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Abstract

The focus on reverse logistics and supply chain has transformed the strategic approach of companies towards profitability. Establishing strong relationships and shared goals with manufacturers, third-party logistics partners, and suppliers has become increasingly vital. While the emphasis has long been on forward logistics, the growing attention to the environment, sustainability, and corporate social responsibility has revealed the need for a Closed-Loop Supply Chain, where product responsibility extends beyond the point of sale. This necessity is particularly significant in the automotive industry, given the diverse array of components requiring proper handling at the end of their life cycles (e.g., remanufacturing, refurbishing, or recycling). Consequently, this thesis examines the current state of reverse logistics in the automotive industry, with a specific focus on Bertel O. Steen as the focal company. Three research questions are proposed: 1) Why is the implementation of reverse logistics important in the automotive industry? 2) To what extent is reverse logistics incorporated into the automotive industry? 3) What are the challenges associated with reverse logistics in the automotive industry? To address these questions, semi-structured interviews, internal documentation, and direct observations were utilised. The thesis adopts a qualitative approach based on a case study. The findings highlight how reverse logistics can generate value not only for the focal company but also for the entire dealer network. The use of core value incentives fosters product reuse and recycling. However, despite the focal company's proactive integration of reverse logistics practices in Norway, the concept has yet to mature fully. The continual need to adapt to new regulations and laws presents significant operational challenges, particularly in accommodating high-voltage batteries due to the increasing sales of electric vehicles.

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1.0 Introduction

The past few decades have witnessed a significant increase in the globalisation of the world economy. This trend has had a profound impact on various industries, including the automotive sector. Globalisation in this context extends beyond the mere exchange of goods and services but also encompasses the creation of business opportunities for both domestic and international markets. One way companies have leveraged these opportunities is by outsourcing their production to take advantage of lower costs in developing countries. However, alongside the rise of industrialisation and globalisation, there has been a corresponding rise in the environmental burden, as highlighted by Rao (2002). This burden can be attributed in part to the fact that numerous countries have become hotspots for End-of-Life products (Zhu et al., 2005). This thesis intends to contribute to the existing body of knowledge on reverse logistics in the automotive industry by providing a comprehensive understanding of the importance, challenges, and opportunities. By addressing these critical aspects, this research seeks to support the industry's transition towards a circular economy, where the automotive sector can thrive while minimising its environmental footprint and creating a more sustainable future.

Zhu et al. (2007) note that environmental impact occurs during all phases of a product's life cycle, including extraction of basic materials, manufacturing, use, reuse, and disposal. Hervani et al. (2005) introduced the concept of green supply chain management (GSCM), which includes green procurement, green production, green distribution, and reverse logistics. The emergence of GSCM is a result of its significance in addressing the environmental impacts associated with the production and disposal of products. In addition to contributing to environmental sustainability, GSCM implementation provides financial benefits and a competitive edge (Lin et al., 2011).

The automotive industry plays a pivotal role in today's global economy, providing mobility and transportation solutions to millions of people worldwide. However, as environmental sustainability and resource depletion become more of a concern, the industry confronts significant challenges in managing its complex supply chains and addressing the growing problem of end-of-life products and waste management. In this context, reverse logistics has emerged as an important field in the automotive industry, with the goal of optimising the passage of products, materials, and information from the end-user back to the manufacturer or supplier. Reverse logistics comprises a vast array of operations, such as product returns, recycling, remanufacturing, refurbishment, and waste management. It involves the integration of various stakeholders, such as manufacturers, suppliers, dealerships, scrap companies, and regulatory authorities, in order to effectively manage the entire life cycle of automotive products and ensure sustainable practices. As the industry endeavours to transition to a circular economy in which resources are conserved, and waste and environmental impacts are minimised, understanding and optimising reverse logistics processes becomes increasingly important.

There has been growing attention and public awareness toward reverse logistics (RL) and Closed-Loop Supply Chains (CLSC). Sustainability is a widely used term that is gaining increasing attention due to the high levels of environmental pollution worldwide. To address this issue, there is a need to prioritise and plan for sustainable supply chains through political, social, and technological measures. Green and sustainable products are in high demand from consumers and are often required by government regulations. In light of growing environmental concerns, many countries have implemented laws to reduce the environmental impact of industries, such as legislation for governments forcing suppliers and producers to take responsibility for their End-of-Life products (Govindan et al., 2015).

One of the most significant challenges facing the global manufacturing industry is how to meet the increasing demand for "Extended Producer Responsibility" (EPR) and its implementation in End-of-Life product return regulations (Seitz & Peattie, 2004). EPR is a concept in environmental policy that expands a producer's responsibility for a product beyond the consumer stage of the product's life cycle, as defined by the Organisation for Economic Cooperation and Development (OECD) (Seitz & Peattie, 2004). The increasing interest in EPR reflects increasing public concern about the environmental impacts associated with disposing of products, including resource depletion, waste generation, and harm to the environment. It has been demonstrated by many large corporations that it is possible to prioritise both environmentalism and profitability and in fact, the pursuit of sustainability can often lead to increased profitability (Tavana et al., 2016). Due to growing pressure to protect the environment and stay competitive, companies have been searching for ways to reduce production costs and thrive in competitive markets. Adopting reverse logistics involves reclaiming and refurbishing defective products in order to both protect the environment and decrease operational costs. Many companies have implemented reverse logistics in recent years as a means of efficiently and effectively managing their resources (Kaviani et al., 2020).

The research will investigate the key elements of reverse logistics, such as product returns management, waste management, recycling, and remanufacturing processes, as well as their effect on environmental sustainability, and economic viability. In addition, the study will investigate the role of regulatory frameworks, industry collaborations, and technological advances in promoting the adoption of sustainable reverse logistics practices. Ultimately, through empirical analyses and case studies, this thesis will evaluate the implementation of reverse logistics practices by notable automotive companies, such as Bertel O. Steen, and assess their efficacy in waste reduction, resource optimisation, and overall operational efficiency. These findings will hopefully provide industry stakeholders with valuable insights and best practices to enhance their reverse logistics operations and contribute to a more sustainable automotive industry.

To conduct our research study, the Watson framework will be used. The first part of the paper, *"What"* and *"Why"*, introduces the topic and explains the motivation for the work. Section 2.0, *"How"*, is a review of relevant literature, which provides a conceptual understanding of the subject. Section 3.0 describes the methodology and design of the study, outlining the practical steps taken to address the research questions. Furthermore, we will share our empirical findings and discuss them alongside the literature in sections 4.0 and 5.0 respectively, before the analysis will be concluded in section 6.

1.1 Research Questions

This paper aims to thoroughly explore reverse logistics in the automotive industry. The goal is also to investigate the role of collaborative partners in reverse logistics within a Norwegian automotive company, in order to address and resolve the research questions mentioned below. In order to achieve this purpose, the following research questions will be addressed:

RQ1: Why is the implementation of reverse logistics important in the automotive industry?

RQ2: To what extent has the automotive industry incorporated good reverse logistics practices?

RQ3: What are the current challenges of reverse logistics in the automotive industry?

To gain an in-depth understanding of the practices, challenges, and strategies for overcoming challenges related to reverse logistics in the automotive industry, we have selected a descriptive case study with an abductive approach as the research design for this study.

2.0 Literature Review

High-performing companies have highlighted effective logistics and supply chain management as a major source of competitive advantage (Wu & Dunn, 1995). Reverse logistics, which are the backwards flows of supply chain systems, have been applied successfully in several industrial organisations, yet a review of the literature reveals that the benefits of using RL in emerging economies are not thoroughly understood (Beh et al., 2016; Abdulrahman et al., 2014). This segment will therefore consist of an overview of the literature on supply chain, reverse logistics, drivers and constraints of reverse logistics, and lastly, a conceptual framework will be created to clarify further investigations.

2.1 Supply Chain

The term "supply chain" refers to the whole network of businesses, individuals, teams, activities, information, and assets used in the creation, distribution, and transportation of products or services to final consumers and eventually back. It includes every step and procedure needed to take a product or service from the time it initially originates to the time it is consumed. The objectives of successful supply chain management are to reduce costs, improve quality, make the most of available resources, adequately satisfy consumer demand, and shorten lead times (Stadtler, 2015). Maintaining efficient operations and quick delivery of goods or services entails coordination, planning, and cooperation among all parties involved (Braziotis et al., 2013).

Additionally, efficient network-wide information exchange and analysis are necessary for effective supply chain management. To collect real-time data, make intelligent choices, and track performance, this includes using cutting-edge technology and information systems (Stadtler, 2015). Supply chain managers may get useful knowledge and improve operations at different points in the supply chain by using technology like artificial intelligence, automation, and data analytics (Modgil et al., 2021).

Supply chain management also values flexibility and reactivity to satisfy customer demands and stay competitive in a modern evolving marketplace. This calls for the capacity to adjust to changes in consumer behaviour, industry trends, or unanticipated interruptions. Supply chain management allows businesses to reorganise logistics, modify strategies, and handle any problems that may develop by encouraging agility and resilience (Stadtler, 2015).

In summary, supply chain management is a challenging task which calls for a careful balancing of several variables. It entails the coordination of several parties, the organisation of numerous processes, and the use of cutting-edge technology. The primary objective is to guarantee efficient operation and customer satisfaction across the whole supply chain.

2.1.1 Open- and Closed-Loop System

To truly grasp the significance of reverse logistics within modern supply chain structures, it's crucial to understand the concepts of open-loop and closed-loop systems. Open-loop systems, often associated with traditional supply chains, follow a unidirectional flow. This means that the flow starts at one point and exits at another, primarily focusing on forward logistics. These supply chains do not incorporate reverse logistics or feedback mechanisms to the original producers since their operations are primarily geared towards moving products forward. Even though the original producers do not incorporate product returns at the end of product life, there are other parties which do fill this role (Özceylan, 2016).

In contrast, closed-loop systems enable the implementation of reverse logistics and feedback mechanisms. The closed-loop nature is derived from the circular flow, which allows the system to continuously operate in a loop, hence the name "closed-loop." In such systems, there is no definitive end-point as products don't exit the loop. Instead, all remaining value is captured and utilised every time, even after consumption. A closed-loop supply chain is a prerequisite for establishing a robust reverse logistics program (Özceylan, 2016).

2.2 Reverse Logistics

Reverse logistics is defined as “the method of planning, implementing and controlling the cost and efficiency of material flow, in-process inventory, finished goods and related information from the point of consumption to the point of origin, in order to recover value” (Daugherty et al., 2001). In other terms, it is the supply chain's backwards flow. Additionally, an RLs process is composed of four key components: a collection process, a combined inspection/selection/sorting process, a reprocessing or direct recovery process, and a redistribution process (De Brito & Dekker, 2002).

Implementing a reverse logistics program is driven by several factors, including supply chain optimisation, environmental benefits, increased customer satisfaction, and compliance (Sarkis et al., 2010). Despite these benefits, implementing a reverse logistics program can be challenging. It requires coordination among various departments and stakeholders within a company, as well as with external partners. It also often requires specialised software and logistics expertise to manage the flow of materials and goods effectively. If not managed correctly, the additional inventory and transportation costs can outweigh the benefits of reduced transaction costs (Shu et al., 2017).

Overall, reverse logistics is a complex process that involves a lot of coordination and operational planning to be effective, but it can provide significant benefits in terms of supply chain optimisation, environmental impact, customer satisfaction, and compliance (Rogers & Tibben-Lembke, 2001).

2.2.1 Reverse Logistics in the Automotive Industry

The automotive industry is widely acknowledged as one of the sectors with the most significant environmental footprints. Figure 1 provides a visual representation of the varying consumption and emissions in the Chinese industry in 2009, specifically focusing on the environmental impact caused by the automotive industry itself, the overall Chinese industry, and the corresponding percentage for comparison.

The environmental impacts of the Chinese auto industry in 2009 (on a one-year basis).

Evaluation index impact sources	Amount of energy consumption (mtce)	Amount of water usage (bt)	Amount of COD emission (kt)	Amount of NH_3–N emission (kt)	Amount of SO_2 emission (kt)	Amount of NO_x emission (kt)
Total environmental impacts of auto industry	593.3	3.4	1288.0	35.7	1015.2	3788.2
Total environmental impacts in China	3066.5[a]	596.5[b]	12775.0[c]	1226.0[c]	22144.0[c]	16927.0[c]
Percentage of environmental impacts of auto industry (%)	19.3	0.6	10.1	2.9	4.6	22.4

Figure 1: Main material consumptions of the Chinese auto industry in 2009. (Liu et al., 2015).

To clarify the process of reverse logistics in the automotive industry, this segment will consist of common product recovery methods, types and reasons for product returns, waste management, and lastly, the process of electrical vehicles and components.

2.2.1.1 Product Recovery

There are options for product recovery that have been well-researched in literature, which can aid in simplifying reverse logistics in the automotive industry. The Original Equipment Manufacturer (OEM) is accountable for managing product recovery and paying for all related expenses (Fleischmann et al., 2000). This includes collection, reprocessing, and redistribution as part of the recovery process. The main variation among these activities is the reprocessing stage (Thierry et al., 1995). According to Thierry et al. (1995), product recovery can be classified into five distinct categories: repair, refurbishment, remanufacturing, cannibalization, and recycling. Nevertheless, Chan et al. (2012), state that there are 19 distinct components in the reverse logistics of the automotive industry. Through their study, they found out that the most frequently used recovery methods in the automotive industry are refurbishing, remanufacturing, and recycling. Figure 2 illustrates the common recovery methods for the 19 product returns.

Components	Remanufacture	Refurbishing	Recycle
Engine; Battery; Transmission	X	X	
Hood; Wire harness; Engine oil; Gear oil; Coolant; Door; Trunk; Vehicle body; Seat; Window			X
Radiator; Bumper; Suspension; Wheel; Tire		X	X
Catalytic converter	X		X

Figure 2: Recovery methods for the 19 product returns (Chan et al., 2012).

Refurbishing is a typical practice in the automotive industry when trying to salvage usable components from objects like fuel tanks, tires, engines, radiators, transmissions, etc. The portion of the item that cannot be refurbished is typically shredded. However, the shredding segment is more related to the recycling process (Yildizbasi et al., 2018).

Nevertheless, the following procedures are frequently taken to streamline the refurbishment process: The used product is examined to spot any damaged parts, disassembled to allow for repair or replacement, removed to make it possible to repair, added back to the product, cleaned to make it appear brand new, and finally tested to ensure it meets quality standards. In other words, the refurbishing process tends to be used when a damaged component can be quickly fixed or replaced while still maintaining high quality.

