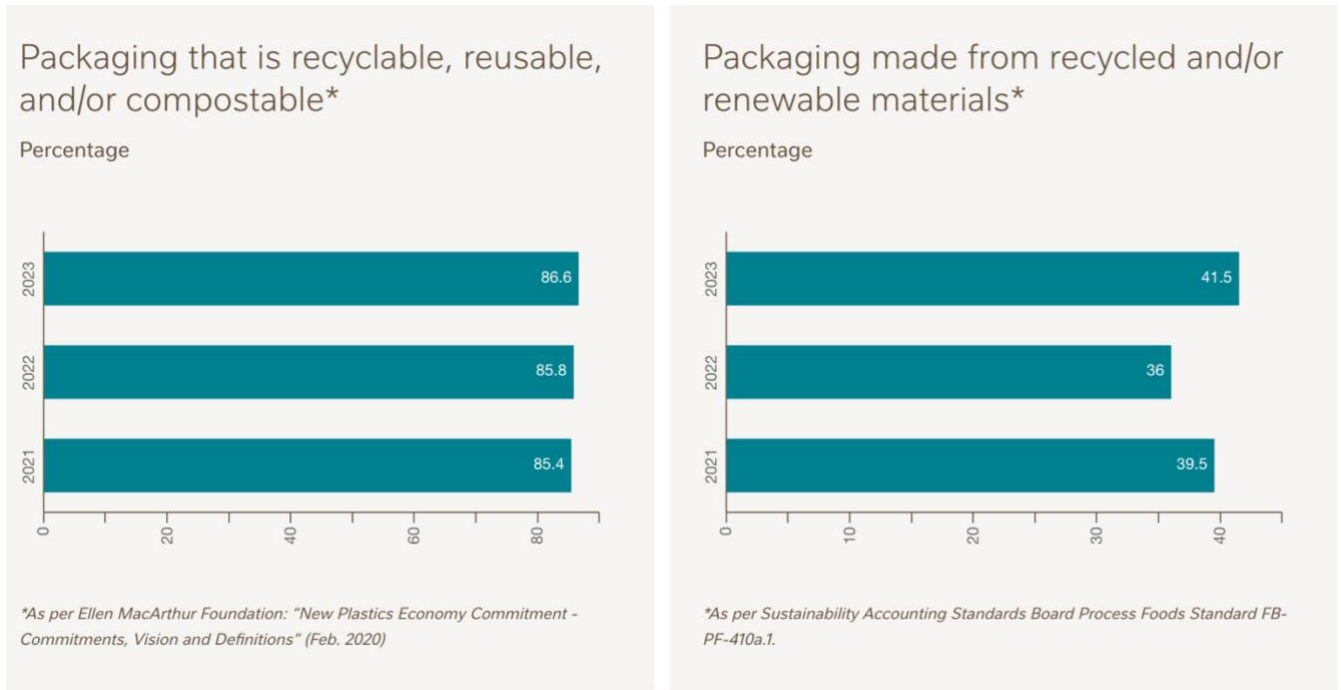


Figure 4. Packaging reduction by Nestlé (Nestlé 2020)

The corporation started that 83.5% of its packaging was designed for recycling by the end of 2023. By gradually eliminating various additives from its processes, it also hopes to avoid any inference with the recyclability of its packaging.

During the same year, it claimed that 86.6% of its packaging was recyclable, biodegradable, or reusable, and 41.5% of it was composed of recycled or renewable resources. According to Nestlé, 0.8% of its cardboard packaging is currently reusable, while the recycled content of the packaging has increased to 9.3%, it has a 1.6% rise from 2022.

This data is interesting for the investigation and the theoretical framework to observe the context of these companies. The way they aim to achieve their goals in the packaging area is by recycling process and using compostable material in their products due to the high volume of material used, they are seeking that along the years this numbers of renewable packaging consumption continue increasing until reaching the point of becoming a leader in sustainability by reducing in majority their carbon footprint.

3 Research Methods

This thesis is supported by different research methods and consulting data provided by the stakeholders related with the topic, principally qualitative and quantitative methods. To achieve the expected outcomes of this paper, the author will need to reach out to stakeholders in the cardboard industry, including manufacturing companies, recycling agents, key companies such as food producers, and workers responsible for manufacturing, design, quality control, and purchasing. The prospection must be with the author network nevertheless the author is going to expand the possible collaborators list by entering Linked In ass an alternative source for experts. The scope is to recover expertize from the three industries considered in this paper. In the following figure the readers can appreciate the mapping of stakeholder's selection.

