Analysis on Application of Reverse Logistics on Global Supply Chains

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Abstract: - The research focuses on the analysis of the role of reverse logistics in supply chain management operations. Reverse logistics can be regarded as an essential process of supply chain management that is associated with the movement of goods from the customers to the sellers or the manufacturers. It is associated with the return and recycling of the products. It is an essential part of supply chain operations to maintain an efficient flow of goods that is also associated with the cost-saving, value creation, and risk mitigation of the companies associated with the supply chain operations. The current study also examines the factors influencing the implementation of reverse logistics within a company, the current trends and technologies used in the reverse logistics process, the profitability aspect of this process to the company, and finally, finding the ways to improve the process. Secondary method and the quantitative method were adopted within the research, that enabled acquiring required outcomes from this research work. In addition, the deductive approach and the inductive approach have been applied for intermingling self-generated and pre-existing concepts and theories. The descriptive design has been applied for linking the different segments of the research topic. The positivism research philosophy has been applied for the purpose of shedding light on the positive impacts of reverse logistics on the management of supply chain operations.

Key-Words: - Reverse Logistics, Global Supply Chains, Technology, Industry 4.0, Digitalisation, Project Management, Logistics Management, Circular Economy

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1 Introduction

Reverse logistics has emerged as a pivotal component within contemporary supply chain management, warranting extensive research attention. It encompasses the strategic processes of retrieving, recycling, and refurbishing products after their consumption, aiming to optimise resource utilisation, reduce waste, and enhance sustainability. This research delves into the multifaceted realm of reverse logistics, elucidating its role in mitigating environmental impacts, improving operational efficiency, and fostering competitive advantage. By exploring diverse industries and innovative methodologies, this study aims to contribute to a comprehensive understanding of how reverse logistics augments modern supply chains, paving the way for more resilient and eco-conscious business practices. Just like general logistical operations, reverse logistics have also a poignant impact on the environment. Customers return some defective products to the seller that needs any sort of repair. The product gets repaired and repackaged and then again, it is delivered to the customer. The process is known as reverse logistics and it's a bit complicated and time-consuming process (Kazancoglu, et.al., 2021). Moreover, if an organisation needs to undergo frequent reverse logistics, there is a potential threat regarding the degradation of its reputation. However, the reputation can be recovered if, the organisation can fulfil the basic criterion of sustainable development goals (SDG) even in its reverse logistical operations (Ahmed and Zhang, 2021). If the warehouse can be maintained properly, less amount of carbon is emitted and green packaging can be introduced in reverse logistics, it will fulfil the SDG goals. Reverse logistics includes activities related to returns, source reduction, recycling, materials substitution, reuse of materials and products, waste disposal, refurbishment, repair, and remanufacturing, in contrast to forward logistics, which concentrates on the unidirectional flow of materials and goods from suppliers to manufacturers to distributors to retailers and ultimately customers (Pokharel and Mutha, 2009). In a reverse supply chain, techniques like reuse, remanufacturing, and refurbishing help in recovering value from products, while recycling and reprocessing assure correct disposal and reduce waste.

1.1 Research Problem and Objectives

Effective Implementation of reverse logistics has become increasingly imperative for organisations seeking to optimise resource utilisation, minimise waste, and enhance sustainability within their supply chains. However, several challenges hinder the successful integration of reverse logistics practices. Many companies lack a comprehensive understanding of the potential benefits and implications of reverse logistics. According to a survey by the Reverse Logistics Association, 35% of respondents indicated that their organisations had limited awareness of reverse logistics practices, leading to missed opportunities for cost savings and environmental impact reduction (Sharma, et.al., 2021).

Compliance with stringent environmental regulations and product-specific requirements presents a substantial hurdle. For instance, the electronics industry must adhere to e-waste disposal laws, adding complexity and cost to reverse logistics operations. In the European Union, the Waste Electrical and Electronic Equipment (WEEE) Directive mandates proper disposal and recycling of electronic products. The absence of advanced technologies, such as IoT-enabled tracking and data analytics, hampers efficient reverse logistics execution. A report by DHL indicates that only 24% of companies use advanced data analytics for reverse logistics, resulting in missed opportunities for optimising return processes (Dhl, 2022).

Complex supply chain networks often lead to fragmented reverse logistics operations, affecting coordination and visibility. This issue is particularly evident in industries such as pharmaceuticals, where product recalls and expired medicines necessitate a seamless reverse supply chain. The Healthcare Distribution Alliance reported that improper reverse logistics practices in the pharmaceutical sector contribute to billions of dollars in losses annually. Quantifying the financial effects and profitability of reverse logistics implementation remains a challenge. Organisations struggle to measure the return on investment (ROI) for reverse logistics initiatives, hindering strategic decision-making. A study by the Council of Supply Chain Management Professionals found that only 19% of companies actively measure the ROI of reverse logistics activities (Singh, 2020). Implementing reverse logistics often requires a shift in organisational culture and mindset.

1.2 Research Aim and Objectives

Employees and stakeholders may resist these changes, impeding the integration of sustainable practices. For instance, a study published in the International Journal of Production Research highlighted employee resistance as a major barrier to implementing reverse logistics in the automotive industry. So, the objective of this present study is:

1. To identify the key factors for influencing the successful implementation of reverse logistics
2. To analyse the latest trends and technology in reverse logistics
3. To evaluate the possible financial effects and profitability related to applying the suggested reverse logistics techniques in supply chain
4. To give suggestions for implementing and integrating reverse logistics practices into their supply

2 Literature Review

The section examines literature on the use of reverse logistics in the management of supply chains. Reverse logistics is associated with the management of a green supply chain, which therefore, helps in the process of ensuring that the products move from their destination to the proper places, for obtaining the satisfaction of the customers. This section revolves around the factors that affect the successful implementation of reverse logistics. Moreover, the latest trends that are associated with reverse logistics are also presented in this section, based on the existing literature. This section also sheds light on the impacts of reverse logistics on the profitability and financial health of business entities. Moreover, this section also presents suggestions to business entities regarding the use and implementation of reverse logistics, which can help in enhancing the performance of the companies. Theories are also furnished, which addresses the different aspects of reverse literature.