Remanufacturing is a procedure that makes a product as high-quality as feasible without creating a new one. In fact, it is anticipated that a remanufactured product will have quality on the level of a brand-new one (Thierry et al., 1995). The cost of the product is also half that of a new product, even though the quality of the product is identical when remanufacturing is carried out (Tian et al., 2017).

According to Tian et al. (2017), 1.874 million ELVs were discarded in 2015, yet only 20% of the recovering volume was retrieved. Since people often return ELVs to recycling dealers rather than OEMs, a lack of awareness might be considered the primary cause of the low recovered volume. Additionally, this makes the process of collecting vehicles complex and costly for OEMs, since scrapped automotive components are the main resource for remanufacturing.

Recycling is carried out at the material level, indicating that it aims to reuse materials rather than components (Thierry et al., 1995). According to Lim et al. (2022), highly effective sorting techniques are becoming more and more crucial for businesses and sectors that recycle. As more people become aware of how important sustainability is for future generations, the idea of recycling is gaining popularity all around the world. This is because recycling successfully conserves reusable energy and materials by recovering products in addition to reducing waste (Consonni & Vigan, 2011).

To illustrate a recycling process in the automotive industry, Figure 3 shows a step-by-step breakdown of the process of recovering plastic, from end-of-life bioplastic components. Vieyra et al. (2022) claim that the process of disassembling plastic is challenging and that deciding which parts are salvageable or dangerous is crucial for recycling. Based on a methodical approach, the organisation can separate recoverable plastic and assist in the choice of whether to recycle or dispose of components.

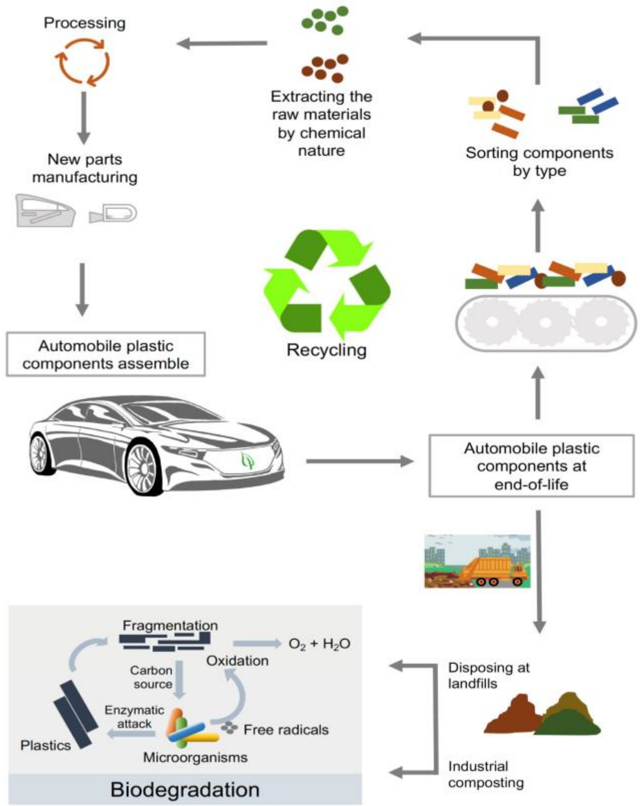

Figure 3: The process of plastic recovery (Vieyra et al., 2022).

Nevertheless, to fully comprehend the entire process of reverse logistics in the automotive industry, it is crucial to examine product return procedures and waste management, in further detail, since they are the starting and ending process.

2.2.1.2 Types and Reasons for Product Return

Product return refers to the process of returning raw materials and components that have been purchased but not accepted due to quality issues (Figenbaum & Thomas, 1986). According to Krikke et al. (2004), there are four distinct categories of returns: End-of-life, end-of-use, commercial, and reusable components. However, to make it more manageable, Fleischmann (2001) divided the product types into five different categories: End-of-use returns, commercial returns, warranty returns, production scrap and by-products returns, and packaging returns.

End-of-use returns: Categorised as the most notable type concerning reverse logistics. It contains not only end-of-life products, which are products that have reached their economical or technical end but also products which are referred to as leased products. The flow of return in this setting is the longest, which indicates more time-consuming and costs. However, Fleischmann (2001) states that there are several benefits of conducting end-of-use returns concerning environmental drivers, financial drivers, and lastly preventing competitors from taking advantage.

Commercial returns: Can occur in any setting between two parties which are in direct connection. Nevertheless, the most common scenarios are consumer-to-retailer or retailer-to-manufacturer. The objective of commercial returns is to change the financial risk between the buyer and seller. This will adjust depending on the relationship between the parties, and hence strongly motivated in today's society, because of market concentration. Commercial returns are often resold or reused since the products have not been used. In other words, there are environmental drivers to conduct commercial returns. Lastly, it is important to inform that these returns often indicate a disadvantage for the seller, in regards to the financial aspect (Fleischmann, 2001).

Warranty returns: This type of return contains malfunctioning or outdated goods which are then sent back to the previous owner. Additionally, these products can be seen as both damaged products during use and delivery. Warranty returns are often driven by laws, customer service, and reputation. Even though there are costs in conducting these returns, the products are usually repairable and then resellable in a later stage (Fleischmann, 2001).

Production scrap and by-products returns: Scenarios where leftover materials are no longer viable in the further process of the supply chain. These returns can refer to cutting products which are no longer applicable to fit the specific objective. Production scrap and by-products returns are often delivered to other supply chains since they usually are not recoverable to fit the objective. However, in some scenarios, it is possible to return the product to the sender if the good is modifiable. In other words, these returns can be both environmentally and financially driven (Fleischmann, 2001).

Packaging returns: Finally, the last return type is packaging returns. These types of returns refer to returns of pallets, crates, and boxes. In most scenarios, especially if the boxes are reusable, these returns are both financially and environmentally driven. The process of packaging is easier and safer for the goods if packed in reusable boxes and crates. Not only does this make the process simpler, but also efficient, since the transportation of delivery exchanges new goods of delivery with old reusable boxes from previous deliveries. This function reduces the effect of not filling trucks up when going back from deliveries, hence adding value to the financial and environmental factors. It is important to note that in some cases, packaging returns are under environmental legislation, where upstream parties are obliged to recover their packaging (Fleischmann, 2001).

Figure 4 illustrates the supply chain in forward and backward directions for the various product returns as defined by Fleischmann (2001), thereby streamlining the interconnections between different product types' occurrences and their flow in the supply chain.

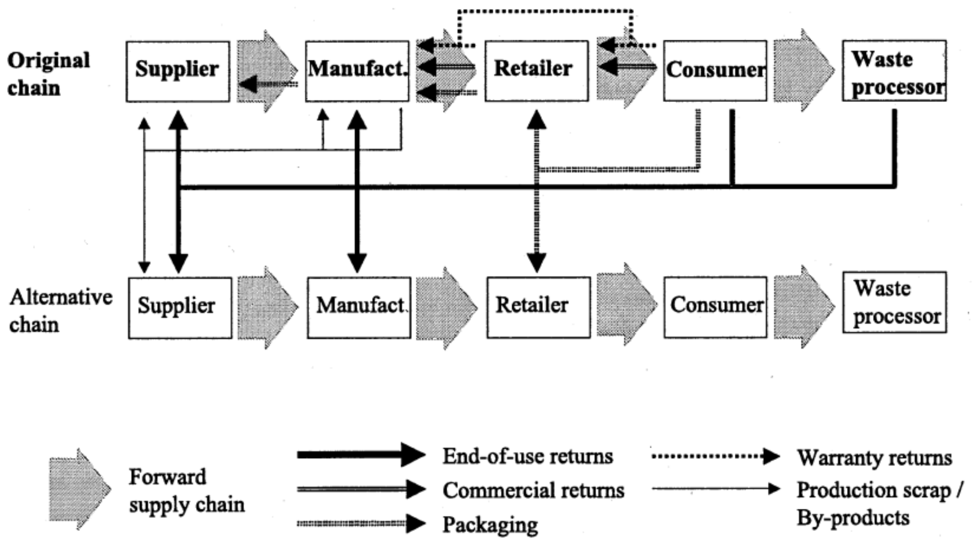

Figure 4: The supply chain for product returns (Fleischmann, 2001).

Additionally, De Brito and Dekker (2004) state that the reasons behind product return could be represented through three different categories: Manufacturing, distribution, and customer returns (De Brito & Dekker, 2004).

Manufacturing returns: When products fail to meet the required quality standards, they are identified as defective during the production stage by quality control if they fall below the expected threshold (De Brito & Dekker, 2004). Fleischmann (2001) refers to these types of products as "production scrap and by-products".

Distribution Returns: Returns that happen during the distribution stage are known as distribution returns. These may include product recalls, returns of products from businesses, overstock, or issues with packaging (De Brito & Dekker, 2004). According to Rogers et al. (2002), product recalls are often caused by safety or quality concerns and may be initiated by government agencies. Industries such as the automotive sector are particularly susceptible to product recalls. Within distribution returns, returns from businesses (B2B) may include products that were shipped incorrectly, products that were damaged during delivery, or products that were not sold (De Brito & Dekker, 2004).

Customer Returns: Returns that occur after a product has reached the customer fall under this category. This includes returns due to reimbursement guarantees, warranties, end-of-life (EOL) products, end-of-use (EOU) products, and some commercial returns. Reimbursement guarantees refer to returns made due to customer regret within a certain period (De Brito & Dekker, 2004). Warranties cover returns of products that have failed (Fleischmann, 2001). EOL returns are made to prevent environmental contamination, as stipulated by laws, and EOU returns are made when the lease period ends (Krikke et al., 2004). Returns made directly with the seller in a B2C process by the customer to undo a previous sale are considered commercial returns (Fleischmann, 2001). Lastly, this group also includes returns related to service customers, such as repairs (De Brito & Dekker, 2004).

2.2.1.3 Waste Management

Waste management is an important factor in sustainability efforts. The main goal of waste management is to reduce the environmental footprint. It is important to state that different regions have their waste treatments, due to laws and regulations (Yu & Chau, 2009). Regarding the automotive industry, there is one usual method of waste disposal, namely converting heat energy into electric energy (Yu & Chau, 2009).

To control pollution and waste that poses a threat to human health, the reduction, treatment, and safe disposal of waste resources are essential (Karam & Nicell, 1997). This includes recycling and reusing resources, such as waste recycling, energy recovery, and resource collection. When recycling industrial waste, it is important to consider the specific characteristics of the industry, production, technical feasibility, competitiveness of products, and economic benefits (Yu & Chau, 2009). Safe disposal of waste is achieved by properly treating or disposing of waste or hazardous materials without causing harm to the environment or converting waste into harmless substances (Yu & Chau, 2009). According to Karam

& Nicell (1997), common methods to accomplish this include landfills, incineration, and composting.

Even though some theory identifies good incorporation of waste treatment and reverse logistics, Erol et al. (2010) state that this might not be the case for all countries. In the case of Turkey and India, low incentives from their country's policies make it difficult to incorporate reverse logistic practices and waste treatment. In addition, the stage of incorporating reverse logistics and waste treatment is at the beginning phase, making capitalisation of experience difficult (Mathivathanan et al., 2018; Erol et al., 2010).

2.2.1.4 Electrical Vehicles/Components

The rise in electric vehicles (EVs) and their difficulties with recycling and disposing of the waste is another crucial topic to be informed about. An electrical vehicle consists of fewer components than a patrol-driven vehicle, thus striking reverse logistics processes as less complex and time-consuming (Suzuki, n.d.). However, large-scale lithium-ion batteries (LIBs), which must be handled properly and in accordance with laws and regulations, are a common component of electric vehicles (Or et al., 2020). For instance, LIBs are classified as dangerous goods in Norway, which makes it necessary to package the batteries safely and with the appropriate labelling. A qualified driver who is familiar with handling and transporting batteries is also lawfully required, otherwise, a fire might occur if the situation is not managed correctly (Batteriretur, n.d.). Due to these distinctive features, the reverse logistics of EVs may be more complicated than those of conventional automobiles.

The most essential component of an EV, the battery, contains hazardous materials such as lithium and aluminium. These are two important elements that are still present in the slag, making it challenging to collect and recycle them. However, there is a significant financial incentive to recycle batteries due to their worth as a possible source of energy storage (Or et al., 2020). Nevertheless, to simplify the process and complexity of the laws and regulations, manufacturers often form partnerships with specialised recycling organisations and waste management suppliers to manage the reverse logistics of EVs. These businesses offer recycling, sorting, transportation, and collection services for discarded batteries and associated parts (Winslow et al., 2018).

Additionally, manufacturers might provide incentives or buy-back plans to encourage customers to recycle or otherwise dispose of their old EVs, batteries, or both. This can assist in minimising the environmental impact of EVs and supporting a circular economy by ensuring that the batteries are recycled or disposed of properly (Winslow et al., 2018). However, it is significant to highlight that in some nations this is not possible due to laws and regulations restricting the shipping of lithium batteries across borders (Posten, n.d.).

2.3 Drivers & Constraints of Reverse Logistics

The implementation of reverse logistics in the automotive industry is influenced by various external and internal factors, as well as certain constraints. Gaining a deeper understanding of these factors is essential in recognising the significance of reverse logistics in the automotive industry.

Carter and Ellram (1998) illustrate the connection between external and internal drivers and constraints in Figure 5. To simplify the model, the dashed ovals illustrate constraints, while the solid ovals show the drivers. The left side of the map is the external drivers and constraints, in comparison, the right side is the internal drivers and constraints.