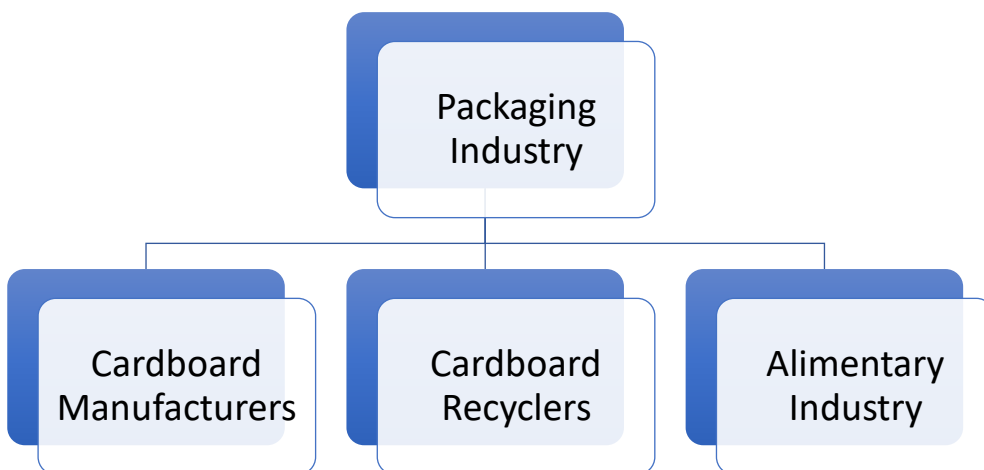


Figure 5. Stakeholders Mapping Structure (Author, 2023)

3.1 Data Collection & Research Design

The carton packaging industry is a complicated network of stakeholders, each of whom plays an important part in the manufacture, distribution, use, and disposal of carton packaging. To understand and handle the numerous issues and opportunities in this industry, extensive research approaches involving stakeholders are required. This introduction discusses the major considerations and strategies for conducting research with carton packaging industry stakeholders.

Identification of Stakeholders: Make a list of every entity involved in the cardboard packaging industry. This includes waste management firms, manufacturers, suppliers, retailers, consumers, brand owners, and regulatory bodies.

Selecting Methods of Research: Surveys and Questionnaires: surveys are used to gather quantitative data on topics including consumer preferences, recycling behaviors, and industry advancements. Send these questionnaires to the right people.

Conversations: Conduct in-depth interviews with key stakeholders, such as packaging designers, manufacturers, and regulatory bodies, to get qualitative insights into their viewpoints and experiences.

RQ How to apply efficiently reverse logistics in multinational food company's cardboard packaging operations?

With the support of experts in the selected areas, this study aims to obtain a better understanding on the reverse logistics process, current strategies for optimization of resources, and quality standards that must be consider for safeguard the supply chain. The author determined to interrogate five experts in order to provide a proper development of the topic, and with the recompilation of their responses, ensure better conclusions.

The First expert is going to be the supply chain manager of a cardboard manufacture company, who is in charge of the results in the systematization of the supply chain. Besides, he has considerable experience on this area due to his 10 years in the industry working in multinational cardboard manufactures and implementing diverse strategies for managing the supply chain processes.

The Second expert is the quality manager in charge of the quality department of a cardboard manufacturer. The author has considered valuable the participation of this expert due to his role in the logistics area. He is in charge of evaluate the standards that the packaging must follow and the multiple processes the material requires for being renewable.

The Third expert, is a member of the quality team in a recycling company. He is going to provide many of the steps and concerns that must be contemplated during the recycling process of cardboard in order to create a renewable raw material.

The Fourth selected member of this investigation is the supply chain manager of this recycling company, where he is going to explain and feature the difficulties and steps to recover the waste of packaging and redistribute to their customers.

And the Fifth expert contacted for this thesis is the purchasing manager of a multinational cereals company. This collaborator is significant for this paper outcomes due to his relevance. The scope of the author is to demand aspects they as a company consider in order to source their materials according to forecasts, regulations and standards and if it is favorable for the company to acquire more sustainable options and implementing unusual techniques regarding sustainability.