2.1 Earlier Research Studies

Previously, several research works have been conducted on reverse logistics, which can be applied in managing the supply chains of businesses. The previous research works have portrayed the different aspects of reverse logistics such as refurbishing and remanufacturing. As discussed by the authors Muhammad and others, reverse logistics was mainly used for management of the E–wastes in the households (Muhammad, et. al., 2020). It has also been studied that reverse logistics have brought about improvement in business operations by improving logistics operations. Moreover, previously it was also discussed that reverse logistics helped in earning the satisfaction of the customers, thereby generating brand loyalty and reliability of the customers on the different brands. The studies mentioned that the different components of reverse logistics are used for upgrading the quality of the returned products and

reselling these, for generating higher value in the market (Wijewickrama, et.al, 2021). It is also mentioned by the authors Voigt and others that reverse logistics was used for assessing the performance of the business operations, I order to make informed decisions regarding the strategies that can help in polishing the business offerings and the customer services (Voigt, et. al., 2019). Therefore, the previous literature sheds light on multiple dimensions of reverse logistics.

Due to many regulatory, corporate social responsibility, economic, and environmental concerns, reverse logistics has become a key consideration for businesses. Extended producer responsibility (EPR) regulations, which hold organisations responsible for the end-of-life disposal or recycling of their products, have been one of the key factors (Abdulrahman, et.al., 2014). These regulations enforce specific take-back and recycling standards, particularly for electronics, appliances, and packaging, in the European Union and some US states. Establishing up reverse logistics capabilities is necessary for compliance.

Reverse logistics is being used by organisations to reduce their carbon footprint, energy consumption, and waste generation across the lifecycle of their products because of sustainability concerns and corporate social responsibility objectives (Bernon, et. al., 2018). Companies understand that implementing closed-loop, cradle-to-grave supply chains improves brand reputation and image by having a beneficial social and environmental impact. Additionally, there are financial incentives to create circular economy business models that recover value through product reuse and remanufacturing in a reverse cycle when resources become scarcer (Souza, 2013).

Other market factors include possible cost savings from collecting product returns as well as extra revenue streams from selling refurbished goods, recycled materials, and spare parts harvesting (Dayanandi, et. al., 2021). Product return rates have increased because of the expansion of e-commerce, offering chances for reducing losses through effective reverse logistics. Recalling defective automobiles comes at an enormous cost to automotive companies but these costs can be reduced by using established reverse networks. Consequently, motivating factors include anything from value generation to regulatory compliance.

Research gaps

Despite the various research conducted in the past, it has been found that the effectiveness of applying reverse logistics in managing the supply chains have not been focused on by any of the authors or research workers. The ways by which the application of reverse logistics in the supply chain can enhance the profitability and the financial health of the businesses have not been studied and hence addressed in study.

2.2 Current Literature Evidence

The concept of reverse logistics can be identified as the movement of goods and services through supply chain management from customer to seller and returning it from user to manufacturer. According to studies (Kaviani, et.al., 2020), it can be stated that the main motto of reverse logistics has been highlighted as return, repair, recall, recycling as well as repackaging. Moreover, the main factors for reverse logistics can be identified as transportation, packaging, accidents, storage and so on that creates a higher impact on the business efficiency to maintain reverse logistics in supply chain management (Balaji, et.al., 2024).

Telematics technology adoption has made it possible for new reverse logistics techniques that increase the effectiveness and efficiency of returns management. Telematics is the term used to describe combined applications of telecommunications and informatics to vehicles and the transportation system (Giannopoulos, 2004). Telematics in reverse logistics allows for real-time tracking of the location of the vehicles and the progress of the returned shipments (Wang and Chen, 2017). Data about goods and assets in transit is provided via global positioning systems (GPS), onboard devices, and RFID tags (Nikolikj and Perakovic, 2016).

Influencing Successful Reverse Logistics

The focus on reverse logistics can be associated with the application of a return policy, remanufacturing policy, proper waste disposal and so on. However, the application of reverse logistics in the development of effective supply chain management can help to maintain efficient supply chain management that creates value recovery and develop combination activities to maintain redistribution and create sustainable return management for a successful business.



Fig. 1: Traditional Forward vs. Reverse Logistics
Source: created by the authors.

Previous studies (Jayasinghe, et.al., 2019) has highlighted the fact that reverse logistics helps to create positivity in the business supply chain that associates with a high rate of productivity and efficiency. It can help to develop a more effective business. The application of the business for Amazon can highlight the aspect of reverse supply chain management through efficient logistics for returning policy that creates cost and time-saving processes for customer satisfaction. Moreover, reversing the logistic policy of Amazon also associates with reused product sales by repairing and repackaging which makes effective profitability and saving of money. The availability of sufficient resources is one of the factors that affect the successful implementation of reverse logistics in the supply chain. The availability of skilled technicians who have robust knowledge on the use of technologies for managing online product return requests and processing the return shipments is highly important.

Trends and Technology Advancement

The focus on the application of reverse logistics has been associated with the application of circular economy as well as robotics in the business process. The increase in the e-commerce business can help to develop more effective reverse logistics and make sustainable growth of the business using advanced technology. The research (Plaza-Úbeda, et.al., 2020) has suggested the fact that the application of RFID technology can help to improve the effective logistic and maintain the supply chain management that can help to follow the trends to maintain sustainability and apply the strategy to make a circular economy. It can help to create more effective business and follow the market trends of reverse logistics as shown in figure 3.

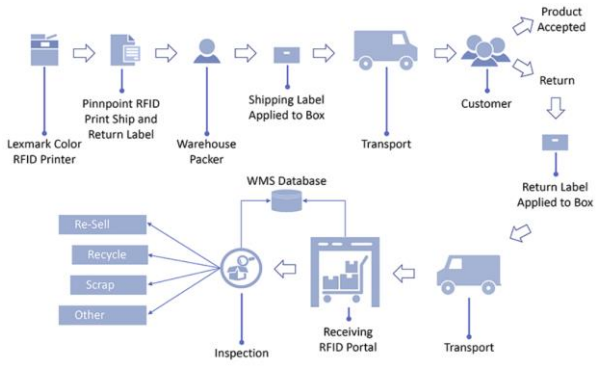


Fig. 2: RFID technology used in Reverse Logistics (rfid.averydennison.com/, 2022)
Source: created by the authors.