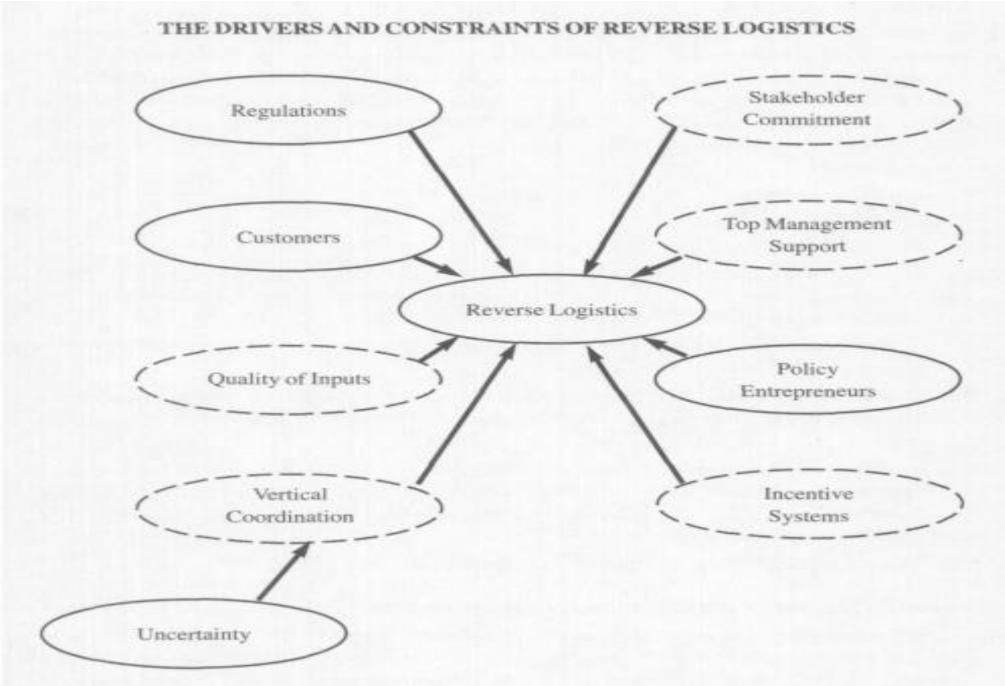

Figure 5: The drivers and constraints of reverse logistics (Carter & Ellram, 1998).

It is important to understand that external and internal drivers are both essential activities to establish reverse logistics. For instance, only policy entrepreneurs may not be enough in itself to persuade the company in changing to a stronger reverse logistics program. However, adding external pressure and drivers in addition to the policy entrepreneurs is crucial in convincing the organisation. Simultaneously, if not drivers and constraints align, the result would only consist of small changes, rather than programs that solve the environmental issues (Carter & Ellram, 1998).

To simplify and elaborate on all the different drivers and constraints of reverse logistics, the first segments will consist of the mentioned drivers and additional drivers from different theoretical papers, since there are multiple drivers not mentioned by Carter and Ellram (1998). These drivers imply the likes of green logistics, sustainability, circular economy, corporate social responsibility, compliance, customer satisfaction, supply chain optimisation, and competitive advantage. The last segment will supplement the different constraints from Figure 5.

2.3.1 Green Logistics

Reverse logistics environmental considerations are highly significant in today's society. Traditional logistics primarily focuses on the movement, storage, packaging, and inventory management of goods from the manufacturer to the consumer. However, it is critical to focus on protecting the environment through efficient recycling and waste management practices (Baah et al., 2021). In this setting, the idea of "green logistics" becomes apparent as a proactive strategy intended to reduce the environmental impact connected with logistical activities.

Transportation, warehousing, and inventory management are just a few of the logistics-related topics covered by a complete set of green logistics strategies and practices. Green logistics seeks to lessen the logistics sector's total environmental effect by implementing eco-friendly practices in these sectors. It aims to reduce ecological problems including greenhouse gas emissions, noise pollution, and accidents often connected to traditional logistical practices (Mallidis et al., 2014).

Green product design is an important component of ecologically responsible logistics. This strategy strongly emphasises taking the environment into account from the beginning of product creation. An in-depth examination of the materials used in product manufacture as well as their potential for recycling and sustainability at the end of the product's lifecycle is required for green product design (Smith & Yen, 2010). Products may support the circular economy and lessen their impact on the environment by using eco-friendly materials and designs.

Although reverse logistics and green logistics may both be seen as subsets, it's crucial to remember that the two ideas have different objectives. The process of managing items after they have been used or returned by customers and guaranteeing their correct disposal, recycling, or refurbishment falls within the purview of reverse logistics. Green logistics, on the other hand, has a wider focus and aims to optimise every part of the supply chain to reduce its environmental footprint (Rogers & Tibben-Lembke, 2001). Reverse logistics and green logistics are compared in depth in Figure 6, highlighting how each makes a unique contribution to sustainable practices.

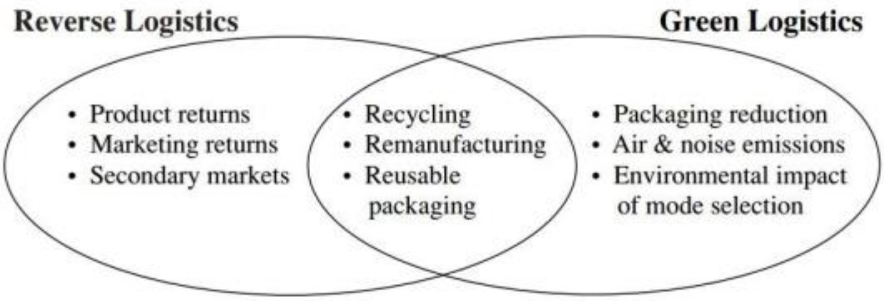

Figure 6: Reverse logistics & green logistics (Rogers & Tibben-Lembke, 2001).

It is important to note that even though green logistics in itself is not a connected driver or constraint to reverse logistics, it is however an essential aspect of environmental drivers, such as sustainability and circular economy. In addition, it is a helpful tool to incorporate and further develop the closed-loop system.

2.3.2 Sustainability

Sustainability is a term that refers to the delicate equilibrium between social progress, environmental protection, and economic growth. According to Sarmento (2005), the objective of sustainable development is to satisfy current demands without sacrificing the capacity of future generations to satisfy their own needs.

Achieving sustainable growth in the automobile sector is a challenging endeavour that requires taking into account several factors.

Economic factors also play a vital role in sustainable development within the automotive industry. Firms must strike a balance between profitability and sustainability goals. This entails spending money on research and development to develop cutting-edge technology that lowers energy consumption, advances performance, and eventually aids the automotive industry become more environmentally friendly. The industry may assure its long-term development and beneficial effects by placing equal emphasis on environmental sustainability and economic viability (Jasinski et al., 2016).

Another vital aspect of sustainable growth in the automotive sector is technological improvement. It is possible to significantly improve the environment by adopting innovative technologies that emphasised energy conservation and zero emissions. This covers the creation and use of hybrid and electric cars and components as well as the use of renewable energy sources throughout the production process. By leveraging technological innovations, the automotive industry can reduce its carbon footprint and contribute to a cleaner and more sustainable future (Wolff et al., 2020).

Viewing the automotive industry in a wider perspective is crucial for achieving sustainable development. This entails taking into account the whole range of the sector, from manufacturing processes to recovery and recycling. The industry can optimise resource utilisation, minimise waste, and encourage environmental responsibility by applying sustainable practices throughout the whole lifespan of automotive products (Vermeulen et al., 2012).

Lastly, addressing the environmental challenges posed by the automotive industry is of paramount importance. The automotive industry is a significant source of air pollution, particularly through end-of-life vehicles. Due to this, major automotive manufacturers have been aggressively investigating the use of recycled and renewable materials in their manufacturing processes to reduce these environmental challenges. To improve the capacity of automotive goods to be recycled, they are also looking for replacements for hazardous materials. By incorporating these sustainable materials and designs, the industry can minimise its ecological impact and promote a circular economy (Williams, 2006).

2.3.3 Circular Economy

The circular economy idea goes beyond the traditional "take-make-dispose" linear framework and instead embraces a more comprehensive and sustainable approach. In a closed-loop system, waste is reduced via recycling and regeneration, resources are used effectively, and products are made to be durable and recyclable. The circular economy strives to enhance resource efficiency and reduce the negative environmental impacts of industrial operations by using the "3R" method of reducing, reusing, and recycling (Ranta et al., 2018).

The circular economy's fundamentals have the potential to significantly alter the automotive industry. To minimise the consumption of raw materials, one of the primary measures is to improve the manufacturing processes. Automotive manufacturers may reduce waste and their reliance on limited resources by incorporating reverse logistics. This not only aids in the preservation of natural resources but also lowers costs for businesses. Furthermore, prolonging the lifetime of components via reuse minimises the environmental impact of manufacturing processes while also reducing the demand for new manufacturing. Furthermore, recycling components into usable resources after they have served their purpose guarantees that valuable materials are not wasted but rather are reincorporated into the manufacturing cycle (Evangelopoulos et al., 2018).

While the automotive industry certainly enhanced mobility and economic development, it has also significantly increased environmental and safety risks. The buildup of plastic waste from abandoned vehicles and components is one of these problems. Manufacturers have employed plastics more and more in the creation of lightweight, long-lasting materials for the automotive industry. However, this has resulted in an increase in plastic waste that has to be managed properly. The industry may solve this problem and support a more sustainable waste management system by adopting circular economy practises, such as recycling and reusing these plastics (Vieyra et al., 2022).

Economically speaking, the automotive sector is aware that long-term success depends on elements other than current profitability. The profitability and competitiveness of automotive firms are critically dependent on market stability, technical breakthroughs, and sustainable business practices. Manufacturers may take advantage of economies of scale by selling in large quantities and entering new markets abroad. Additionally, by using "break-even" plans, they are able to concentrate on cost-effective manufacturing techniques without having to significantly expand their capacity. Adopting the circular economy's concepts of repair, reuse, and recycling may benefit the business's bottom line as well as meet the rising demand from customers for environmentally friendly goods and services (Williams, 2006).

The advantages of the circular economy strategy go beyond only the financial and environmental aspects. It also discusses the societal consequences of automotive pollution. Organisations can reduce the negative effects on communities, especially those near landfills or regions with high automotive disposal rates, by adopting automotive recycling practices and implementing circular economy ideas into practice. Components should be recycled and disposed of properly to avoid problems with land usage and to stop the discharge of pollutants into the air, soil, and water (Abubakar et al., 2022).

Lastly, sustainable development solutions are more important as the global economy expands and resources become more limited. A workable solution to the problems of resource depletion, pollution, and waste buildup is provided by reverse logistics. Organisations can encourage innovation, reduce dependence on limited resources, and create a more resilient and sustainable future by converting the automotive industry to a circular model (Širá et al., 2022).

2.3.4 Corporate Social Responsibility (CSR)

Corporate Social Responsibility (CSR) is defined as “a management concept whereby companies integrate social and environmental concerns in their business operations and interactions with their stakeholders.” (*What Is CSR?* n.d.). CSR urges businesses to proactively meet the needs and expectations of many stakeholders rather than concentrating just on profits. Companies may promote a deeper awareness of and relationship with their stakeholders by integrating CSR practices into their organisational culture, which aligns with reverse logistics practices (Sarkis et al., 2010).

CSR may result in measurable financial advantages. Companies might find cost-cutting possibilities by incorporating social and environmental factors into their operations. For instance, employing waste reduction strategies and energy-efficient technology may result in considerable utility and waste management cost reductions (Yang & Baasandorj, 2017). Implementing reverse logistics is another strategy which might aid in incorporating CSR practices, due to its contribution to both environmental and societal concerns (Sarkis et al., 2010).

Organisations need to understand that CSR extends beyond profit-making and encompasses a triple-bottom-line approach: economic, environmental, and social. Businesses should focus on creating value for the economy, environment, and society in addition to maximising their financial returns. This calls for ethical sourcing, reducing environmental effects, and assisting local communities. It also calls for responsible corporate practices. Companies may stand out in the marketplace and get a competitive advantage by adhering to CSR tenets (Lim & Pope, 2021).

2.3.5 Compliance

Regarding the treatment, disposal, and transportation of vehicles and automotive components, the automotive sector is regulated by multiple laws (Schultmann et al., 2006). By establishing clear guidelines on how to conduct safe reverse logistics, organisations are able to reduce potential environmental damage, accidents, or injuries, when treating, disposing, or transporting returned components or vehicles (Abdulrahman et al., 2014).

Electronic components, fluids, and batteries are among the hazardous substances utilised by the automotive industry. Reverse logistics facilitates businesses to dispose of these hazardous substances in accordance with environmental laws. By collaborating with certified waste treatment plants or recycling facilities, automotive firms are able to guarantee that dangerous substances are disposed of carefully and in compliance with the law. Thereby avoiding penalties (Günther et al., 2015).

Furthermore, establishing a structured reverse logistics program will aid in adapting more knowledge and understanding for employees involved in the process. Adding knowledge and understanding is a crucial role for innovation, nevertheless, from a compliance setting, this is important as it creates deeper understanding during employee training (Sarkis et al., 2010). Nevertheless, to simplify why compliance is a driver towards reverse logistics, it is possible to state that compliance and reverse logistics aid each other in establishing safety guidelines in the process of failed products and components.

2.3.6 Customer Satisfaction

Subramoniam et al. (2009) imply that adding value after the original purchase creates higher customer satisfaction. Implementing reverse logistics is one of the ways of establishing value after the original purchase, because of easier returns, quick repairs and replacements, warranties, feedback, and lastly sustainability and environmental responsibility concerns.

Reverse logistics provides an easier return process for customers if problems occur with the vehicle. A structured and effective process makes it easier for customers to know what to do and when to do it. This system enables customers to initiate returns with quick aid, which results in loyalty and higher customer satisfaction (Subramoniam et al., 2009).

Additionally, having an established reverse logistics program enables quicker repairs and replacements of failed products and components. This is related to structured processes that identify and address the problem faster. Nevertheless, quicker processes lead to reduced downtime, which results in higher customer satisfaction. In addition, a reverse logistics program also involves technical experts, which makes the process both faster and more accurate (Subramoniam et al., 2009).

Furthermore, warranty claims for automotive vehicles and components are common. To be able to manage warranty claims efficiently and effectively, reverse logistics programs are crucial. This makes the entire process easier for the customer, as they know they receive the aid they are entitled to, without any delays (Subramoniam et al., 2009).

Feedback is an important way of capturing customers' expectations and wishes for further development. A reverse logistics program aids in capturing customers' feedback since they have dialogues on failed components and goods. Organisations actively seeking customer feedback gain insight into which areas need further attention and improvements. This is not only related to the reverse logistics process but the entire supply chain. Thus, a vital key to creating competitive advantage and customer satisfaction (Subramoniam et al., 2009).

Lastly, Subramoniam et al. (2009) state that in recent years, customers focus more on environmental aspects than previously. Establishing a reverse logistics program is therefore important in the sense of aligning with customer values. Additionally, this would result in loyal customers, as well as satisfied environmentally focused customers. Due to easier returns, quicker repairs and replacements, warranties, feedback, and sustainability and environmental responsibility concerns, which all are assisted by adapting reverse logistics, there is a high potential for establishing customer satisfaction.

2.3.7 Supply Chain Optimisation

Moreover, implementing a reverse logistics programme can also help optimise the supply chain. Referring to advantages such as improved visibility, inventory management, forecasting, cost reductions, supplier partnerships, transportation/logistics, lean and agility, and continuous improvements.