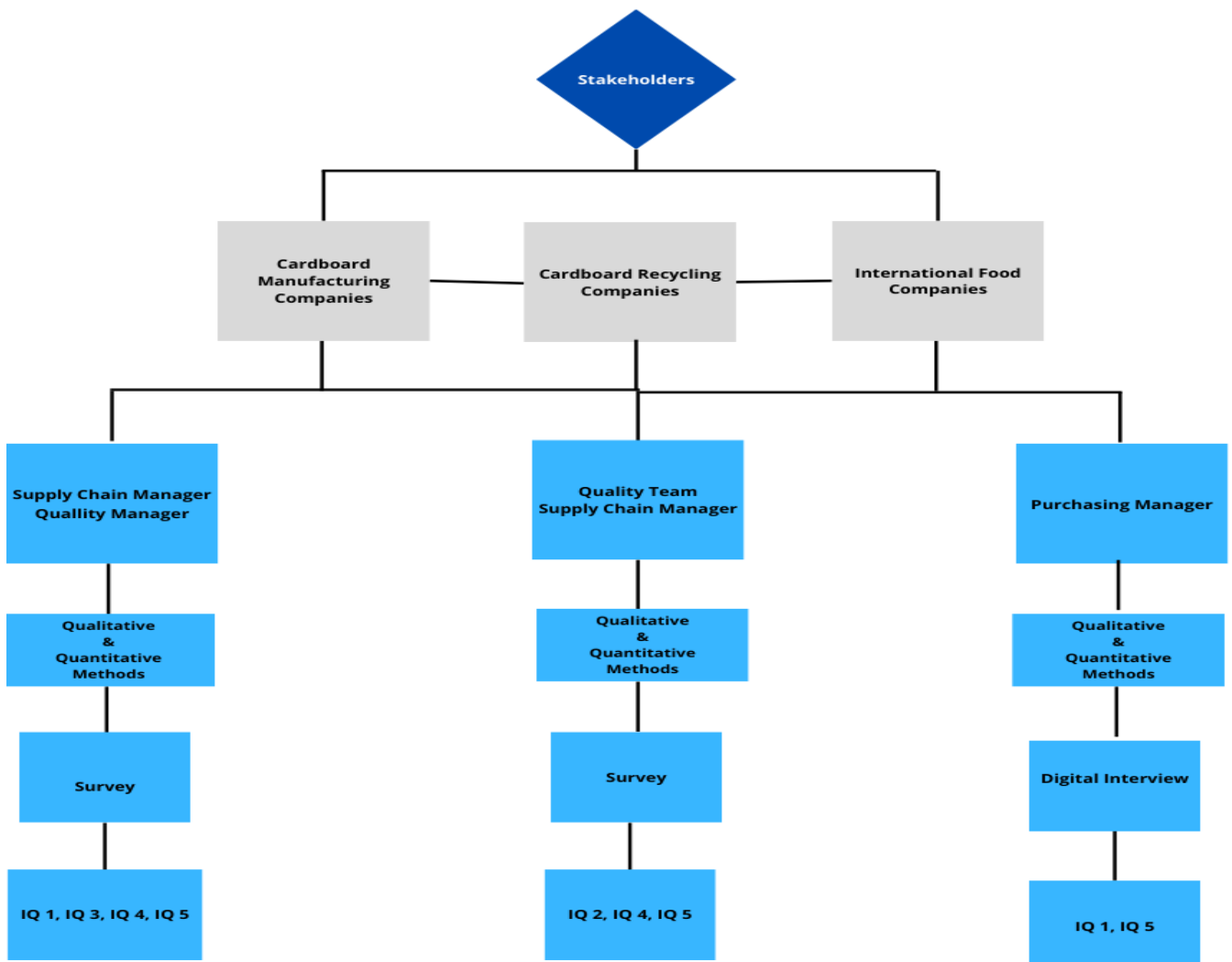


Figure 6. Research Methods Design Chart (Author, 2024)

In the previous figure, we can notice of the chosen stakeholders by the author as well as the research methods, their relationship with the investigative questions, and their role through the investigation. The interaction with the stakeholder is going to be remote due to their location and time disposition.

The information is going to be recovered by digital interviews with collaborators and the author will provide to them a survey with inquiry according to the information that the author demands. The questions and survey are going to be divided in three for the different stakeholders selected. For facilitating the task, the author sent a survey to the cardboard manufacturers and another one to the recycling agents. Besides, to the food company the author reach an interview with the expert selected.

The author outlines the study design and how the survey questions relate to the investigative questions in Table 3.