Moreover, as per studies (Makarova, et.al., 2021), it can be stated that the application of robotics through AI can help to maintain efficient supply chain management. It is associated with maintaining OLAP technology to create proper analytical aspects that can help to maintain efficient reverse logistic trends in the business of the contemporary era. Moreover, the application of OLAP can help to maintain the practice of applicability of business intelligence that helps to set robotics in the supply chain management and creates sustainability by saving resources and providing more accurate service trends for reverse logistics. Thus, the application of RFID technology and OLAP technology can help to increase more cost-effective and efficient applicability for reverse logistic that makes a sustainable supply chain while maintaining a circular economy. An example research framework for digital technologies in reverse logistics is shown in figure 3.

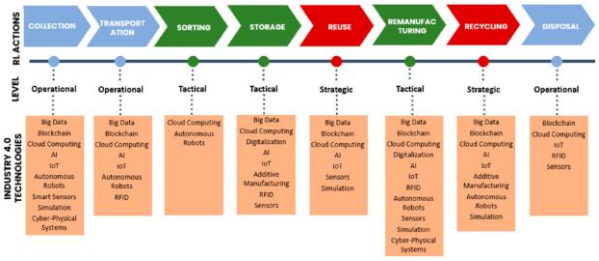


Fig. 3: Framework for Digital Technologies in Reverse Logistics Action (Rodrigues, et.al., 2025)
Source: created by the authors.

Automations are highly used in reverse logistics. Automatons are being used for receiving the online product return requests (Solanki, Shah, Hasan, 2024). Moreover, automations are also used in the identification of the identities of the customers requesting the product returns. The other trend in reverse logistics is the use of cloud storage. Cloud storage is often used by the companies for storing the information regarding the product return reasons and the IDs of these return requests.

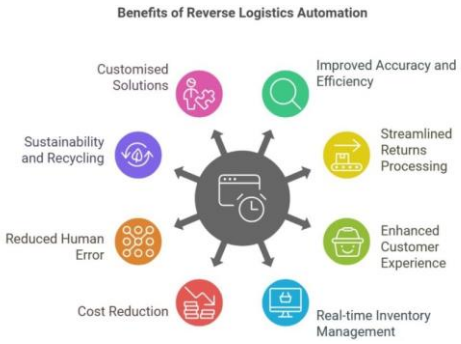


Fig. 4: Benefits of Reverse Logistics Automation (
Source: https://addverb.com/blog/reverse-logistics-automation-for-warehouse-efficiency/)

Cloud storage is being used in the process of storing other information regarding the return and exchange policy, the number of products returned, the number of online product return requests received, and so on (Pawar, et.al, 2025).

Evaluation of Reverse Logistics Application in Global Supply Chains

Reverse logistics deals with the picking up of the already delivered or sold products from the end customers, in case of any defects in the products or the products, do not meet the requirements of the customers. In the case of defective items that have been sold out and delivered to the customers, the products are picked up from the end users and then remanufactured or refurbished, making the product suitable for reselling to the customers. Such reverse logistics can help in earning the satisfaction of the customers, by enhancing the quality of operations of supply chains of the different companies, as mentioned by studies (Russo, et.al., 2019). Therefore, the financial performance of the business can be improved with the help of the application of this reverse logistics in managing the tasks of the supply chain. This is because, the successful pick up of the products, renovation of the products and reselling of the products earn the satisfaction and trust of the customers, which in turn indulge the customers to repurchase the products of these companies. Moreover, reverse logistics also enables the customers to exchange the products and get them replaced with the precise one and the product that they require as per the words of the authors Asha and others (Asha, et.al., 2022). This also enhances brand loyalty, which affects the sales of the products of the companies. In addition to these, it has been found that the sales of the retail industry in the UK have increased by 1.5% in the year 2022, in comparison to the year 2021, with the help of the application of this reverse logistics as shown in figure 5. Reverse logistics has been able to enhance the satisfaction of the customers by providing them opportunities to exchange and retire the products that they received, based on the requirements and complaints (Pawar, et.al., 2025).

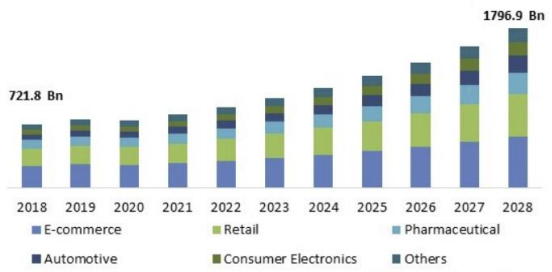


Fig. 5: Advantages of Reverse Logistics (kbvresearch.com, 2022)
Source: created by the authors.

In a similar way, the sales of the automotive industry and the consumer electronics industry are also found to be increasing by 1% to 1.5% in the year 2022, when compared with the year 2018. This indicates that the profitability of the business entities can be found to be increasing due to the successful application of reverse logistics in the supply chain, which enhanced the revenue generation of the companies (Astete, 2022). Moreover, the profitability of these industries in the UK is also predicted to increase by 2.3% within the year 2028, through the implementation of reverse logistics. Reverse logistics helps in the renovation of the defective items and enables the marketers to re-sell these items, which otherwise would have been losses of the companies.

Cost Optimization

The application of reverse logistics can help in reducing the transportation cost, because the returned defective items can again be renovated and resold, without extra expenditures in transportation required for obtaining new raw materials to produce new items. In this way the companies can become sustainable. Moreover, with the help of the right technical support that is required for carrying out reverse logistics operations, it can be identified that the operational costs of the different businesses such as Sainsbury's, and so on, have been reduced by considerable amounts (Lahane, et.al., 2020). Studies noted that the operational costs of Sainsbury's are lower to Tesco by 1%, owing to the use of reverse logistics in 2020.