As previously stated, organisations emphasise developing efficient and effective return policies. This can be viewed in relation to improving supply chain visibility. Organisations can identify inefficiencies, bottlenecks, and recurring patterns by monitoring the passage of returns and conducting structured reverse logistic practices. Resulting in improved decision-making, process development, and planning throughout the entire supply chain (Genchev, 2009). However, it is important to state that if not handled correctly or the organisation has limited information and visibility, the result would lead to challenges in effectively managing reverse logistics processes. The reason behind this is that there is more reduced visibility in a reverse logistics process, rather than in a forward supply chain, because of a lack of information systems and resources priority (Tibben-Lembke & Rogers, 2002).

In addition, organisations are more capable of managing their inventory after implementing reverse logistics in their supply chain. By enhancing the categorisation, recovery, and classification processes, organisations can optimise their inventory levels. Due to these modifications, organisations are able to reduce inventory costs, overstock, and provide access to remanufactured and refurbished parts for time-sensitive replacements or repairs. On the other hand, if not managed properly, the management of inventory might be too complex, and costly, and create bottlenecks (Turrisi et al., 2013). In addition, an increase in reverse logistics flows would lead to the need for more warehouse space and might result in higher costs (Dowlatshahi, 2012).

Supply chain optimisation includes more robust planning and demand forecasting. Organisations can analyse return flows, due to this they will be able to understand customers' expectations, identify trends, and modify their inventory and production correspondingly. Krapp et al. (2013) mention all these factors as a part of reverse logistics, in other words, reverse logistics is a participant in developing more accurate planning and forecasting structures. Thus, resulting in minimising risks, reducing excess stock, and in general, enhancing supply chain efficiency (Nagashima et al., 2015).

Govindan and Bouzon (2018) present financial drivers as one of the key drivers, due to their importance within the business industry, concerning its contribution to staying sustainable and growing. Larsen et al. (2018) suggest that by managing returned, excess, and end-of-life products organisations can reduce costs referring to disposing of products, as well as recovering value by reselling or repurposing them. In addition, by recovering value from used products, companies are able to reduce the need for raw materials, since they gain materials from recovering products. As a result, this will reduce the overall cost of the supply chain, which is a crucial factor in staying competitive and developing better supply chain optimisations. It is important to note that establishing and running a reverse logistics program is costly, however, because it reduces costs in other segments, it may result in an equilibrium or cost reduction in time.

Furthermore, creating a reverse logistics programme might also help to forge stronger relationships with suppliers. Partners can strengthen their communications and work processes, which increases their collaborative functions, by cooperating on returning parts and supplies. The opportunity to receive feedback through reverse logistics might also be of interest. Later, the company may utilise the input to enhance both the product and the entire operation of the supply chain.

Nevertheless, the organisation can enhance supply chain optimisation thanks to all these aspects (Govindan & Bouzon, 2018).

Transportation and logistics are also crucial aspects of supply chain optimisation. In an industry such as the automotive industry, transportation and logistics can be costly and time-consuming. As a result, it is critical to developing techniques that are both effective and efficient to reduce back on potential unnecessary transit time and costs (Ullah, 2023). According to Selviaridis et al. (2016), the majority of partners in the automotive industry utilise reverse logistics as a tactic to capture the full value of transportation. For instance, rather than not transporting anything back, they use trucks that transport the products to the customer to convey returned goods. As a result, they can use the vehicle on the trip back, cutting down on expenditures and time overall. Additionally, this approach lessens their environmental impact and, finally, improves the efficiency of their entire supply chain. In some cases, the returned products can be complex due to varying product sizes and weights, transport modes, and logistic processes of returned goods from different locations (Grandjean et al., 2019).

According to Musa et al. (2014), reverse logistics can be a factor in enhancing lean and agility. Both lean and agility are essential when trying to establish a responsive and effective supply chain. As mentioned previously, reverse logistics enables the possibility to capture feedback from customer demands and market conditions. By using this mechanic, organisations can analyse and increase their responsiveness. Additionally, by implementing a reverse logistics programme, businesses improve their ability to manage returned materials and components, creating a leaner supply chain.

Last but not least, organisations can use reverse logistics to continuously enhance their supply chain optimisation. As stated previously, reverse logistics enables feedback from current market trends and issues from product returns. Organisations are able to continuously improve their entire supply chain, their product quality, and ultimately lower their return rate through analysing this data. The ability to continuously improve aids in creating customer satisfaction, supply chain optimisation, and competitive advantages (Kumar et al., 2009).

2.3.8 Competitive Advantage

Rogers and Tibben-Lembke (2001) researched over 150 managers with reverse logistics responsibilities. During this research, they found that 65,2% of reverse logistics managers believed that competitive reasons were the key driver to conducting reverse logistics. Similarly, during the previous segments of the literature review, competitive advantage has been mentioned as a result of reverse logistics. By implementing logistics, organisations can improve their environmental footprint, sustainability, circular economy, CSR, compliance with laws and regulations, customer satisfaction, and optimisation of supply chains. Consequently, resulting in gaining a competitive advantage or staying competitive with competitors, if handled correctly.

2.3.9 Constraints of Reverse Logistics

Even though there are several drivers to implement reverse logistics, there are also constraints which are important to supplement in detail.

Carter and Ellram (1998) state that the “Quality of Inputs” is one of the external constraints in the implementation of reverse logistics. Procurement managers expect that recycled materials are of lower quality than original raw materials. Due to this procurement managers often neglect purchasing these materials, as they want to reduce potential risks. Nevertheless, the constraint of “Quality of Inputs” is, therefore, to persuade the procurement managers to believe that these materials are of the same quality as original materials, and also actually recycle materials consistently at the same quality as original raw materials. If this is not possible, there is no point in recycling, since organisations will not be able to sell and in some cases use recycled materials.

“Vertical Coordination” is the other external constraint, and is the transparency factor between suppliers and customers. Li et al. (2023) believe that introducing full transparency and collaboration between two parties is difficult, because of different factors, such as expectations of losing competitive leverage and sensitive information. However, Carter and Ellram (1998) mention that increased external uncertainties would result in increased collaboration between parties. Consequently, this could increase vertical coordination between supplier and customer, which is necessary to create a reverse logistics program between the parties.

The first internal constraint that Carter and Ellram (1998) mention is “Stakeholder Commitment”. This is referred to as having all stakeholders on the same page when considering a reverse logistics program. If this is not the case, the program would be removed during the startup phase, and before the organisation commits. It is important to note that the commitment of the stakeholders is essential for continuous success.

“Top Management Support” is the second internal constraint. Organisations are led by top management, which indicates that they have a saying on what the organisations should focus on. In other words, top management support is crucial for keeping reverse logistics programs (Carter & Ellram, 1998).

The last constraint that Carter and Ellram (1998) mentions is “Incentive Systems”. This is referred to developing and implementing a system that recognises and rewards employees that contribute to reverse logistics activities. Whereas if this is not the case, the reverse logistics activities would become more of a burden, and employees would neglect reverse logistics activities.

2.4 Conceptual Framework

To simplify the further investigation of our research questions, a conceptual framework has been created and illustrated in Figure 7. To clarify, each of the left boxes is the cornerstone of the research questions. The blue diamond is there to give a clearer illustration that both “Incorporation of Reverse Logistics Practices” and “Current Challenges of Reverse Logistics” have a common relation to the variables “Waste Management” and “Electrical Vehicles/Components”.

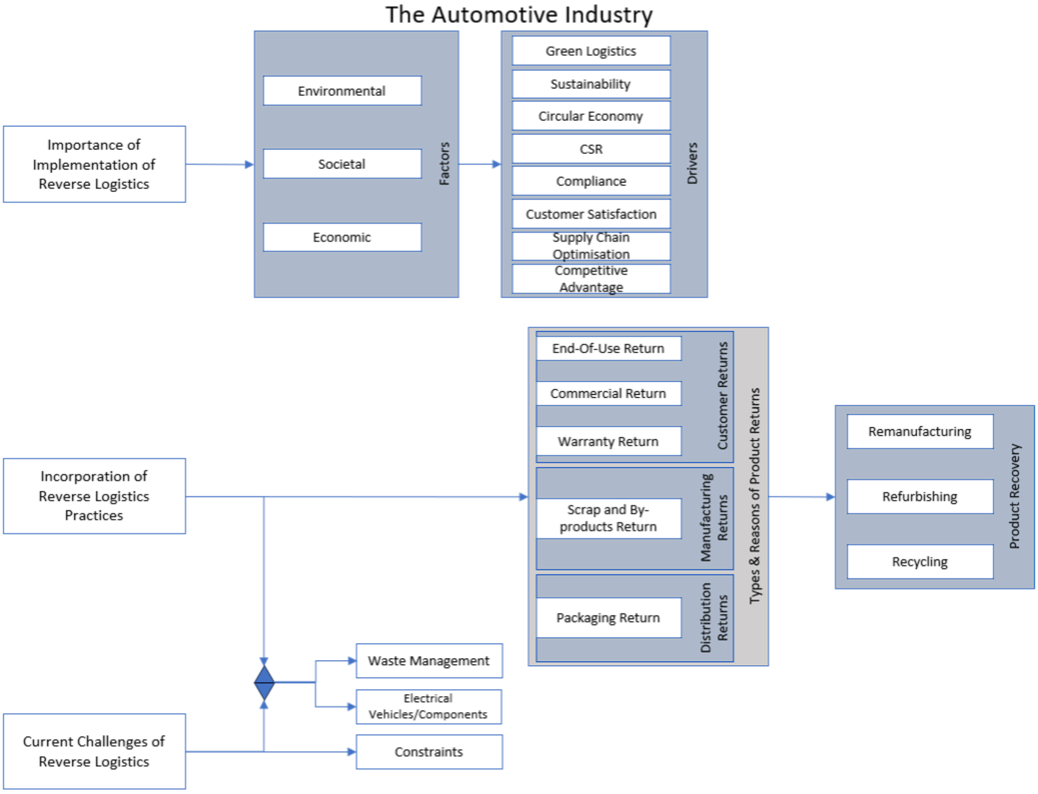

Figure 7: Conceptual Framework

3.0 Methodology & Design

As previously alluded to in the introductory segment of this research, a qualitative, descriptive case study has been devised with Bertel O. Steen as the focal point of investigation. The primary objective of this endeavour is to delve into the significance of reverse logistics within the automotive sector, with a particular emphasis on identifying existing challenges and devising potential solutions. The selection of Bertel O. Steen as the target company is a result of our visit to their logistics warehouse last year, where we had the opportunity to gain firsthand familiarity with their practices within reverse logistics.

3.1 Research Strategy and Design

As outlined by Bell et al. in their publication from 2019, the field of research encompasses a variety of strategies and general approaches, with the two main types being quantitative research and qualitative research. The fundamental distinction between these two approaches lies in their focus and methods of data collection, analysis, and interpretation. A quantitative research strategy places a significant emphasis on quantification and the use of measurement, numerical data, and statistical analysis to understand the subject matter (Bell et al., 2019). On the other hand, the qualitative research strategy emphasises words and images and usually concentrates on the collection, analysis, and interpretation of non-numerical data such as observations, interviews, and text-based materials (Bell et al., 2019).

The concept of qualitative research has been put forth by Thompson and Walker (1998), which describe it as a method for delving deep into a phenomenon by illustrating and identifying the various elements and relationships within a given situation. This in-depth understanding can provide valuable insights for researchers and help them gain a more detailed understanding of the subject matter. Furthermore, the qualitative approach can also serve as a guide for future studies and research efforts, by providing direction and strategies to strengthen the guiding practice. It can also be used as a tool to identify areas that require further research and to develop the scope of research.

Case studies are used because you wish to understand a real-world case and believe that doing so will probably involve crucial contextual circumstances relevant to your case (Yin, 2017). According to Gerring (2017), a case study is a thorough investigation of one or a few instances that uses observational data and aims to provide insight into a broader population of cases. The purpose is to examine the company's current behaviour and processes through thorough research, mixed with existing information on reverse logistics, which is important to assess the company's current procedures surrounding reverse logistics.

There are various methods for connecting theory and research, and among them, deductive and inductive reasoning are the two most commonly used techniques. According to BRM (n.d.), the inductive approach involves starting with observations and then formulating theories once the research is completed. Additionally, Thomas (2006) suggests that a systematic set of techniques can be employed to analyse qualitative data using an inductive approach. On the other hand, the deductive approach, as described by Awuzie and McDermott (2017), begins with an established theory and then develops a research plan to test the hypothesis. As a result of researchers facing difficulty in selecting the appropriate study methodology, the abductive approach was established as an alternative.

We believe an abductive would be the most fitting approach to our case study of reverse logistics in the automotive industry. The abductive approach is a distinct method of reasoning that differs from both the deductive and inductive approaches. Unlike the deductive approach, which involves the pre-selection of a theory to be verified through the formulation and testing of hypotheses (Haig, 2005), the abductive approach does not rely on this method. Instead, it focuses on developing hypotheses by examining facts that infer the potential validity of a new theory, if no other explanation has greater validity or the possibility of further developing an existing theory (Haig, 2005). Furthermore, it does not involve the process of creating and validating theories by analysing singular events through "secure observations" as is the case with an inductive approach (Haig, 2005). The abductive approach is a unique method of reasoning that can provide a different perspective and a way to approach research and problem-solving.

3.2 Data Collection and Analysis

The process of data collection for this thesis involved utilising two primary sources of information: primary data and secondary data. As stated by Saunders, Lewis, and Thornhill (2019), primary data refers to information that is collected in its raw form, typically through methods such as interviews, surveys, and direct observation. This type of data is considered to be firsthand and original and allows for a deeper understanding of the subject matter being studied. On the other hand, secondary data refers to information that has already been collected and recorded, such as from literature reviews, books, and articles. This type of data provides a broader understanding of the subject matter and can be used to supplement primary data.

In this thesis, the data collection process involved a combination of both primary and secondary data. The primary data was collected through in-depth interviews with the focal company and direct observation, providing a firsthand and intimate understanding of the subject matter. Additionally, secondary data was gathered through an extensive literature review, which helped to supplement the primary data and provide a broader understanding of the subject matter being studied. The use of both primary and secondary data was crucial in providing a comprehensive and well-rounded analysis of the subject matter.

3.2.1 Primary data - Bertel O. Steen Logistics

The primary data was collected through two main data collection methods: field observations and semi-structured interviews. These two methods, when combined, provided us with a thorough comprehension of the critical elements required to construct and analyse the case.