Table 3. Research Structure (Author, 2024)

Investigative Question	Interview / Survey Questions	Results
IQ 1. What is the economic feasibility of incorporating reverse logistics in cardboard packaging operations?	Do you consider sustainable practices are profitable for food industry? Why? Which aspect is more important in the process of manufacturing your product? Which is the most important aspect to consider while purchasing raw material for your products?	p.24, p.25, p.29
IQ 2. Which factors contribute to the overall environmental footprint in the reverse logistics process?	What would you consider the environmental benefits of reverse logistics in the cardboard industry?	P.28

<p>IQ 3. Which is an effective strategy to implement reverse logistics on cardboard packaging manufacture for food industry?</p>	<p>Does your company implements a reverse logistics process?</p> <p>Which is a sustainable practice that your company has implemented?</p> <p>Do you consider recycling or reusing waste of package as raw material is viable for your company? Why?</p> <p>Does your company currently have reverse logistics program in place for cardboard packaging?</p>	<p>p.24, p.26, p.29</p>
<p>IQ 4. What is the environmental impact of implementing reverse logistics in cardboard packaging operations compared to traditional disposal methods?</p>	<p>How suitable do you consider is sourcing raw material from recycled waste?</p>	<p>p.27</p>
<p>IQ 5. What are the main challenges and barriers faced by companies when implementing reverse logistics for cardboard packaging?</p>	<p>Which are the main challenges for implementing reverse logistics on cardboard industry?</p> <p>What do you consider could be the biggest challenge for implementing an optimal reverse logistics strategy?</p>	<p>p.27, p.29</p>

4 Results

In this chapter, the author is going to expose the results by the investigative methods applied for information recovery from collaborators. The preceding chapters established the theoretical foundation for applying reverse logistics principles. The author explored the current state of cardboard packaging waste and various innovations for this topic. This chapter now delves into the essence of the project which are the results. Here the findings derived from the chosen research methodology are presented. The author organized the results in a clear and proper manner. The purpose of this chapter is to communicate to the readers the findings of the research. By effectively presenting the results, the author can create a strong foundation for the conclusion chapter.

4.1 Cardboard Industry Expert's Results

In order to get homogeneous groups of questions and more accurate results to improve the conclusions, the same questions were demanded to every participant in the cardboard sector.

The first question on the survey is “**Does your company implement a reverse logistics process?**” expecting to know more about the current processes of the selected stakeholders.

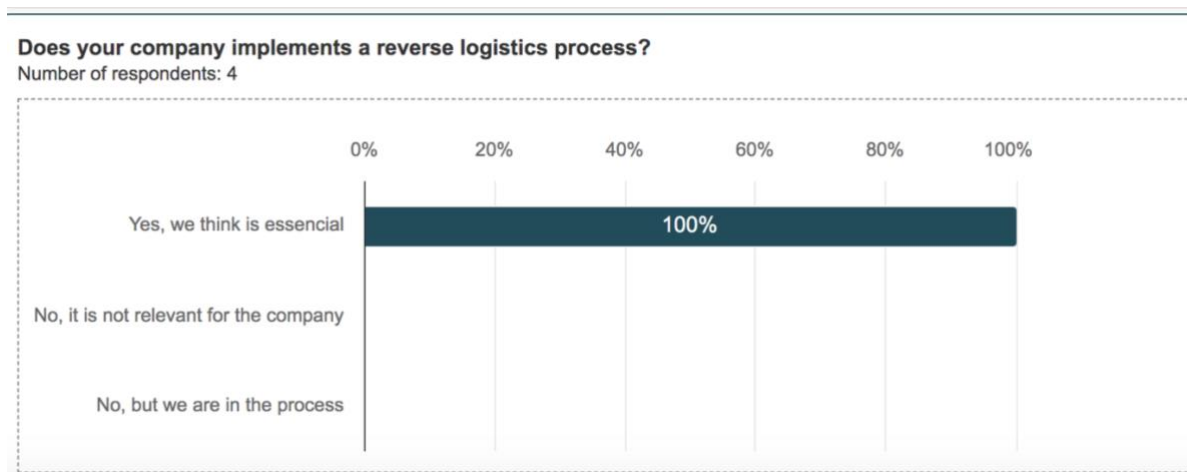


Figure 7. Question number 1, Cardboard Packaging Industry (Author 2024)

These results were expected by the author because according to the investigation made, he perceived that at present, multiple companies are including sustainability as a fundamental target to cover on their goals. The participants showed a clear awareness regarding sustainability by responding that it is essential to them and that they already practice the reverse logistics.