Reverse Logistics Integration in Supply Chains

To implement reverse logistics successfully, certain actions can be performed by the business entities. One of the most important ways by which reverse logistics can be used for managing the supply chains with the help of reverse logistics is by using Artificial intelligence. Artificial Intelligence can be used for the purpose of processing the return of products. Artificial intelligence can be used for receiving the signal of product return or exchange from the customers, as soon as it is requested by the customers. Moreover, his technology can be implemented for the identification of the reason for the product return and matching the reasons with the conditions of the products. This can help in ensuring that the product return requests from the customer end are valid and facilitating the further return and exchange operations by the supply chain executives. As mentioned by the authors Dhamija and Bag, the scheduling of the return shipments and approving the return requests can be carried out with the help of Artificial Intelligence (Dhamija and Bag, 2020).

Integration of Artificial intelligence with reverse logistics can help in enhancing the return and exchange procedures (Shah, Chen, Ganji., 2024)



Fig. 6: Reverse Logistics Integration
Source: created by the authors.

Establishing a centralized return centre can be another way by which reverse logistics can be improved and integrated with the business operations. This centre can be used for renovating the defective items and identify the appropriate fate of the products that have been returned by the customers. Furthermore, the centralized return centre can also be used for identification of the best method by which the returned product can be restored and renovated to make it suitable for selling it again. Therefore, this centralized centre can be used for creating a higher value of the product, when it shall be resold in the market.

Implementation of Big Data can also be used for implementing reverse logistics successfully. Big Data can be used for collecting information regarding the returns of the products by customers. This technology can be used to collect information regarding the most frequent reasons, which are responsible for the product returns (Chalmeta and Santos, 2020). Therefore, the company can steer its manufacturing processes and quality checking processes, accordingly (Shah and Patil, 2024).

Establishing close collaboration with the suppliers can also help in enhancing reverse logistics operations. The suppliers can be kept motivated by providing bonuses and incentives. Close collaboration with the suppliers can encourage them to carry out their pick-up operations, efficiently, which in turn can help in generating customer satisfaction. The experience of the customers can be refined that can create brand loyalty, thereby bringing about a surge in the sales of the products.

2.3 Theoretical framework

Circular Supply Chain Theory

The Circular Supply Chain theory revolves around the recycling of products, without the use of new raw materials for manufacturing new products. The use of this theory relates to the use of the worn-out raw materials for the purpose of recycling the products or items, for selling, proposes. This theory can be used for addressing the reverse logistics operations. Since the reverse logistics operations are related to the picking up of the defective products from the customers and renovating them to restore the products for reselling, therefore, circular supply chain theory can help in recycling worn out raw materials for manufacturing new products (Frei, et.al., 2020). An example Circular Supply Chain theory is as shown in figure 7.

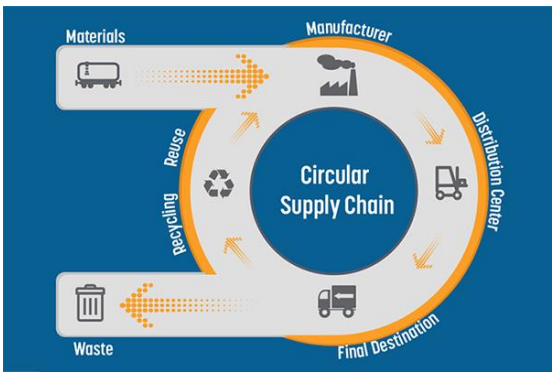


Fig. 7: Circular Supply Chain Theory (supplychain247.com/, 2021)
Source: created by the authors.

This can help in maintaining the sustainability of the businesses. This can help in reducing the requirement of raw materials and cutting down the transportation costs. Reduction of the transportation can help in reducing the emission of greenhouse gases, thereby making the businesses sustainable. This can help in recycling the returned products, thereby optimizing the operational costs. The 3Ps of sustainability are the planet, the people and profit. The application of this theory being discussed in reverse logistics can prove beneficial in managing the satisfaction of the people, quality of the environment and the profitability of the companies. Reverse logistics can help in reducing the requirement for transportation of raw materials. This can help in reducing the emissions from the businesses, thereby helping in the management of the supply chain, sustainably, thus reducing the carbon footprint of the businesses (Pawar, et.al., 2025).

Theory of Resource-Based View

As per the Theory of Resource-Based view, it can be noted that the behaviour of a company can be interpreted in the form of the outlook of the organisation, in terms of its competitive gain. The availability of resources can be used for obtaining

insights regarding the capability of the company to compete with the close competitors. The postulates of this theory can be related to reverse logistics. Reverse logistics require the availability of appropriate resources for proceeding with easy return and exchange operations. The resources that are essential are physical resources such as laptops, networks, smart phones, and so on. Financial resources are also required for hiring and paying wages to technical experts, who can process the online product return requests and the product return shipments (Chahal et al. 2020). The human resources can be used for the purpose of proceeding with reverse logistics operations. The application of this theory in reverse logistics can help the companies gain a competitive advantage over the other players in the market (Khanra, et.al., 2022). The application of this theory assists firms cope with the severe competition in the market (Pawar, et.al., 2025).

2.4 Conceptual framework

The conceptual framework helps in the identification of the dependent variables and the independent variables. The dependent variable in the case of this research topic is supply chain management and the independent variable is reverse logistics. Depending on the discussions in the sections furnished above, it can be identified that reverse logistics is an essential aspect in the management of supply chain, which is being nowadays implemented by many businesses in the United Kingdom. The use of reverse logistics has been found to enhance the profitability and the revenue generation of the business organisations. In addition, this concept also helps in reducing the operational costs of the business organisations. Moreover, the transportation costs of the businesses can also be reduced with the help of reverse logistics due to the recycling of the products and the raw materials. Therefore, as per the literature presented above, reverse logistics can help in reducing wastage, thereby ensuring better implementation of lean management in the supply chain (Pawar, et.al., 2025). The factors affecting the successful implementation of reverse logistics can be identified to be the efficiency of the labourers, and the availability of sufficient resources.