3.2.1.1 Field Observation

During the interview, we were given a tour of Bertel O. Steen’s warehouse, where we were able to witness firsthand the various processes involved in the handling of deposit items and commercial returns. This visit provided us with practical examples of the challenges faced in the management of reverse logistics. Furthermore, by beginning the data collection procedure with observations, we had a stronger starting point for understanding the actual situation for conducting the interviews. These findings also laid the groundwork for understanding the potential problems of changing the warehouse's logistics systems and architecture.

3.2.1.2 Semi-structured Interview

To gain a thorough understanding of the challenges faced in reverse logistics within the automotive industry and uncover potential sustainable solutions, a semi-structured interview approach was employed with the focal company. This method of interviewing allowed for open and dynamic interaction between the interviewer and interviewee, enabling new subjects to be discussed as the conversation progressed. Additionally, questions were formulated based on the responses received during the interview to delve deeper into the subject matter. According to Bryman and Bell (2019), the semi-structured interview approach offers a high level of flexibility and allowed for a wide range of subjects to be covered, providing a more comprehensive understanding of the topic at hand. This approach provided valuable insights and perspectives, crucial in identifying and addressing the challenges of reverse logistics in the automotive industry.

In order to gain an in-depth understanding of reverse logistics and its practical applications, the present study selected Bertel O. Steen Logistics as a case study. This company was chosen for its well-established reputation in the field of logistics and its extensive experience in the management of reverse logistics. To gather primary data, we conducted a series of interviews with three key personnel; the

Purchasing Manager, the Supply Chain Manager, and the Director of Bertel O. Steen Logistics, at their office. The Purchasing Manager was initially contacted via email, with a clear explanation of the research topic and the research questions. After being granted access to their office, we provided the interviewees with an interview guide that helped them prepare for the interview and ensured the efficiency of the process. However, the interview being semi-structured, the interviewees sometimes diverged towards topics that were of interest to them, but not relevant to the scope of the thesis. Some of the topics that were discussed and covered in the interview were the following measures; *general questions (their roles, what they do), how reverse logistics work, reverse logistics processes, and regulations.* The notes summarised after the interview has enhanced our dataset and comprehension of it, as well as given us a more solid groundwork for data analysis.

3.2.2 Secondary Data

The comparison of our findings to other records was a crucial step in broadening our understanding and insight into the subject matter. As other researchers may have approached the topic from a slightly different angle, examining their findings provided valuable perspectives and insights. Additionally, the use of secondary data, such as records from companies and organisations, was an extremely valuable resource for our proposed study (Bell et al., 2019). Our goal was to gather relevant documents such as contracts, supplier evaluations, and potential analysis and statistics about the reverse activities within the case company and its logistics collaborative partners. The provision of secondary data was especially beneficial as it allowed for more time to be devoted to the analysis of primary data, as data collection could be a time-consuming process. Furthermore, secondary data is often of high quality as it is generated by highly experienced researchers (Bell et al., 2019).

3.2.3 Data Analysis

The collection of qualitative data for this study will involve a thorough examination of various forms of information provided by the focal company and its collaborative partners. This data will likely come in the form of interviews and documents, resulting in a vast amount of unstructured material that requires analysis. The interviews we conducted with the managers at Bertel O. Steen were important for our data collection, as they provided invaluable insight into their perspectives on reverse logistics and the associated challenges. These firsthand accounts added depth and real-world context to our study, complementing the existing literature.

3.3 Trustworthiness and Authenticity

Mason (2018) posits that reliability, validity, and generalisability are crucial indicators of the quality of research. However, while these measures are commonly associated with quantitative research, there have been calls for additional criteria to evaluate qualitative research (Lincoln & Guba, 1985; Guba & Lincoln, 1994). These additional criteria are trustworthiness and authenticity, with trustworthiness further divided into four sub-categories: credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). In the forthcoming sections, we will delve deeper into these suggested criteria put forth by Lincoln and Guba.

Credibility: Ensuring that research is conducted in accordance with principles of good practice is essential, and credibility plays a vital role in this process. To establish credibility in our research, we will focus on implementing strategies such as respondent validation and triangulation. Respondent validation involves presenting our findings to the individuals or groups that were studied, allowing them to confirm the accuracy of our interpretation of the data (Bell et al., 2019). This approach enables us to ensure that our research is credible and that the findings accurately reflect the perspectives of the individuals or groups studied. Additionally, triangulation will be used to enhance the credibility of the research by using multiple data sources and methods of data collection.

Transferability: Transferability, a subcategory of external validity, is a key measure for evaluating the applicability of qualitative research findings in other contexts (Golafshani, N., 2003). Lincoln and Guba (1985) have emphasised the need for this measure in qualitative research, as it concerns the ability of the research findings to be replicated or applied in different situations or time periods, given that qualitative research often focuses on specific and narrow scopes (Bell et al., 2019, p. 365). To ensure transferability in this study, we have placed a significant emphasis on providing a comprehensive and detailed portrayal of the research context, referred to as a "thick description" (Lincoln & Guba, 1985). This will assist external researchers in determining whether the findings generated in this study can be applied in other contexts.

Dependability: Ensuring dependability, which is equivalent to consistency in qualitative research, is crucial for the validity of our study. To achieve this, we will maintain detailed records and documentation of every step of the research process, including the formulation of research questions, selection of participants, notes, and transcripts of interviews. By keeping these records, we are making it easy for an external review, audit, and critique of our research process (Bell et al., 2019). This approach will help ensure that our research is dependable and can be replicated by others, thus increasing the credibility of our findings.

Confirmability: Confirmability is a measure of the objectivity of research, meaning it assesses whether the researcher's personal values and opinions have influenced the findings of the study (Bell et al., 2019, p. 48). Although Bell et al. (2019) acknowledge that complete objectivity may be unattainable, we will strive to maintain objectivity in our research by making a conscious effort to ensure confirmability. To accomplish this, we will reflect on the research process through a reflexive journal, examining our personal connections to the topic and being transparent about any potential biases. This will ensure that the research findings are as unbiased as possible and can be considered trustworthy.

Authenticity: Lincoln and Guba (1985) introduced an alternative evaluation criterion called authenticity, which concerns the social and political ramifications of research. In this study, we are committed to ensuring that our research question and overall study are impartial and objective and that it does not perpetuate discrimination or bias in any form. We will strive to ensure that our study is inclusive and does not perpetuate any form of discrimination or bias.

3.4 Ethical Considerations

Given the personal nature of qualitative studies, the relationship between researchers and participants can present ethical dilemmas for the researchers, as they are actively involved in various aspects of the study (Sanjari et al., 2014). Therefore, it is imperative to establish clear ethical guidelines to navigate these challenges and ensure that the rights and welfare of the participants are protected throughout the study. In this respect, it is essential to establish specific ethical principles to ensure that the rights and dignity of the participants are respected and safeguarded at all times. As anonymity is not a feasible option, it is crucial that the participants' identities are kept confidential to adhere to ethical considerations. To ensure the protection of the participants' privacy, our research will abide by the General Data Protection Regulation (GDPR) which harmonises privacy regulations for the handling of personal data. This will ensure that the rights of the participants are respected and their privacy is protected throughout the research process. In order to safeguard the privacy and confidentiality of the participants, we will take necessary measures to exclude personal information and evaluations that are specific to individuals in our study. Additionally, access to the collected data will be restricted exclusively for the researchers to ensure that the participant's private information is protected.

4.0 Empirical Findings

Reverse logistics is already a crucial aspect of supply chain management in the automotive industry. Due to the complexity of the supply chain, the diversity of products and components, and the need for specialised handling and processing are big contributing factors to the difficulty of managing reverse logistics operations in the automotive industry. However, successful and effective management of reverse logistics can lead to cost savings, reduced environmental impact, and better brand reputation. In addition, the increasing popularity of electric vehicles introduces new challenges in terms of high-voltage batteries, which require careful handling and strict regulations.

In response to global concerns, one of Norway's most prominent auto retailers, Bertel O. Steen, has placed a strong emphasis on sustainability and environmental impact. Interviews with managers provided valuable insights that complement existing literature, highlighting the company's core value of reusing materials and effectively managing return order lines for used parts. By obtaining environmental certifications and partnering with PostNord for sustainable logistics, Bertel O. Steen has established itself as a dependable and environmentally conscious automotive supplier. Their investments in waste management, addressing challenges in reverse logistics, such as high-voltage batteries and diverse supplier practices, and their endorsement of battery passports, such as the Battery Pass, demonstrate their commitment to a greener and sustainable supply chain.

4.1 Introduction of Bertel O. Steen

Bertel O. Steen was founded in 1901 by Bertel Otto Steen, and started out as an importer of metal, Gillette razor blades and Colt handguns, and didn't start to import cars till 1907 (Bertel O. Steen, n.d). The holding company has grown into one of the biggest privately owned companies in Norway and is split into two entities; Bertel O. Steen AS and Bertel O. Steen Kapital. Bertel O. Steen AS consists of car imports, car retail, and car financing. In addition to the two aforementioned entities, Bertel O. Steen also has a segment for real estate that consists of the company's properties that are used for car retail and other commercial purposes. Additionally, Bertel O. Steen, besides being Norway's biggest Mercedes-Benz retailer, also sells other car brands such as Citroen, Kia, Peugeot, and Fiat.

In terms of total sales, Bertel O. Steen is often seen as the second biggest retailer and importer of passenger cars and vehicles in Norway. During 2021, Bertel O. Steen had a revenue of over NOK 22 billion with a market share of 17.3 %.

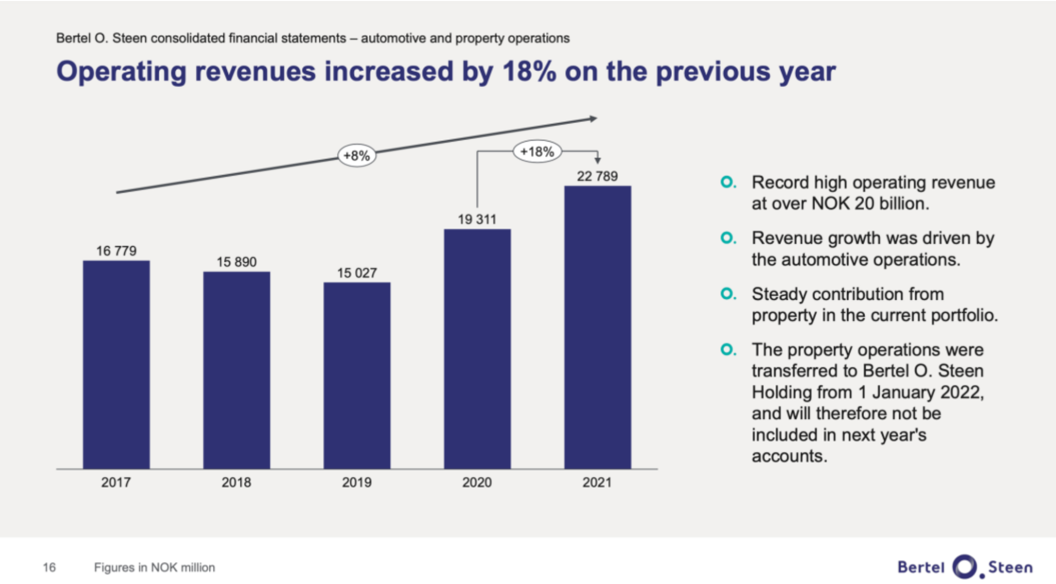

Figure 8: Bertel O. Steen Financial Statements 2021 (Bertel O. Steen Årsrapport, 2021).

4.1.1 Bertel O. Steen Logistics

Bertel O. Steen Logistics plays a crucial role as the logistics provider and central warehouse for the entire Bertel O. Steen Holding group. With approximately 8,000 daily outgoing order lines and an extensive inventory of 86,000 stock-keeping units (SKU), they serve as an indispensable distribution centre for all of the company's dealerships and workshops. Their responsibilities include purchasing and ordering components from major suppliers located in Sweden, Germany, France, and Italy.

In addition to serving as a central distribution centre, Bertel O. Steen Logistics also acts as a support and stock management facility for more than fifty dealerships throughout Norway. In addition to managing transport and clearance operations, they are responsible for essential duties such as receiving, storage, and logistics support. Their possession of immense amounts of data and information generated by their operations is one of their notable capabilities. Using the data, they can optimise orders for spare parts and determine which components dealerships should return.

4.1.2 Stena, Norsirk & Autoretur

Stena Recycling and Norsirk are leading recycling companies known for their industrial-level waste collection, advanced recycling, and reuse services (Stena Recycling, 2022; Norsirk, 2023). Bertel O. Steen partners with Norsirk for the transportation and recycling of Waste from Electrical and Electronic Equipment (WEEE) and packaging. Norsirk is a nationwide company, while Stena, is an international recycling provider, which specialises in recycling raw materials and promoting material reuse.

Autoretur (2023), a dedicated scrapping company in the Norwegian automotive industry, plays a pivotal role in the recycling and sustainable administration of end-of-life vehicles. The efforts of Autoretur have resulted in an impressive 97% recycling rate for scrapped vehicles. By attaining such a high rate, Autoretur effectively contributes to the establishment of a circular economy in which the materials from these vehicles are recycled and repurposed to create new products. This sustainable approach to vehicle scrapping minimises waste and maximises resource utilisation, thereby promoting sustainability and encouraging a more sustainable future for the automotive industry.

4.2 Importance of Reverse Logistics

Bertel O. Steen, one of the most prominent automotive retailers and importers in Norway, recognises the importance of sustainability and environmental impact in the current global context. The company has placed a strong emphasis on addressing these concerns, particularly within industries that are known for generating substantial pollution. To address this difficulty, the company has established important Extended Producer Responsibility (EPR) partnerships with Stena and Norsirk. These partnerships enable Bertel O. Steen to effectively and sustainably dispose of waste and implement efficient recycling practices.

In its operations, Bertel O. Steen places a heavy emphasis on sustainability, particularly the reuse and recycling of used materials. Similar to Norway's deposit system for plastic bottles, the industry implements a system for the management of return orders for used and unused parts. By remanufacturing or repairing returned components, Bertel O. Steen ensures the availability of affordable remanufactured parts while simultaneously reducing waste and extending the lifecycle of vehicles. Additionally, Bertel O. Steen holds environmental certifications such as "Miljfyrtårn" (Eco-Lighthouse) and ISO 14001, providing tangible evidence of their commitment to sustainable business practices and assuring stakeholders and customers of their dedication to measuring and reducing environmental impact. In addition to contributing to a more sustainable future, these certifications open the door to new market opportunities and collaborative partnerships.