Regarding the feasibility of the model, the author added the following question into the survey. **“Which aspect is more important in the process of manufacturing your product?”**.



Figure 8. Question number 2, Cardboard Packaging Industry (Author 2024)

The author understood by scanning the results that in the cardboard sector quality is crucial above the cost that it generates. Every contributor responded that quality is the main factor to achieve between their multiple operations regarding cardboard production, whether as producer or as a recycler.

The following question is “**Which is a sustainable practice that your company has implemented?**” which is suitable to understand the main practices in the area. Being the responsible of the cardboard production and sourcing, they provide their current strategies that make this feasible. This was in an open format where the participants could provide a written answer.

Which is a sustainable practice that your company has implemented?

Number of respondents: 4

Export all text answers in [Word](#) or [PDF](#)

	Responses
▼	Tree treads by cardboard
▼	Sourcing recycling cardboard paper as raw material
▼	The use of recycled material by refining process
▼	Recycling

Figure 9. Question number 3, Cardboard Packaging Industry (Author 2024)

The main and most important activity in order to renew the cardboard packaging is the recycling of cardboard paper. Companies find this product cheaper to produce and more efficient the working process of the material. Every respond from the different participants was similar. Appealing to the recycling process in their current operations seeking sustainable results.

Regarding the challenges faced in this sector to achieve outstanding result, the author demands directly to the participants the following question “**Which are the main challenges for implementing reverse logistics on cardboard industry?**” The participants were encouraged to provide a free response according to their diverse experiences.

Which are the main challenges for implementing reverse logistics on cardboard industry?

Number of respondents: 4

Responses
Develop high performance papers
The initial investment that many companies need for creating new transportation routes and recollection. Most of the time jeopardizing the quality of the product
Encouraging consumers to participate in cardboard return programs
Consumer Participation Economic Viability Sorting and Processing

Figure 10. Question number 4, Cardboard Packaging Industry (Author 2024)

As seen, the participants purpose different answers. The first response aims to the same aspect of quality, of how difficult is to develop resistant cardboard paper. The second comment was regarding the investment needed to implement new transportation routes for relocate the waste in the recycling warehouse. And how the quality of the product is jeopardized in the beginning of the operation by the lack of experience. The third response is related to the encouragement of the consumers to participate in the returning of the material by separating correctly the cardboard from other materials. And the last response regards the customer participation matching with the previous response, besides it includes the economic viability in the sorting and processing process.

The following question is “**How suitable do you consider is sourcing raw material from recycled waste?**” where the author chose a selection where the participants can rate in a scale from 1 to 10 how suitable is the sourcing of waste as a raw material. The results were interesting and provide an overview about the environmental awareness of these experts.

How suitable do you consider is sourcing raw material from recycled waste?