3 Research Methodology

Research methodology refers to the process by which the inquirers search. The different steps that are taken by the inquirer for completing the research and drawing the most relevant and accurate conclusions consist of the research methodology. The concepts and the thinking process of this individual during the process of conducting the research method are also included in the research methodology. The section on research methodology provides a detailed glimpse of the different procedures applied by the research individual while proceeding with this research work on the topic of reverse logistics in the management of the supply chain. This section sheds light on the research philosophy that has been utilised by the individual. The section also provides a description of the approach that has been applied to make the research work more informative and engaging. The research design is also presented in this section along with appropriate justifications for choosing the types of approach, design and philosophy. The procedure by which data has been acquired by the individual is also discussed with proper justifications. Along with these, the process by which the data has been analysed and the samples that have been selected by the inquirer are also the contents of this section.

Research Approach refers to the broader assumptions that are made by the researcher, to obtain the outcomes that are desired. It reflects on the step-by-step process of conducting the research study. The research approaches are indicative approach and deductive approach The inductive approach makes use of the self-generated concepts as well as theories that rely heavily on the information collected. The deductive approach makes use of the concepts and the theories that are collected from the books, articles or urinals For this research work, both the inductive and the deductive approaches have been used. The deductive approach has been used to ensure that the theories and concepts that are collected from the secondary sources are underpinned and well supported. The deductive approach has been applied for ensuring that the theories and concepts that have been generated based on the information gathered for aligning the outcomes regarding the financial impacts of reverse logistics on the organisations, are incorporated in the research work to improve its quality (Mulisa, 2022).

Research Design is referred to as a framework that helps in establishing connections between the different parts and variables of the research study. The multiple aspects of the research topic are interlinked with the help of this research design. Research designs are of three types that are explanatory, descriptive and exploratory. The explanatory research design explains all the facts and the information with the help of illustrations and theories. The descriptive research design allows describing all the variables of the research topic, thereby ensuring that all the segments

of the research study are vividly described (Rezigalla, 2020). The exploratory research design is used for the purpose of eliminating all the data that are not useful and can degrade the quality of the research topic. The descriptive research design has been utilised in this research work.

This research design has been selected to identify the trends in the use of reverse logistics in managing supply chain operations. Using this design can help in the identification of patterns in the improvement of customer satisfaction and product sales with the help of reverse logistics. This research design can prove beneficial in providing insights regarding reverse logistics that can be used for future research work. The facts that are associated with the management of applied chain operations with the help of reverse logistics can be easily understood by applying this research design.

3.1 Proposed Methodology

There are two ways for collecting data which are primary and secondary. Primary data collection is defined as the method where the new data is obtained via interviews and surveys. Secondary data collection is defined as the method where the existing research is used which is already present in the journal articles and the books. These types of data collection sources are used by the researcher for gathering appropriate data. In this study, the researcher has used a secondary data collection method as this process involves gathering relevant information using sources such as articles, reports and academic journals. The selected case studies have been thoroughly examined by the researcher to identify key themes. During the data collection process, the researcher used the following keywords: reverse logistics, profitability, financial strength, operations, innovation and performance. Several types of industry have been referred by the researcher and the book and journal articles referred are based on the last ten years.

The researcher has not used the primary data collection sources as it is both time-consuming and very expensive. It is complex for the researcher to collect relevant information to understand the importance of reverse logistics and practical implementation to evaluate the possible financial effect and profitability prospects. This is the main reason why the researcher has selected a secondary data collection method to understand the practicality of reverse logistic operations. Therefore, to save cost and time and collect relevant information, the secondary method for collection has been deemed to be appropriate for this research study.

3.2 Data Collection and Analysis

The process by which information is collected or acquired is known as the data collection method. Data can be collected by two method that is the primary method and the secondary method. The primary method consists of collecting first-hand data from the samples. The secondary method involves collecting information from books, websites, journals, and so on (Waring, 2021). The secondary methods have been applied for this research work.

The secondary method has been utilised to collect a wide variety of data from the samples. Moreover, the secondary method can help in the collection of the most relevant data from the books, journals and articles that are based on the research topic that is reverse logistics in managing supply chains.

The process by which the samples are identified and selected for collecting information is called sampling. There are different methods by which samples of research work are chosen. The random sampling method has been selected by the researcher in this research work. 5 samples for the secondary data collection. The samples of the secondary data collection are books, journals or articles. Random sampling technique has been used to ensure that there exist no biases in the research study (Obilor, 2023). The sample sizes have been selected as such that can help in obtaining a wide range of information regarding the impacts of reverse logistics in managing supply chains and on the financial benefits of the organisations obtained by reverse logistics.

The entire process of data analysis involves collecting information and organising the information for discarding all the irrelevant and unusual data that can hamper the quality of the research study. The thematic data analysis method is used for analysing the information that is acquired from secondary sources (Taherdoost, 2022). Themes are created based on the objectives and findings of the research work, under which the data that has been gathered is presented in sequential order. The data analysis technique can help in incorporating the relevant data in the research study, by eliminating all the irrelevant information.

Based on the choice of the different components of a research methodology, it is concluded that the researcher has selected the positivism research philosophy for shedding light on the positive sides of reverse logistics in the management of the supply chain of different companies. The secondary method has been applied for collecting information. This is because it can help in covering all the aspects of reverse logistics including the real-life experiences of the supply chain managers. The deductive approach has been applied by the inquirer which can help in the

integration of collected concepts and self-generated concepts. The application of both approaches can refine the research quality, thereby making it highly informative.

4.Initial Study Analysis

During the study, the research has full field ethical guidelines which play a critical role in providing an ethical Research report. The researcher has used a consent form to briefly describe the research topic and the method along with the duration (Paula et al. 2020). The researcher has gathered the information during the study and has kept the information confidential for protecting privacy and has ensured that the information is not disclosed to individuals who are unauthorised reference to the General Data Protection Regulation (GDPR) Act of 2018 (Mahadevan, 2019). The researcher has used a secure server for storing the confidential data and has removed information which can be easily identified from the secure databases. The researcher has collaborated with a third-party company to manage the data of the respondents and maintain the records. The researcher has also conducted an ethical review for the identification of possible harms which can be social, psychological and legal. The researcher has ensured that authenticity and transparency are maintained while the research study (Safdar et al. 2020).

In addition to these, the intellectual contributions to the research study also includes the incorporation of authentic and relevant information that are provided by the secondary sources. This has helped in gathering relevant and the most authentic information from the respondents, thereby maintaining the authenticity and quality of the research work. This has also contributed to the collection of the most genuine information required for understanding the multidimensional aspects of reverse logistics in the management of supply chain.