4.2.1 Core Value

At Bertel O. Steen, a clear distinction is made between two types of return orders: used parts, also known as core value items, and unused parts. When the company purchases components from its suppliers, many of them come with an additional cost to their primary value. Dealerships are required to return the product to Bertel O. Steen to recover this value. The company then returns these components to their suppliers, who remanufacture or repair them before repurchasing them. This method has similarities to Norway's deposit system for plastic bottles, which incentivises retailers and dealerships to return products to the manufacturer, regardless of whether they are new or used. Depending on the condition of the returned product, it is remanufactured, refurbished or repaired, resulting in more affordable remanufactured parts that are readily available to both the company and its customers.

The managers at Bertel O. Steen recognise the significance of reusing used materials and emphasise the significance of sustainability in their operations. Annually, Bertel O. Steen Logistics manages a substantial volume of 25,000 return order lines for used parts. By reusing and recycling these components, the company ensures the sustainable use of raw materials and reduces the pressure on landfills. Due to the extensive use of minerals in the production of batteries, this strategy is particularly suitable. Additionally, the reuse of parts enables the company and its dealerships to provide customers with cost-effective repair options while extending the lifespan of older vehicles and vans by utilising remanufactured parts. This not only reduces waste but also maintains products in circulation for as long as possible, thus encouraging resource efficiency and sustainability.

4.2.2 Environmental Certifications

The incorporation of good reverse logistics has also encouraged other aspects of sustainability. During our interview with Bertel O. Steen, they mentioned how environmental certifications helped them to stay up-to-date with industry trends and practices. They explained that certification programs make them naturally more engaged in aligning with standards, as well as gaining access to valuable resources, networks, and educational opportunities that keep them informed on the latest developments in sustainability and logistics.

Environmental certifications are voluntary initiatives or established standards that acknowledge a company's commitment to sustainable business practices (Ren et al., 2021). They provide tangible evidence of an organisation's commitment to environmental responsibility, thus elevating its reputation and enhancing its corporate image. It was emphasised that these certifications play a crucial role in optimising operational efficiency, reducing costs, and fostering innovation by evaluating existing practices comprehensively and identifying potential improvement areas. In addition, they facilitate the development of new market opportunities, collaborative partnerships, and lucrative contracts, since many entities prioritise working with environmentally certified businesses. Certifications ultimately serve as evidence of a company's constant dedication, distinguishing them from competitors and actively contributing to a more sustainable future.

Bertel O. Steen has the “Miljøfyrtårn” certification, also known as the Eco-Lighthouse certification and the ISO 14011. The Eco-Lighthouse certification is a national environmental certification program in Norway that aims to assist businesses, organisations, and municipalities in instituting and documenting environmentally friendly practices in their operations. It also became the first national certification scheme in Europe to be recognised by the European Commission, making the certification on par with internationally recognised eco-labelling schemes such as EMAS and ISO 14001. (Stiftelsen Miljøfyrtårn, n.d). With the Eco-Lighthouse and ISO 14001 certifications, stakeholders and customers can be assured that environmental impact is being measured and improved.

4.2.2.1 3PL Sustainability Requirements

Bertel O. Steen decided to be selective when choosing their third-party logistics (3PL) partners in addition to considering various aspects of sustainability. During the course of the interview, it became clear that the interviewees emphasised the importance of aligning with 3PLs partners who share a similar perspective on sustainability. Therefore, Bertel O. Steen has decided to exclusively delegate their reverse logistics operations to PostNord. PostNord's strong commitment to sustainability, as evidenced by their objective of fossil-free operations by 2030, is the driving force behind this decision. In addition, PostNord has implemented a comprehensive plan to replace its complete fleet of vehicles with emission-free models.

By collaborating with PostNord for reverse logistics, Bertel O. Steen ensures that its operations are consistent with its sustainability goals. This strategic alliance enables them to leverage the knowledge and commitment of a logistics provider who shares their commitment to minimising environmental impact. With PostNord's ambitious aim of eliminating fossil fuels and transitioning to emission-free vehicles, Bertel O. Steen can rely on a partner that actively promotes sustainable transportation practices and reduces carbon emissions. This collaboration not only supports Bertel O. Steen's sustainability goals but also reinforces their reputation as a company committed to environmentally conscious business practices.

4.3 Incorporation of Reverse Logistics and Sustainability in the Company

Bertel O. Steen has prioritised waste management and recycling during its 2019 transition to a new logistics centre. The site, strategically located near a transportation hub and the Oslo border, offers efficient day distribution to dealerships. Bertel O. Steen has achieved a 92% sorting ratio, reducing waste sent to landfills and reducing greenhouse gas emissions. The company also uses reusable containers for transport and storage, reducing waste generation and aligning with sustainability objectives. Autoretur (2023), a scrapping company in the Norwegian automotive industry, has achieved a 97% recycling rate for scrapped vehicles, contributing to a circular economy. This sustainable approach minimises waste and maximises resource utilisation, and lastly, promotes sustainability for the automotive industry.

Bertel O. Steen has implemented a variety of storage systems and established efficient procedures in order to effectively manage the substantial nature of its reverse logistics operations. These measures were essential for accommodating the complexity of their operations. In addition to the core value items and product circulation strategies mentioned previously, the company has made substantial investments in waste management, recycling, and warehouse facilities. By prioritising these areas, Bertel O. Steen ensures the optimal management of materials and resources, minimising waste and maximising sustainability and green logistics. These strategic investments demonstrate their commitment to environmental responsibility and the seamless execution of their reverse logistics processes, contributing to a greener and more efficient supply chain.

4.3.1 Waste Management

Especially during the 2019 transition to their new logistics centre, Bertel O. Steen has placed a significant emphasis on waste management and recycling. As a result of Bertel O. Steen's growth strategy, the company required increased space for its warehousing and distribution operations. The site is zoned for logistics and terminal operations and is conveniently located with easy access to the E6 highway. It is also situated near a transportation hub that includes other logistics providers such as DHL, Posten Bring, and UPS. Additionally, the site is only 10 minutes away from the Oslo border, ensuring efficient day distribution to their network of dealerships in and around Oslo. The company has achieved an impressive 92% sorting ratio as a consequence of this strategic focus. Some of the waste they sort and recycle are paper, plastic, and electronics. This high rate of waste classification increases the potential for efficient recycling and drastically reduces the amount of waste sent to landfills, thus decreasing the emission of greenhouse gases. Figure 9 illustrates the reduction of waste due to their new warehouse and practices.

Figure 9: Waste quantities per waste category (Bertel O. Steen, 2022).

The proactive use of reusable containers is another noteworthy aspect of Bertel O. Steen's approach to waste management, which can be seen in Appendix 2. They are sent from their suppliers in different sizes and are used for transporting and storing goods and parts at the warehouse. The containers are designed to be foldable, making transportation and storage convenient when they are not being used. By utilising these eco-friendly alternatives, the company is able to effectively reduce the amount of waste generated throughout its operations. This commitment to waste reduction aligns with their broader sustainability objectives, allowing them to make significant advances in reducing their overall waste footprint.

4.3.2 High-Voltage Batteries

During our conversation with Bertel O. Steen, they provided insights into the life cycle of EV batteries. The focus was on the journey of these batteries, including their eventual deterioration and the options available at the end of their life cycle. When EV batteries reach the end of their life, there are three primary choices: refurbishment, remanufacturing, and recycling. It is worth reiterating that refurbishment involves replacing only the failed components, e.g. unused customer returns that are essentially “new” or warranty returns that have been repaired of their defects. Remanufacturing, on the other hand, entails replacing all the components, making it a more expensive process that aims to meet the same performance standards as a new battery. The final option, recycling, is carried out in collaboration with the partners mentioned earlier in the Findings. Figure 10 below illustrates Bertel O. Steen’s EV batteries’ life cycle.

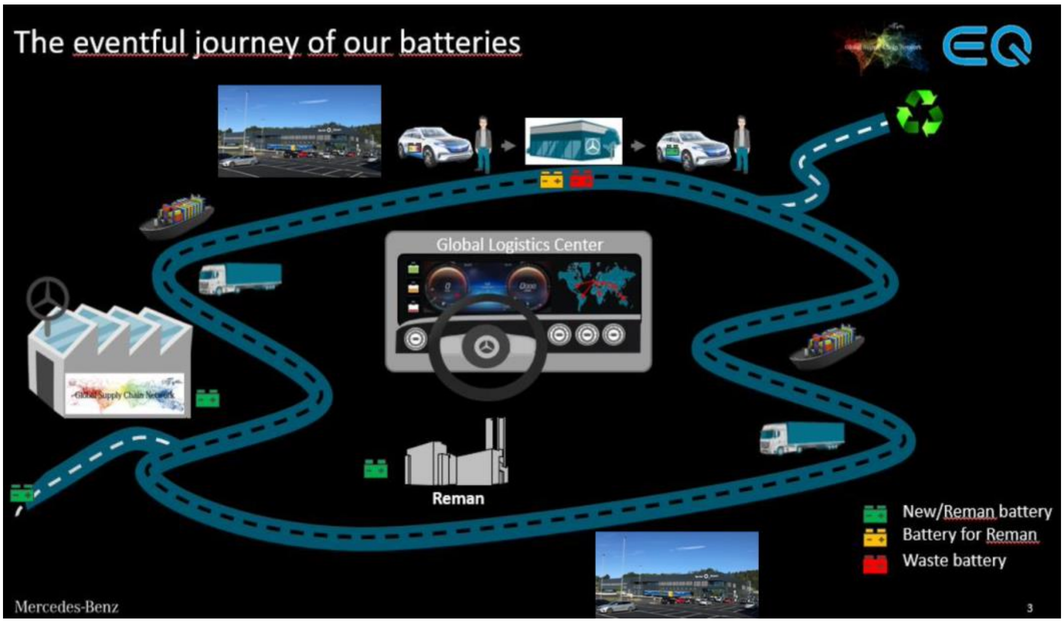

Figure 10: The eventful journey of our batteries (Bertel O. Steen, 2022).

4.4 Challenges of Reverse Logistics

In today's dynamic business landscape, reverse logistics face a multitude of challenges that require careful consideration and strategic solutions. The growing popularity of electric vehicles (EVs) is a significant factor contributing to the complexity of reverse logistics. The influx of EVs presents unique challenges in handling, recycling, and repurposing batteries, necessitating specialised procedures for appropriate disposal and reuse. In addition, the rapid technological development of EVs requires efficient administration of product returns, warranty claims, and repairs, as well as the incorporation of new supply chain models to accommodate the unique characteristics of these vehicles. These obstacles highlight the need for innovative strategies and partnerships within the reverse logistics sector in order to effectively navigate the ever-evolving environment of sustainable transportation and guarantee optimal resource utilisation and waste reduction.

4.4.1 Regulations and Rules

The managers at Bertel O. Steen have expressed significant concern regarding the constantly evolving world of reverse logistics, where changing regulations and rules pose a challenging obstacle. As a relatively recent concept, reverse logistics is constantly evolving to accommodate new innovations and technologies. This constant change requires a proactive strategy, requiring businesses to continuously adapt their practices, revise their strategies, and optimise their processes. This difficulty is further complicated by the rapidly expanding EV market, which introduces unique complexities to the reverse logistics field.

In addition, the rapid expansion of the EV market demands new methods for handling and the distinctive features of EVs, such as advanced technology, call for the development of customised reverse logistics strategies. These strategies must incorporate efficient refurbishment, remanufacturing, and recycling processes to minimise waste and maximise resource utilisation.

An additional challenge highlighted by the managers at Bertel O. Steen revolves around the diverse practices and rules adopted by different suppliers for their customers. This variation incorporates varying environmental requirements and guidelines for the return of particular products. Some suppliers prioritise the return of products with the highest core value, while others may place restrictions on the return of certain items. Bertel O. Steen's role as an importer of multiple car brands from a broad variety of suppliers further complicates the process of managing this supplier landscape and navigating the ever-changing regulations and rules.

Companies like Bertel O. Steen must implement robust supplier management strategies in order to effectively deal with evolving regulations and rules. This includes developing strong relationships, engaging in continual discussion to comprehend supplier expectations, and promoting collaborative initiatives that integrate practices and standards. By establishing transparent communication channels and forming partnerships based on shared sustainability objectives, businesses can mitigate the challenges posed by diverse supplier practices, improve compliance, and work to create a more unified and efficient reverse logistics ecosystem.

4.4.2 High-Voltage Batteries

The introduction of high-voltage batteries in EVs presented Bertel O. Steen with new challenges and complexities, requiring cautious navigation of particular rules and regulations. Compliance with storage and processing requirements for these batteries is critical. One such regulation specifies the allocation of dedicated spaces for the storage of batteries, which are designed to prevent the spread of fire by autonomously sealing the area in the event of an incident. In addition, it is prohibited to stack more than two high-voltage batteries on top of one another, resulting in inefficient battery storage and transportation procedures.

Ensuring that batteries are returned in their original packaging further adds to the intricacies of reverse logistics. Failure to satisfy this requirement would require the purchase of new packaging, delaying the entire process. In addition, transporting these batteries requires compliance with specific regulations, such as truck drivers possessing the required certification for securely transporting these items. Furthermore, passenger ships are not permitted for transporting batteries by sea, which further complicates logistical planning and execution.

To address these challenges, Bertel O. Steen must maintain a comprehensive understanding of the ever-evolving rules and regulations governing high-voltage battery handling. Ensuring compliance demands close collaboration with industry experts and ongoing monitoring of industry standards. Investing in specialised training and certification for truck drivers, as well as robust packaging and storage solutions, can help expedite operations and improve the safety and efficiency of transporting and storing high-voltage batteries.

4.4.2.1 Battery Passports

During the interview, the concept of battery passports emerged as a promising solution for promoting sustainable battery industry practices. The managers emphasised the importance of environmentally responsible and climate-friendly batteries in promoting electromobility. The introduction of the digital Battery Pass is a significant step in the direction of achieving this objective, as it stores and facilitates the exchange of vital information across the battery value chain, from the extraction of raw materials to reuse and recycling.

With the Battery Pass, a variety of vital data, including the carbon footprint, conditions of raw material extraction, repairability, and recyclability, are stored in a safe location. This shared information promotes openness among stakeholders, enabling them to make informed decisions and collectively contribute to the development of sustainable battery practices. By leveraging the capabilities of the Battery Pass, an in-depth understanding of the environmental impact and life cycle of electric car batteries emerges. This newfound transparency enables manufacturers, suppliers, and recyclers to effectively collaborate, promoting shared responsibility and advancing sustainable advancements in the electromobility industry.