Number of respondents: 4

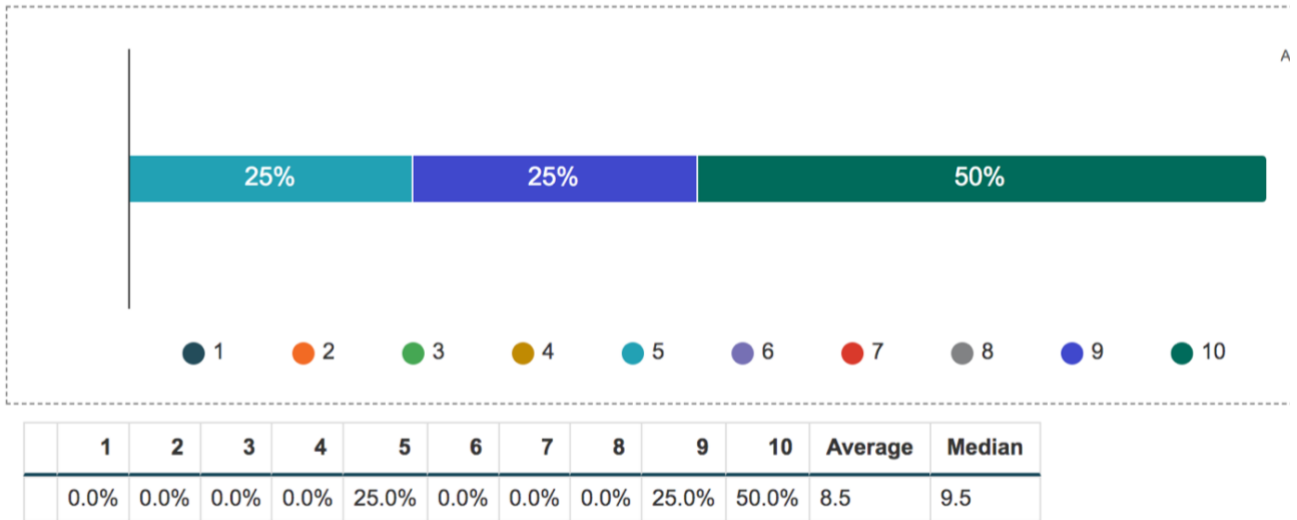


Figure 11. Question number 5, Cardboard Packaging Industry (Author 2024)

Two of the participants rated a 10 which is traduced as necessary. While other participant considered a 9 very suitable but not in its totality, and the last one rated a 5 which is consider as neutral (not necessary but helpful).

And the last question of this survey is **“What would you consider the environmental benefits of reverse logistics in the cardboard industry?”** which helps to analyze the environmental benefits and why are these initiatives feasible.

What would you consider the environmental benefits of reverse logistics in the cardboard industry?

Number of respondents: 4

Responses
Is the most important to be competitive industry
Betterment of cost in raw material in the long term. Reducing carbon emission and pollution.
Lower Greenhouse Gas Emissions, manufacturing cardboard from virgin materials requires a significant amount of energy, leading to greenhouse gas emissions. Reverse logistics promotes the use of recycled cardboard fibers, which require less energy to process compared to virgin pulp.
Reduced Landfill Waste And energy savings

Figure 12. Question number 6, Cardboard Packaging Industry (Author 2024)

The participants believe these sustainable alternatives help companies to create a direct competence. They create a reputation for the company by regarding their sustainability reports and its data.

4.2 Purchasing Managers Results

Now the author provides the responses of the procurement area in the packaging operation. It was provided in a short format besides it is well explained and cover the aspects that the author needed in order to contrast the needs of the customer (the food company) with the proposal of the manufacturer and analyse if they converge in the same ideas for the development of a perfect alternative.

Do you consider sustainable practices are profitable for food industry? Why?

Yes, sustainability is on the company's agenda in all raw materials, packaging and energy, it is a commitment we have with consumers and with the world

Do you consider recycling or reusing waste of package as raw material is viable for your company? Why?

Yes, all our packaging is recyclable and we have this commitment in sustainability targets for all our materials, not just cardboard.

Does your company currently have reverse logistics program in place for cardboard packaging?

Our suppliers who use paper to recycle have it, they have programs to take and recycle paper, the same as our clients like Walmart and those who also collect the cardboard and use it to recycle and complete the cycle.

What do you consider could be the biggest challenge for implementing an optimal reverse logistics strategy?

The challenge to make it in a direct manner would be the collection points of the waste material.

Which is the most important aspect to consider while purchasing raw material for your products?

Quality, specs, responsible sourcing and cost.

5 Conclusions

This thesis has explored the application of reverse logistics principles to cardboard packaging operations within the food industry. Throughout the preceding chapters, the author has examined the current state of cardboard packaging waste, the environmental and economic benefits of reverse logistics and the various models for implementing such system. There is also appreciated the challenges and opportunities associated with applying this techniques for companies in the food sector as well as their sustainability goals, the strategies and policies they are following.

The purpose of this final chapter is to synthesize the findings of this research the author will revisit the initial investigative questions and objectives outlined in the introduction with the intention to connect the outcomes of this investigation. The author has made some conclusions about this paper research and expects to contribute to readers with a simple explanation of this outcomes. Consequently, presenting the main conclusions highlighting the environmental, economic and social advantages benefits due to implementing the reverse logistics efficiently in the cardboard packaging.

Advantages for the Environment

The thesis can state that a more circular cardboard economy can be achieved and landfill trash can be greatly decreased by putting in place a reverse logistics system for cardboard packing. Another important conclusion that emphasizes the advantages of recovering and reusing cardboard packaging for the environment could be higher recycling rates for this type of material.

Financial Gains

The thesis might show how, by lowering disposal costs and even making money from the sale of recycled cardboard, a well-thought-out reverse logistics system can save food firms money. Other financial gain can be increased operational efficiency across the supply chain, as more efficient procedures for shipping and collection drive down expenses.