The other critical contribution to this research study includes the use of theories from the secondary sources for addressing the different aspects of reverse logistics. The “Circular Supply Chain Theory” has been used to relate the operations of reverse logistics. The operations of reverse logistics involve collection of defective or improper items from the customers, back to the warehouse for renovation. These materials after renovation can again be used for manufacturing new products. The “Circular Supply Chain Theory”, also deals with the recycling of items to reduce the amount of waste production and emissions from the business operations. The incorporation of this theory in this research study has helped in upgrading the quality of the research study by contributing to the understanding of the activities of reverse logistics and the ways by which this can prove beneficial in maintaining the sustainability of the supply chain activities (Shahidzadeh and Shokouhyar, 2022). This use of this theory in this research study also enables the managers of supply chain in the different companies to manage the reverse logistics sustainability thereby, earning the satisfaction of the customers.

The **“Theory of Resource-Based view”** has also been used in this study to highlight the operations of reverse logistics This theory sheds light on the availability of different types of resources that are present in a business entity for gaining competitive advantage. The most crucial resources that are necessary for carrying out reverse logistics operations are human resources. The availability of skilled and trained human resources can help in picking up the materials that have received return requests from the customers. Concerned reverse logistics executives can be used for the purpose of picking up these items from the customers on time (Khanra et al. 2022). This can help in earning the satisfaction of the customers, thereby keeping them engaged. This in turn, can assist the organisations to gain competitive advantage over the other players in the market, thereby enabling them to flourish in the competitive marketplace.

5 Results and Discussion

The section overview showcases the significance of reverse logistics in the domain of supply chain management. The main implication of results and discussion is to provide secondary research findings to collect quantitative data. The secondary findings and discussion include the consideration of 5 prominent journal articles which highlight the relevant usage and enhancement of reverse logistics for optimum customer satisfaction.

5.1 Secondary Findings and Discussion

Reverse Logistics Implementation Factors

Studies identify that technical experts are essential to receive online return requests and approve these requests by investigating the validity of the return requests of the customers (Bag and Gupta, 2020). The availability of financial resources is also important to fund the different operations of reverse logistics and for paying the deserved wages to the reverse logistics executives (Kazancoglu, et.al., 2021). The sorting process is another factor affecting the efficiency of reverse logistics. The sorting process involves the task of sorting the returned products based on the reasons that these have been returned for. Sorting these returned products can help in determining the next process that can be helpful for renovating and

recycling the returned products, for reselling purposes. As opined by Blanchard (2021), the author has focused highly on the RFID technology to address the issue related to out-of-stock for increasing the visibility of the supply chain. It has been observed that most retailers enjoy the various merits of Radio Frequency Identification (RFID) technology. The return on the technological investment is high and helps in facilitating product recalls as well as thwarting counterfeiters. The wireless technology helps in expanding the capability of reverse logistics operations by 81.3%. An efficient third-party reverse logistics provider can help in maximising profit as per our sales channel. It can be noticed that the scalability of reverse logistics has enhanced mainly due to the operation of system integration software. This has helped different businesses in guaranteeing that the reforms and the return policy can be issued within 14 business working days as per the compatibility aspects. The date of retail returns has increased by 40% due to the growth of online shopping. The system integration software is very much useful for integrating the reverse logistics operations. A Lexmark colour RFID printer is used for pinpointing and is used by the warehouse packer for shipping the level from transport to the customer. This is then received by the RFID portal via the WMS database and inspection checks are done in terms of resale, scrap and recycling.

Evaluation of Financial Effects and Profitability

It has been found that the sales of the pharmaceutical industry in the UK have increased by 1.2% in 2022, with the help of the application of reverse logistics. The customers of the online medical stores can easily return the effective or inappropriate medicines with the appropriate medicines, as and when required. The logistics executives or the delivery executives pick up the medicines that the customers want to return, to provide them with the right medicines and other pharmaceutical items. This has helped in enhancing the trust and the satisfaction of the customers, theory ranging about a surge in the sales of the pharmaceutical products. The profitability of the pharmaceutical industry in the UK is predicted to increase by 2.5% by the year 2028, owing to the use of reverse logistics. The prime focus of sustainable development goals is on preserving and protecting the environment. Logistics, on the other hand, refers to the entire chain of business operations in a very systemic trajectory as opined by previous studies (Guarnieri, et.al., 2020). The fundamental functionality of logistics of a certain organisation incorporates certain functions such as the supplying of raw materials, manufacturing of the products, maintaining the warehouses, packaging of the products and the like all this functionality is directly linked to the environment (Behmanesh and Pannek, 2023). Therefore, logistics in modern times are directly connected to the aim of sustainable development goals. It is because the present notion in this post-pandemic period is to admire such initiatives of the organisation which reflects its concern for preserving the environment.

As per previous studies, Reverse Logistics Supply Chain (RLSC) is useful for assuring the quality metrics used in the traditional supply chain of the construction industry (Wijewickrama, et.al., 2021). The author has prioritised more on the reprocessed products which are low quality, and the RLSC help in resolving the hindrance by exploring elements of demolition waste. The author has used content analysis and descriptive research methods for experimental study to understand that policy and Technology is required for meeting the quality assurance checks in the reverse logistics supply chain which is maintained by the government subsidies. Good third-party logistic providers help in elevating the experience of the customer and protect the brand integrity but also cost the company a high substantial amount as it fails in minimising the wastage produced while rectifying the defects. The author has highlighted that there is relevance between quality control and reverse logistics supply chain. Quality control aims at the acute identification of non-compliance output and utilises various techniques for enhancing the quality parameters and performance of reverse logistics. The reverse logistics supply chain helps in providing a systematic procedure as per the requirements of the construction industry to ensure that quality products are used in the construction life cycle. If the products returned by our customers are increasing our operational expenses of the company as well as time, then outsourcing the return management to a third-party provider can help in improving the logistic management. With similar third-party reverse logistic providers in the past however working with these types of businesses have similar order flows and products which mean that they do not customise or incorporate the appropriate process for dealing with the inventory flow. Most of the third-party reverse logistics providers use the latest technology for managing the stages of the life cycle management of returned products. This helps the business in optimising the usage of current resources and focusing on increasing sales. This might result in inefficiency and potential challenges which can hinder the brand image of the company.