5.0 Discussion

Discussing the comparison between the existing literature and our findings will be essential to respond completely to the pertinent research questions. Deliberations about the significance of implementing reverse logistics in the automobile sector, the extent to which effective reverse logistics practices have been implemented, and finally, the current difficulties facing reverse logistics in the automotive industry will make up this segment. So far, we have presented a thorough description of the current literature on reverse logistics in the automotive sector and explored real-life practices of reverse logistics in the automotive industry (Empirical Findings). Both segments contain valuable intel on how to answer and discuss the following research questions:

5.1 RQ1: Why is the implementation of reverse logistics important in the automotive industry?

Both Stadtler (2015) and Bertel O. Steen have recognised the importance of supply chain operations. As illustrated in Figure 1, it is possible to discuss that the automotive industry is an environmental concern, and implementation of reverse logistics can aid in reducing the total environmental footprint. Previously and today, supply chain optimisation has been valued as a strong contributor to gaining competitive advantages and staying competitive, due to its overall contribution of reduced costs, improved quality, resource utilisation, adequately satisfying consumer demands, and shortened lead times. Nevertheless, Daugherty et al. (2001) believe that reverse logistics is essential in optimising supply chains because it is the backwards flow of the entire supply chain. Likewise, Bertel O. Steen has the same focus, hence why they are implementing and investing in a strong reverse logistics program.

The existing literature and Bertel O. Steen identify several drivers towards implementing reverse logistics in the automotive industry. Table 1 demonstrates the link between the literature review and the findings, highlighting the varying drivers of the implementation of reverse logistics.

Importance of Implementation of RL	Literature Review	Emperical Findings
Enviromental Benefits	X	X
Green Logistics	X	X
Sustainability	X	X
Circular Economy	X	X
CSR	X	
Compliance/Laws & Regulations	X	X
Supply Chain Optimisation	X	X
Customer Satisfaction	X	
Resource Utilisation	X	X
Increase in EV	X	X
Waste Management	X	X
Feedback	X	
Cost Reduction	X	
Further Sale	X	X
Competitive Advantage	X	X

Table 1: Link between the literature review and the findings

Reverse logistics highlights green logistics as a way of adding environmental considerations into logistic strategies, namely product return, refurbishing, remanufacturing, recycling, and waste disposal (Rogers & Tibben-Lembke, 2001). Baah et al. (2021) believe that implementing green practices is essential in establishing sustainable business operations, thus adding further value towards the implementation and development of reverse logistics. Likewise, Bertel O. Steen identifies possibilities of green logistics within their business operations. They operate with reusable packaging, as well as they facilitate recycling and remanufacturing processes.

In addition, Bertel O. Steen strongly emphasised the importance of establishing sustainable processes to reduce environmental footprints. Moreover, they believe that a structured reverse logistics program could be an important key to improving environmentally friendly tendencies. Likewise, Wolff et al. (2020) state that by leveraging technological innovations the automotive industry would be able to reduce its carbon footprint and contribute to a more sustainable future. This would entail spending money on research and development to lower energy consumption, advance performance, and aid the industry to reach sustainability. In other words, establishing a reverse logistics program could assist the automotive industry towards a sustainable future.

Manufacturers in the automotive industry are investigating possibilities of the use of recycled and renewable materials in their manufacturing processes to reduce their environmental footprints (Williams, 2006). Vermeulen et al. (2012) also mention that to establish a sustainable process the whole range of the sector needs to be accounted for, namely everything from manufacturing processes to recovery and recycling. As mentioned previously, Bertel O. Steen is an importer and retailer, thus not able to incorporate changes in the manufacturing process. However, it emphasises the importance of reverse logistics and which way their suppliers are heading. In addition, creating strong partnerships can be vital in creating sustainability, thus making Bertel O. Steen an important contributor towards sustainable practices.

Implementation of reverse logistics can also embrace a circular economy. By reducing, reusing, and recycling the automotive industry may reduce their waste and reliance on other parties. This not only aids in the preservation of natural resources but also lowers costs for businesses. In addition, by prolonging the lifetime of components it is possible to reduce overall pollution. Recycling components also enhances the possibility to capture valuable materials back into the cycle, rather than creating more waste (Evangelopoulos et al., 2018). For instance, Vieyra et al. (2022) mention that plastic waste, which is a common material in the automotive industry, could be resolved by introducing circular economy practices, such as recycling and reusing plastics. This can be seen in relation to Bertel O. Steen identifying similar drivers, such as reuse to increase the lifetime of components and vehicles, and recycling to have steady access to materials.

Another important factor to consider is that organisations are able to reduce negative effects on communities, especially those near landfills or regions with high automotive disposal rates, by implementing reverse logistics practices. Components must be recycled and disposed of accordingly to avoid issues with land usage and reduce air, soil, and water pollution (Abubakar et al., 2022). This can also relate to CSR practices, which urges business to proactively meet the needs and expectations of stakeholder, rather than only focusing on profits. Hence why reverse logistics can be a vital tool in contributing to both environmental and societal concerns (Sarkis et al., 2010).

Furthermore, Bertel O. Steen focuses on environmental certifications and 3PLs partners to guide and assist them in their goals of creating and staying sustainable. This was especially a talking point during the conversation regarding high-voltage batteries. Bertel O. Steen referred to batteries of EVs as complex due to their different sizes and regulations. Even though the process of transporting batteries is complex and regulated, both theory and Bertel O. Steen mention that a well-structured reverse logistics program can be essential in reducing the complexity and the possibility of avoiding potential penalties.

Simultaneously, implementing a reverse logistics program is essential in following laws and regulations. Moreover, this is even more critical in the automotive sector, because of the multiple laws associated with the industry, especially with hazardous materials and batteries (Schultmann et al., 2006). Fleischmann et al. (2000) also state that Original Equipment Manufacturers are accountable for managing product recovery and paying for all related expenses. In other words, OEMs have to implement a reverse logistics program to align with the laws and regulations. Even though Bertel O. Steen is not an OEM, and are not obliged to follow this expectation, they are however a part of the reverse logistics program further down the supply chain. This does result in having to follow these guidelines, otherwise might lose its partnerships with its strongest partners, such as Mercedes-Benz and Peugeot.

Moreover, most hazardous materials and batteries that are damaged are not possible to transport between countries, which does make the reverse logistics process complicated for OEMs, as they are not able to recover the value from these products. However, because they have partnerships with importers, such as Bertel O. Steen it is less complex to conduct reverse logistics processes within the relevant countries. This is based on an assumption from the findings that OEMs give the responsibility to Bertel O. Steen to conduct reverse logistics processes and in return, Bertel O. Steen gets an exclusive deal such as being the importer of that explicit brand.

Winslow et al. (2018) mention methods on how to solve the barriers of returning hazardous materials and damaged batteries. One of which is based on incentives or buy-back methods which encourages customers to deliver products back to the supplier. Bertel O. Steen has a similar system, which is defined as “core value”. Winslow et al. (2018) also believed that it was common for reverse logistics programs in the automotive industry to partner up with specialised recycling organisations and waste management suppliers to recycle, sort, transport, and collect hazardous materials and discarded batteries, due to its high complexity regarding laws and regulations. Similarly, Bertel O. Steen has partnered up with Autoretur, Norsirk, and Stena. These partnerships are ideally there to aid Bertel O. Steen with recycling challenges if the product that is returned is not possible to send further up in the chain, due to laws and regulations, or possible dangers.

Additionally, Subramoniam et al. (2009) state that implementing a reverse logistics program is a vital tool for increasing customer satisfaction, and at the same time promoting customer loyalty. Subramoniam et al. (2009) also mention that reverse logistics can be used as a service after the sale of the product, thus increasing the value of purchasing that product at that specific supplier, rather than a competitor. Consequently, this is important because, in today's society, most individuals expect warranties, quick, and efficient repairs on vehicles and components. Due to this, a reverse logistics program is almost mandatory, otherwise, there might not be any sales (Subramoniam et al., 2009). Likewise, Bertel O. Steen focuses on delivering their products and services as effectively and efficiently as possible, hence their major investments in warehouse facilities and recycling processes. In addition, Bertel O. Steen mentions that customer focus is essential in their day-to-day business, and they strive to improve their customer satisfaction and loyalty. Due to these goals, and their investments, they are able to assure the availability of components for dealerships and workshops across the network when needed in a quick and simple way.

Furthermore, Bertel O. Steen state that they use their data-driven technology to gather products that might need to be returned from their dealerships/customers, because of overstock purchases. Due to this technology, Bertel O. Steen is able to incorporate transparent communication processes with customers and reduce overall waste. Subramoniam et al. (2009) believe that environmental concerns have been heavily focused on lately, thus making reverse logistics a way of aligning with customer values. To be able to implement a good reverse logistics program, transparency and corporation are key (Govindan & Bouzon, 2018). Nevertheless, this theory aligns with Bertel O. Steen's assumptions on how to implement a reverse logistics program.

Even though Bertel O. Steen does not mention anything about the increased possibility of customer feedback from reverse logistics. Subramoniam et al. (2009) believe that reverse logistics is a good way of capturing customers' expectations and wishes for further development. By actively seeking customers' feedback from a reverse logistics program, they can analyse different components and gain insight into which areas need more improvements and further investments. Resulting in further innovation and increased customer satisfaction and competitive advantage.

Moreover, Bertel O. Steen identifies a potential in recycling materials as a risk mitigation strategy, where they are able to safely collect raw materials from returned products, rather than other suppliers. In other words, the supply chain does not need to be reliant on other suppliers, because they are able to gather the materials themselves. Larsen et al. (2018) elaborate that a reverse logistics program has the same potential as Bertel O. Steen mentions. In addition, both Larsen et al. (2018) and Bertel O. Steen also identifies returned products as a potential for further sales, where they can be refurbished or remanufactured.

Considering supply chain optimisation and how the implementation of reverse logistics affects the overall operations, some theories and Bertel O. Steen consider different perspectives. Bertel O. Steen and Dowlatshahi (2012) agree on the fact that they need more space for product returns and the cost increase in administrative and operational processes connected with reverse logistics. While Larsen et al. (2018) mention that there are start-up costs and other costs related to reverse logistics, they also identify the possibility of reducing other cost segments because of reverse logistics, such as reducing raw material expenses, legal penalties, and also the potential of selling returned materials and products.

In addition, there are several potential drivers of supply chain optimisation from reverse logistics, namely, improved visibility, inventory management, forecasting, supplier partnerships, transportation/logistics, lean and agility, and continuous improvements (Genchev, 2009; Turrisi et al., 2013; Krapp et al., 2013; Govindan

& Bouzon, 2018; Ullah, 2023; Musa et al., 2014; Kumar et al., 2009). However, even though reverse logistics has the potential in improving supply chain operations, theory discusses that if reverse logistics is not handled correctly, the outcome can be less visible, create more complex inventory solutions, and be too costly to operate. In other words, if reverse logistics is not handled correctly, the negatives outweigh the positives (Tibben-Lembke & Rogers, 2002; Turrisi et al., 2013).

Lastly, Rogers and Tibben-Lembke (2001) believe that gaining a competitive advantage is the strongest driver for implementing reverse logistics processes. Similarly, Bertel O. Steen mentions that they used their reverse logistics program as a way of distinguishing themselves from other competitors. Due to this, they were able to establish a competitive advantage. By examining the theory it is possible to assume that most of the drivers mentioned result in gaining a competitive advantage or staying competitive.

5.2 RQ2: To what extent has the automotive industry incorporated good reverse logistics practices?

Bertel O. Steen has implemented storage systems and efficient procedures to manage their reverse logistics operations. They have invested in waste management, recycling, and warehouse facilities to minimise waste and maximise sustainability. Bertel O. Steen's 2019 transition to a new logistics centre emphasised waste management and recycling, achieving a 92% sorting ratio. The company also uses reusable containers and packaging to reduce waste and aligns with its sustainability objectives. Autoretur, a Norwegian scrapping company, contributes to a circular economy by recycling and repurposing scrapped vehicles, promoting a more sustainable future for the automotive industry. The implementation of core value products incentivises remanufacturing and a closed-loop system.

Chan et al. (2012) identify refurbishing, remanufacturing, and recycling as the most common product recovery methods in the automotive industry. This can be seen in relation to OEMs' dedication towards incorporating reverse logistic practices. Further, it is possible to assume that OEMs usually are the leading organism in the supply chain which incentives the incorporation of reverse logistic practices (Fleischmann et al., 2000). Hence their integration of different return types, namely end-of-life-, commercial-, warranty-, scrap and by-product-, and packaging returns. These return types are essential in understanding today's incorporation of reverse logistic practices (Fleischmann, 2001). In addition, each type is identified under different reasons for product returns, referred to as manufacturing-, distribution-, and customer returns. All these elements and categorisations aid reverse logistic programs to incorporate good practices since they add structure and solutions (De Brito & Dekker, 2004).

Bertel O. Steen has made significant advances in effectively managing waste and increasing recycling rates, demonstrating their dedication to sustainable business practices. Their approach aligns with the concept of closed-loop systems, which emphasises resource reduction, reuse, and recycling (Ranta et al., 2018). By employing this strategy, they not only reduce waste but also contribute to the circular economy, as evidenced by their partnership with Autoretur, which resulted in a remarkable 97% recycling rate for end-of-life vehicles (Evangelopoulos et al., 2018). These initiatives demonstrate their commitment to circular economic principles and resource conservation. However, Erol et al. (2010) elaborate that not all reverse logistic processes within the automotive industry are as fluid. Due to low incentives from some countries, and reverse logistics being in the beginning phase, it can be challenging to incorporate good reverse logistics practices. Erol et al. (2010) and Mathivathanan et al. (2018) illustrate this with Turkey and India in their respective articles.

The automotive industry's pursuit of a circular economy aims to improve resource efficiency while minimising environmental impacts (Evangelopoulos et al., 2018; Ranta et al., 2018). Bertel O. Steen has adopted this strategy by optimising their production processes, reducing waste generation, and maximising the reuse of components. By conserving natural resources and reducing expenses, they not only contribute to a more sustainable future but also strengthen their market competitiveness (Evangelopoulos et al., 2018; Williams, 2006).

The recycling of plastics derived from vehicles is a particular area of interest for Bertel O. Steen, as it addresses the expanding problem of plastic waste accumulation (Vieyra et al., 2022). Their commitment to sustainable waste management practices encourages the responsible use of resources and reduces the environmental impact of plastic waste (Vieyra et al., 2021). By implementing these initiatives, Bertel O. Steen not only demonstrates their environmental responsibility but also functions as a model for other businesses in the industry.