Social Advantages

A thesis can state that implementing sustainable procedures, such as reverse logistics for cardboard packing, improves and fortifies a food company's reputation and strengthens in

customer loyalty. Another social advantage could be raising consumer knowledge of how packaging waste affects the environment, which could encourage more responsible consumption.

Knowledge Contribution

A particular framework or methodology for applying reverse logistics in cardboard packaging processes within the food sector may be proposed in the thesis. It would be possible to identify and document the best methods for gathering, classifying, and moving used cardboard packing, which would be extremely helpful in advising other businesses.

A certain outcome from this project is that recycling is the main strategy for cardboard manufacturing companies whose work synergic with the multinational food companies to achieve their sustainable goals. Besides, this international companies develop diverse strategies to encourage the final consumers to recycle, by separating the cardboard material specially in order to make the process more efficient. Regarding profitability, the author regards through the results obtained in the investigation that for multinational companies is a suitable option the reverse logistics process due to the cost reduction in transportation and the price decreases when is about a recycled material, this one maintain its functionality by a quality control in charge of the recycling agents.

The author can conclude that the implementation of reverse logistics techniques for the food industry is a suitable alternative for reducing cost, reducing waste and becoming more sustainable through the years by reducing their carbon footprint. It is considering as the best alternative for companies to create a real change into the food industry which is the biggest in the world.

Appreciations

To be honest, it has been such a magical journey. Starting with the first years of my life that built the foundations of my life. I have known each version of my being that has been formed in various scenarios. I have laughed countless times, I have cried many times, I have doubted my ability and I have also felt ecstasy at the wonderful things that life has shown me. But I have always known who I am, and if I forget, life reminds me and reiterates what I am made of. He arms me and disarms me according to his consideration, seeking perfection within me. Every day when I wake up I dream of being at the top, although the journey is long I know I will arrive.

We often focus on what we cannot achieve and neglect what we already have. At this point in my life, after 21 years of career, of breaks and achievements. Now, I can relate that I am living my own life.

I begin by dedicating this project to my family, who has taught me the purest love I know, what I consider to be the driving force of my life. For your support, patience, trust and time, I thank you.

I would especially like to thank my parents, who taught me by example what effort and hard work achieve. They inspired me to be a good man, but they also gave me the best years of my life living in their home.

I am equally grateful and dedicate this project to my brothers and true friends, who make life easier by being the reason for my deepest joys, but, above all, they are a fundamental part of my triumphs and failures by providing comfort and genuine love.

Also, I dedicate this project to all the efforts I made to get to where I am, to all those sleepless nights, those times when things were not what I expected, despite the tribulations and the pain that tried to overcome me, today I have reached this place.

Finally, I want to thank those people that I have met throughout my life, for all the teachings that I acquired from each one. Above all, those that are no longer here are part of me now.

But above all, I dedicate this thesis to the person I have become. I dedicate this project to my purest self, who is my loyal partner and has reborn brighter than ever, teaching me what it is to live. Who has made all of this an adventure and whose essence has made his dreams possible.

I hope the rest of the journey continues to teach me the wonders of living

Long live for what is worth...

Sources

Elsevier B.V. May, 2020. Sustainability of reusable packaging. Current situation and trends, Science Direct. URL: <https://www.sciencedirect.com/science/article/pii/S2590289X20300086#sec0010> Accessed: September 20, 2023 Accessed: 28 January 2024.

TORRENT,D. 2018. What is sustainability?. Stanford University. URL: <https://earth.stanford.edu/news/what-sustainability-definition-environmental-scientist-pamela-matson> Accessed: 02 February 2024.

2023.Meaning of Packaging. Cambridge Dictionary. URL: <https://dictionary.cambridge.org/us/dictionary/english/packaging>. Accessed: 02 February 2024.

What is reverse logistics?. Association for the Supply Chain. URL: <https://www.ascm.org/lp/reverse-logistics/> Accessed: 11 February 2024.

Abby Jenkins. 2021. A Guide to Reverse Logistics: How It Works, Types and Strategies. URL: <https://www.netsuite.com/portal/resource/articles/inventory-management/reverse-logistics.shtml>

2024. Bolt Boxes. How to reduce waste in product packaging. URL: <https://boltboxes.com/blog/reducing-waste-in-product-packaging/> Accessed: 03 March 2024.