5.2 Results and Discussion

As opined by Bag and Gupta (2020), it has been identified that technical experts play a crucial role in receiving online return requests and investigating customer validity in a prominent manner. In some cases, these technical experts utilise financial resources such that the different source operations of the reverse logistics can be funded while providing a relevant compensation package to the executive handling this type of operation. This type of sorting mechanism helps the technical expert in enhancing the operation of reverse logistics. For instance, the experts can utilise the reasons for returning the specific products and collect the data from the consumers and this helps in sorting the products based on reason. This type of agile approach is crucial for recycling and renovating the damaged products that can be sold in future.

According to the perspective of (Wijewickrama, et.al., 2021), the traditional supply chain operation gets enhanced when using Reverse Logistic Supply Chain (RLSC). The author has placed a greater emphasis on low-quality reprocessed products, and the RLSC assists in overcoming the obstacle by examining components of demolition waste. The creator has involved content examination and strategies for exploratory review to comprehend that strategy and Innovation are expected for meeting the quality affirmation checks in the converse coordinated factors production network which is kept up with by the public authority endowments. Great outsider strategic suppliers help in lifting the experience of the client and safeguard the brand respectability yet in addition cost the organization a significant sum as it flops in limiting the wastage delivered while redressing the deformities. The reverse logistics supply chain network helps in giving a methodical technique according to the prerequisites of the development business to guarantee that quality items are utilized in the development life cycle. If the items returned by our clients are expanding our functional costs of the organization as well as time, then, at that point, re-appropriating the return of the board to an outsider supplier can help in working on the strategic administration. While working with businesses with similar order flows and products, third-party reverse logistics providers have not customized or incorporated the appropriate inventory flow management procedure in the past.

From the perspective of Blanchard (2021), there are several merits of Radio Frequency Identification (RFID) technology. The profit from the mechanical speculation is high and helps in working with item reviews as well as defeating forgers. Remote innovation helps in extending the ability of reverse logistic operations by 81.3%. According to the sales channel, an effective third-party reverse logistics provider can assist in maximizing profit. It tends to be seen that the adaptability of converse coordinated factors has improved for the most part because of the activity of system integration software. This has helped various organisations in ensuring that the changes and the reverse logistics can be given within 14 business working days according to similar viewpoints. The rise of online shopping has resulted in a 40% increase in the date of retail returns. The RFID is especially valuable for incorporating the opposite coordinated factors activities. A Lexmark variety RFID printer is utilized for pinpointing and is involved by the distribution centre packer for delivery of the level from transport to the client. This is then gotten by the RFID gateway by means of the WMS data set and assessment checks are finished regarding resale, scrap and reusing. It has been found that the deals of the pharmaceutical business in the UK have expanded by 1.2% in 2022 with the assistance of the use of reverse logistic operations. The clients of the web-based clinical stores can undoubtedly return viable or improper prescriptions with the proper drugs, as and when required. The coordinated factors leaders or the conveyance chiefs get the medications that the clients need to return, to give them the right meds and other pharmaceutical things. The productivity of the pharmaceutical business in the UK is anticipated to increase by 2.5% continuously in 2028, attributable to the utilisation of reverse logistic operations.

Therefore, the main motive of sustainable development goals is to protect the environment, and this is done by using the reverse logistic operations. Based on this consideration, reverse logistics is used in enhancing systematic business operations in a way such that certain functions such as product manufacturing, raw material supply, warehouse management and product packaging can be maintained. This initiative is of utmost importance for the retailer as this is what enhances the customer satisfaction content as they can easily return the product without any hassle if there is any damage. The reverse logistic executive is responsible such that the reason for returning the specific product is validated properly. This initiative is helpful for reverse logistics to sort the products that are partially damaged, and these can be recycled and resold further for-profit maximisation purposes. This is where the reverse logistic operations are utilised in a productive manner such that the damaged products are removed from the warehouse, and the customer considerations are taken into consideration for more brand enhancement. This type of approach is mainly utilised by large-scale

brands when the shipping and return orders are in huge amounts and software like this help in maintaining the bulk orders and mitigating the possibility of inaccuracy. The reverse logistic executive uses supply chain software like Shipibo and Magaya for handling the logistic operations. The software helps in the effective management of customer databases and storing the reasons such that the company does not commit the same mistake. The agile approach is useful for promoting efficiency in maintaining reverse logistics.

6 Conclusions and Recommendations

Key Factors Influencing the Implementation of Reverse Logistics

The current research study has critically explored the factors influencing the use of reverse logistics in SCM operations with respect to business organizations. The result and discussion section has critically found that the company policy and management support as well as awareness can be regarded as the key influencers of the application of reverse logistics in the supply chain organisations. Both internal and external roles have been found to play crucial roles in this aspect. The availability of financial and human resources of the company has been found to be crucial internal factors to implement reverse logistics in a successful manner as both financial strengths, as well as expertise in this field, are required to implement the process. This fact can be aligned with the previous findings as represented in the Literature review section which also highlighted the need for the availability of skilled technicians and adequate financial resources to support this process. The expert workforce is required in the present context as relevant knowledge of the employees regarding the successful use of proper technology to manage the products returns as well as shipment which must need robust technical expertise. Apart from that, the findings have also shaded light on the essential aspects of management motivation and experience in this segment along with their open-mindedness to use technological advent which could influence the acceptance of the reverse logistics from the end of the company management.