The primary objective of green logistics is to minimise the environmental impacts associated with transportation, production, and warehousing activities (Rogers & Tibben-Lembke, 2001). This was one of the factors that motivated Bertel O. Steen to relocate and construct a new warehouse that aligns with these requirements. The empirical findings reveal the growing importance placed by the focal company and its industry on consumer awareness of environmental conservation. An illustration of this is the incorporation of eco-labelling as a component of their marketing strategy. Additionally, the diminishing availability of natural resources and the increasing amount of waste emphasise the importance of prioritising resource reuse, waste reduction, and pollution prevention.

Overall, the progress made by Bertel O. Steen in waste reduction and increased recycling rates reflects their dedication to sustainable practices in the automotive industry. Through their adherence to circular economy principles, optimisation of production processes, and recycling initiatives, they actively contribute to resource efficiency, cost reduction, and environmental preservation. By embracing these practices, Bertel O. Steen sets a positive example for the industry, demonstrating that sustainable business models are not only environmentally responsible but also economically advantageous.

5.3 RQ3: What are the current challenges of reverse logistics in the automotive industry?

The findings from the literature reviews provide valuable insights into the challenges and opportunities associated with reverse logistics in the automotive industry, particularly in relation to the treatment, disposal, and transportation of vehicles and automotive components. These findings highlight the significance of following regulations, establishing structured reverse logistics programmes, and addressing internal and external constraints for the success of reverse logistics initiatives. In addition, the literature review emphasises the growing importance of reverse logistics in the context of EVs and the complexities associated with the handling and recycling of EV batteries.

The analysis of the findings from the literature reviews reveals several key themes and implications. Firstly, compliance with regulations is crucial in reverse logistics operations, particularly in the treatment and disposal of hazardous substances and the handling of EV batteries (Schultmann et al., 2006). As the sales and production of EVs continue to rise, there is a corresponding increase in waste generated from batteries and plastics (Vieyra et al., 2022). It is for this reason that Bertel O. Steen has placed significant focus on their waste management facilities and the responsible handling of battery reuse, repair, and recycling. These efforts align closely with the views expressed by Williams (2006) regarding the importance of sustainable practices in this context.

Not only is the treatment and disposal of hazardous substances and EV batteries complicated because of laws and regulations, but also its specifications. For instance, EV batteries contain lithium and aluminium, which are elements that are challenging to collect and recycle because of their presence in the slag (Or et al., 2020). In addition, most EV batteries are heavy and come in different sizes, making them complicated to store and transport. Bertel O. Steen emphasises that the increase in product returns of EV batteries was one of their most challenging endeavours for future progress, because of storage complications and transport regulations. During the interview, Bertel O. Steen explained that large batteries could only be transported with two batteries in height. In other words, trucks were not possible to fill up, because of these regulations. In addition, they had to store the returned batteries in separate storage rooms in order to minimise potential fire occurrences. Lastly, Bertel O. Steen also mentions that it was not permitted to transport batteries on passenger ships by sea, making logistics planning and execution complicated.

Following storage challenges, Dowlatshahi (2012) states that the increase in reverse logistics processes could increase the need for more warehouse space. Thus incentivising more costs and time. This can be seen in relation to Bertel O. Steen's investments towards a modern and large warehouse which has the possibility to store large amounts of returned products. Furthermore, due to the number of different products and customers, return order flows may become even more complicated. This is a result of different sizes, packaging specifications, materials, shapes, and weights. All these affect the way an organisation is able to store, transport and dispose of specific products. In regards to Bertel O. Steen, they identified similar issues, especially the complications of packaging specifications, sizes and shapes which made it difficult to store and transport.

Furthermore, uncertainty is a key barrier to reverse logistics in the automotive industry. Bertel O. Steen mentions that the different products could have different damaged conditions or quality, making it complicated to know what to do with the product. Nevertheless, even though this is a challenge, it is possible to reduce its effect by incorporating experienced workers and systems that mitigate the risk of wrongdoings related to the topic. Additionally, Carter and Ellram (1998) mention that a reverse logistics system hardly can expect when a component is returned, hence the increase in uncertainty towards forecasting potential product returns.

Tibben-Lembke & Rogers (2002) also emphasise the lack of effective reverse logistics information systems, which reduces the impact a reverse logistics process could have. To illustrate, by introducing effective reverse logistics information systems, organisations are able to get feedback, which could aid in analysing and improving further product quality. In addition, removing the challenge of lack of information systems could provide more efficient returns, and result in cost reduction of transportation and storage.

There are also challenges concerning waste disposal in the automotive industry. Yu & Chau (2009) mention that there is one usual method of waste disposal in the automotive industry, namely converting heat energy into electric energy. In addition, when recycling industrial waste, consideration towards the industry, production, technical feasibility, competitiveness of products, and economic benefits should be inspected. Proper waste disposal is achieved by treating and disposing of waste without causing harm to the environment. This process can be challenging in the automotive industry, because of hazardous materials and complicated disabling processes.

In addition, Carter and Ellram (1998) elaborate on several constraints which can be challenging for a reverse logistics program. Firstly, “Quality of inputs” can be challenging because it is not easy to persuade procurement managers that recycled materials are of the same quality as raw materials. “Vertical coordination” can be complex due to the lack of transparency, caused by parties afraid of losing competitive leverage or sensitive information. However, Li et al. (2023) also believe that an increase in uncertainty can aid the relationship to a more transparent coordination system between customers and suppliers, which is essential in an effective reverse logistics program.

“Stakeholder commitment” can become a major challenge for organisations, if not all stakeholders are committed. Bertel O. Steen mentions this as one of their challenging endeavours where some manufacturers do not want to receive unused parts. In other words, rather than bringing it back to the suppliers, Bertel O. Steen has to keep the product, which can facilitate more inventory costs and space. Further, Bertel O. Steen identified that product returns reduce turnover which the manufacturers are measured on. To simplify, some manufacturers do not want to implement reverse logistics practices, because it reduces their achievements. On the other hand, it is possible to assume that manufacturing companies are usually the incentive party in the supply chain towards reverse logistics, due to several advantages. Nevertheless, this illustrates that not all manufacturers incentivise reverse logistics practices even though it might provide several benefits.

“Top management support” is another important constraint. By removing top management support, the organisation would focus elsewhere, and result in no implementation or no continuous reverse logistics processes. This constraint aligns with the general perception, and it is safe to assume that it would affect Bertel O. Steen as well. The “Incentive systems” constraint could be essential when incorporating reverse logistics activities, due to its rewarding system. Simultaneously, this constraint is even more relevant from the perspective of Bertel O. Steen related to the core value system, which pushes Bertel O. Steen to implement reverse logistics in order to gain the core value back.

In addition, even though Larsen et al. (2018) mention that there are possible economic drivers of reverse logistics in the automotive industry. It needs to be discussed that implementing a reverse logistics program is costly and time-consuming, especially in the start-up phase. Bertel O. Steen also mentioned that they do not gain significant profits from their reverse logistics program. To simplify, in some cases where the business cannot afford to implement reverse logistics practices, there would be economic challenges.

Lastly, theory and Bertel O. Steen emphasise the importance of managing reverse logistics practices properly. By doing so, organisations can achieve several benefits, as mentioned previously. However, by avoiding managing reverse logistics properly, companies might find themselves losing the benefits, and in addition adding complex, costly, and time-consuming reverse flows.

6.0 Conclusion

6.1 Main Conclusion

Bertel O. Steen has developed a reverse logistics program as a response to stakeholder expectations and sustainability goals. In order to reach its sustainability goal, Bertel O. Steen tries to establish a long-term relationship with its stakeholders and society and minimise their environmental footprint. However, even though reverse logistics systems have been applied successfully in several industrial organisations, a review of the literature reveals that the benefits of using reverse logistics in emerging economies are not thoroughly understood. Hence, the objective of this thesis was to investigate why the implementation of reverse logistics is important, its incorporation, and its challenges in the automotive industry.

Theory and Bertel O. Steen have mostly common assumptions on why it is important to implement a reverse logistics program in the automotive industry. Both focus on sustainability factors, by reducing environmental footprints, and at the same time consider economic and social factors. In addition, they elaborate on the potential benefits, such as reducing legal penalties, increasing customer satisfaction, supply chain optimisation, and in the end increasing competitive advantages. However, there is a difference between Bertel O. Steen and the theory regarding the supply chain optimisation of reverse logistics. As mentioned previously, Bertel O. Steen identifies costs from reverse logistics program and states that they do not to a high degree increase their overall profits, while Rogers & Tibben-Lembke (2001) believes that there are high-profit potentials from reverse logistics. Furthermore, Bertel O. Steen does not mention anything about feedback functions from their reverse logistics program, while Subramoniam et al. (2009) identify this as a key driver to implementing reverse logistics. It is possible to assume that these drivers mentioned by theory are referring to manufacturing operations, due to the access to cheaper recycled materials, and the possibility to change their products from feedback.

Even though the theory usually touches base on manufacturing corporations, it is possible to conclude that importers and retailers gain similar benefits. In addition, Vermeulen et al. (2012) state that every partner within a reverse logistics program is critical for the program to strive. To simplify, Williams (2006) mentions that automotive manufacturers focus on establishing reverse logistics programs to reduce their environmental footprint, which may lead to pressure on retailers to implement reverse logistics practices. Both theory and Bertel O. Steen believe that it is important to implement reverse logistics in the automotive industry based on sustainability considerations, compliance, customer satisfaction and loyalty, supply chain optimisations, and lastly gaining a competitive advantage or staying competitive.

The empirical findings highlight how Bertel O. Steen implements various practices alongside their suppliers and partners to promote sustainability and green logistics. By incorporating a closed-loop system, Bertel O. Steen can reduce, reuse, and recycle resources. The theory identifies the usage of different types and understanding of the reason for product return as a key element to incorporate good reverse logistic practices, This can reflect in Bertel O. Steen's dedication and progress towards sustainable waste management practices. Nevertheless, even though Bertel O. Steen has implemented good reverse logistic practices, theory identifies that some automotive organisations struggle with incorporating good reverse logistics due to low incentives and being in the beginning phase.

Both theory and Bertel O. Steen identify the challenges of reverse logistics. EV batteries and hazardous substances, which are getting more common, can be a challenging endeavour due to laws and regulations on how to store and transport them. An increase in reverse logistics processes creates challenges in the form of the need for more storage space and complex processes. In addition, reverse logistics can increase uncertainty due to a lack of information systems, which also makes forecasting product returns difficult. There are also waste challenges, on how to dispose of the increase in returned products, such as EV batteries and hazardous materials. In some cases, there can also be economic challenges, due to the cost of a reverse logistics program. Carter and Ellram (1998) point out the quality of inputs, vertical coordination, stakeholder commitment, top management support, and incentive systems as key constraints. If these constraints are not present, there would be challenges in implementing or continuing reverse logistics practices. Lastly, a challenge can also occur if the reverse logistics process is not handled correctly, which can cause costly, time-consuming, and complex reverse flows.

6.2 Limitations

The scope of this study has specifically focused on a single organisation, Bertel O. Steen, with whom we have engaged. However, due to the limitations of time and resources at our disposal, conducting a broader examination encompassing multiple companies was not possible. In addition, most theory is based on reverse logistics from a manufacturing, distribution, or general point of view in the automotive industry. Thus making it complicated to establish clear links between theory and findings, since Bertel O. Steen is an importer and retailer. Moreover, since the data collection process did not consist of any specific data, it may lead to some bias in specific areas.

6.3 Further Research

In order to further enhance the research, there are several areas that could be explored for future investigation.

Firstly, expanding the scope of data collection to include a broader range of companies would provide a more extensive understanding of the subject. By comparing the reverse logistics practices of multiple companies, more comprehensive findings can be obtained.

Secondly, delving deeper into the specifics of returns, such as categorising and analysing the different types of returns, would provide valuable insights into the challenges and opportunities associated with each category. This could involve examining the reasons for returns, the condition of returned products, and the frequency of different types of returns.

Additionally, exploring the perspectives of Bertel O. Steen's third-party logistics providers would offer a valuable perspective on the effectiveness and efficiency of the reverse logistics processes. Engaging with these providers would enable access to additional valuable data and insights, contributing to a more comprehensive analysis.

By incorporating these aspects into further research, a more comprehensive and nuanced understanding of reverse logistics practices can be achieved, thereby strengthening the overall findings and recommendations of the thesis.

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Appendix 1 - Template of Bertel O. Steen Interview

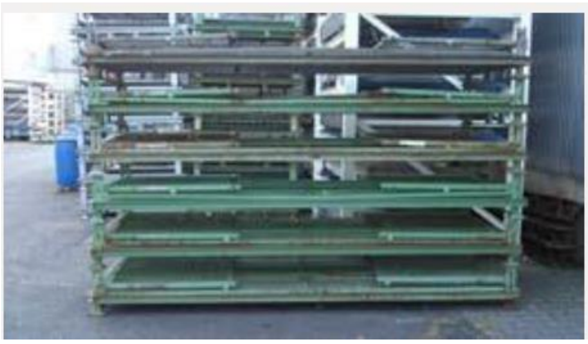
General questions
1. How important is the issue of sustainability and environmental impact to your dealership and the automotive industry as a whole?
2. How do you currently handle the disposal of vehicles that have reached the end of their life cycle?
3. Is the process the same for all products/parts? If so, what are the differences?
4. How do you stay up-to-date on industry trends and best practices related to sustainability and logistics?

RQ1: Why is the implementation of reverse logistics important in the automotive industry?
1. Can you describe what reverse logistics means in the automotive industry?
2. In your opinion, why is reverse logistics important for the automotive industry?
3. How does the implementation of reverse logistics affect the overall operations of a car dealership?
4. Can you provide an example of how reverse logistics has helped Bertel O. Steen in the past?
RQ2: To what extent has the automotive industry incorporated good reverse logistics practices?
5. How does your dealership incorporate reverse logistics practices into its operations?
6. How do you measure the success of your reverse logistics practices?
7. Have you seen an improvement in your operations since incorporating reverse logistics practices?
8. How do you compare your dealership's reverse logistics practices to other dealerships in the industry?
RQ3: What are the current challenges of reverse logistics in the automotive industry?

9. What challenges have you faced when implementing reverse logistics practices?
10. How have you addressed these challenges?
11. Are there any current challenges in the automotive industry that affect the implementation of reverse logistics practices?
12. How do you plan to overcome these challenges?

Appendix 2 - Reusable Containers and Packaging

Picture 1: Reusable plastic containers for small to medium-sized products



Picture 2: Big containers/boxes used for transport