2020. Packaging Strategy.Nestlé.URL. <https://www.nestle.com/sustainability/waste-reduction/packaging-strategy> Accessed: 02 March 2024.

Nestec Ltd., Corporate Identity & Design, Vevey. 2013. The Nesté Policy on Environmental Sustainability. Switzerland. URL: https://www.nestle.com/sites/default/files/asset-library/documents/library/documents/environmental_sustainability/nestl%C3%A9%20policy%20on%20environmental%20sustainability.pdf. Accessed: 02 March 2024.

2023. Kellanova's industry-leading sustainable packaging solutions. Kellanova. URL: <https://newsroom.kellanova.com/2023-12-15-Q-A-Kellanovas-industry-leading-sustainable-packaging-solutions> Accessed: 15 February 2024.

2023. WestRock. URL: <https://es.westrock.com/markets/foodservice-packaging-solutions> Accessed: 15 February 2024.

2022. Recycling Cardboard. Recyclinginside. URL: <https://recyclinginside.com/recycle-cardboard/> Accessed: 15 February 2024.

Mahdi Esmieol, Moad Shaklawon, Omar Shaneb. 2018. Feasibility of Cardboard Waste Recycling. Colledge of Industrial Technology. Libya. URL:http://dspace.elmergib.edu.ly/bitstream/handle/123456789/91/CEST_5_072.pdf?sequence=1&isAllowed=y Accessed: 02 March 2024.

Statista Research Department. Nov 24, 2023. Global cartonboard consumption 2021-2032 <https://www-statista-com.ezproxy.haaga-helia.fi/statistics/1090460/global-cartonboard-demand/> Accessed: 20 March 2024 from Statista.

Suzano. (November 14, 2023). Cartonboard consumption worldwide from 2021 to 2032 (in million tons) [Graph]. In Statista. Retrieved April 26, 2024, from <https://www-statista-com.ezproxy.haaga-helia.fi/statistics/1090460/global-cartonboard-demand/> 30 March 2024.

[Lummus, R.R.](#), [Krumwiede, D.W.](#) and [Vokurka, R.J.](#) (2001), "The relationship of logistics to supply chain management: developing a common industry definition", *[Industrial Management & Data Systems](#)*, Vol. 101 No. 8, pp. 426-432. Accessed: 30 March 2024.

Kenton, W. January 28, 2024. Logistics: What it means and how business use it. Investopedia. URL: <https://www.investopedia.com/terms/l/logistics.asp>. Accessed: 30 March 2024.

Appendices

Appendix 1. List of figures and tables

- Figure 1. Theoretical Framework
 - Figure 2. Reverse logistics flow chart
 - Figure 3. Cartonboard consumption worldwide from 2021 to 2023
 - Figure 4. Packaging reduction by Nestlé
 - Figure 5. Stakeholders Mapping
 - Figure 6. Research Methods Design Chart
 - Figure 7. Question number 1, Cardboard Packaging Industry
 - Figure 8. Question number 2, Cardboard Packaging Industry
 - Figure 9. Question number 3, Cardboard Packaging Industry
 - Figure 10. Question number 4, Cardboard Packaging Industry
 - Figure 11. Question number 5, Cardboard Packaging Industry
 - Figure 12. Question number 6, Cardboard Packaging Industry
-
- Table 1. Overlay Matrix
 - Table 2. Risk Matrix
 - Table 3. Research Structure

Appendix 2. Research Tools

Questions to international food company's purchasing managers

- 1.- Do you consider sustainable practices are profitable for food industry? Why?
- 2.- Do you consider recycling or reusing waste of package as raw material is viable for your company? Why?
- 3.- Does your company currently have reverse logistics program in place for cardboard packaging? If so, mention it.
- 4.- What do you consider could be the biggest challenge for implementing an optimal reverse logistics strategy?
- 5.- Which is the most important aspect to consider while purchasing raw material for your products?



1. Does your company implements a reverse logistics process?

- Yes, we think is essential
- No, it is not relevant for the company
- No, but we are in the process

2. Which aspect is more important in the process of manufacturing your product?

- Quality
- Cost

3. Which is a sustainable practice that your company has implemented?

4. Which are the main challenges for implementing reverse logistics on cardboard industry?

5. How suitable do you consider is sourcing raw material from recycled waste?

1 2 3 4 5 6 7 8 9 10

6. What would you consider the environmental benefits of reverse logistics in the cardboard industry?

Submit