Analysis of Trends and Technology within Reverse Logistics

The Literature Review section has critically explored the use of RFID technology, OLAP technology, and robotics in the implementation and smooth running of reverse logistics in supply chain operations. The findings in the current research have also supported the role played by these technologies in the smooth operation of reverse logistics in the SCM. The role of RFID has been explored in the current study to keep a track record of the returned product quantity as well as the arrival time of the returned goods. The supervision of the shipment of the goods in both their origins and destinations has been found to be easier with the help of such a technology. Robotics is one of the modern technologies which have also been highlighted in the research findings as one of the current trends used in the reverse logistics process. Robotics has been found to support the automation of the overall techniques is the said process enabling automated stocking and restocking procedures which can be able to speed up the overall process efficiently and, in an error, -free manner as compared to the manual approaches. Thus automation, as the opinion given by the previous researchers, as described in the Literature review section, helps to ensure the profitability from the supply chain operations through the delivery of the complete workflow in a flawless manner. Apart from that, the current research findings explored the latest trend in the use of AI technologies and analytics in the reverse logistics process which can optimize operations by providing critical insights into customer satisfaction, their behaviour, their demands, and the performance of products in the market.

Evaluation of Financial Effects and Profitability

The researcher, in the current study, has focused on the evaluation of the profitability aspect and financial benefits of the application of reverse logistics in supply chain operations. The findings have critically gathered the benefits of the application of reverse logistics in the SCM by optimizing the transportation routes by which the supply chain processes can be streamlined. Moreover, reverse logistics has been found to be able to reduce the carrying cost of the goods through the avoidance of obsolescence and adjusting the product design which can ultimately decrease the operational cost increasing the profitability. The review of literature from the viewpoints of the previous researchers has also supported the same fact as an improvement in the financial performance of the business has been observed by implementing a reverse logistics process. It can ensure the earning of profitability by enhanced customer satisfaction as reverse logistics is accompanied by renovation and reselling facilities of the products which insists the customers to repurchase. Moreover, by the efficient flow of goods, reverse logistics has been found to help the inducement of value creation of the business firm leading to enriched brand endorsement and increased

brand popularity. It can also be accompanied by the possibility of reduced risk of supply chain operations being adhered to the policies and guidelines of waste disposal which further helps to maintain the business reputation.

Suggestions for Implementing and Integrating Reverse Logistics Practices

The survey responses from the respondents have critically explored the role of reverse logistics in managing the returned goods, buying surplus goods, as well as dealing with refurbishment. The implementation of reverse logistics can lead to a straightforward, fast, and visible return process and thus, the integration of a centralized return centre has been found to be helpful in the process of implementing reverse logistics in the supply chain operations. This finding is aligned with the findings from the literature review section which also ensured the need for centralized return centre in the integration of this process in the supply chain operations for the restoration and renovation of the returned products. Moreover, packaging management has also been found to be an integrated approach for the establishment of reverse logistics within the supply chain to align with the guideline of sustainable waste disposal through the reuse and recycling strategy of the packing materials. Moreover, the findings also explored the application of analytics to integrate and modify the reverse logistics process with an improved outcome. This process can be associated with the analysis drive mapping to find out the exact reasons for the return of the products from the end of the customers which helps to reduce the frequency of return requests.

5.1 Research Recommendations

Investment in the monitoring system- Although the companies tend to carefully monitor the sales process, they often do not have the proper care in the return process leading to delays and defects in the return process. Careful supervision of the reverse supply chain can help the logistics operations to detect potential problem areas associated with product quality. Hence, adequate investment in supervision is necessary for the end of the companies. In this context, GPS technologies can be used successfully to improve the supervision process by monitoring vehicle speed, transportation routes, and effective fleet management systems (Jović, et.al., 2020). This technology can be recommended to integrate into the process of reverse logistics to track the movement of shipments. An example can be given by one of the market leaders in the retail industry of the UK, Tesco which has been found to implement GP trackers in the logistics operations which aids with tracking the movement of the products across the globe.

Involvement of recycling strategy- In the case, when the returned products are not back again to the customers, the involvement of sustainable use of those products can help to maintain environmental sustainability as well as alignment with the implemented guidelines. Recycling is a recommended process for waste products in reverse logistics which can mitigate the tendency of unsustainable waste disposal. This recycling can be possible by involving electronic components as well as reselling the products in the secondary market (Tuomala, et.al., 2022). It also ensures the avoidance of landfills with waste products that ultimately increase the company's reputation and brand image in the marketplace.

5.2 Limitations and Future Research

This research focuses on the significance of reverse logistics which is defined as a supply chain process helping in moving the products or goods from the customer directly to the manufacturer or seller. Reverse logistics happens when the customer is in dire need of recycling or returning the product which has been received (Cricelli, et.al., 2021). Since the logistic process goes backwards starting from the end consumer to the manufacturer through a supply chain, there are several limitations of this approach.

Complex Flow of Return Orders

Reverse logistics generally involves coordinating with the origin point and multiple business partners to get the products specifically to the destination (Mishra et al. 2022). It has been noted that when the specific product reaches the Return Forwarding Centre (RFC) or Central Distribution Centre (CDC), there are various steps involved which include verification, inspecting testing and determining the cost-effective process of recycling or refurbishing (Khoei, et.al., 2023). Then the product repairs are completed and re-packaged in refurbished inventory however it is a challenging process for the manufacturers with respect to keeping track of data flow between the decentralised sections of the company in terms of tracking return orders.

Evolving Consumer Demands

Many supply chain departments of large-scale corporations try to mitigate revenue loss by determining the reason why the product is being returned by the consumer (Bottani et al. 2019). A solution is provided by the vendor for the customer such that it can be fixed on the spot however there are inaccuracies in recording information about service level expectations and entitlements in Return

Merchandise Authorisation (RMA) (Wilson, et.al., 2022). The evolving consumer demand focus on fast delivery of returned products and it is complicated for companies to enhance the return management system and stay at par with competitive parity.

It has been estimated that approximately 13 billion units of returned products which will be worth 573 billion will be handled by retailers within 2025 as per the National Retail Federation (Ni et al. 2023). The research provides scope for analytical insights and detailed comprehension of supply chain issues and customer behaviour. The agile approach will help the companies in implementing reverse logistics automation efficiently by increasing profit via contactless returns. Since the returns strategy will play a crucial role in the supply chain, the number of goods returned by the consumer will help the companies in gaining a profit of 4% (Phochanikorn, et.al., 2020). The future of reverse logistics highlights the acute integration of returns strategy along with the transformation of the supply chain to reduce the operation cost and established cross-channel for the end-to-end sales cycle of the consumer.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the author(s) utilized artificial intelligence (AI) technologies solely for the purpose of linguistic refinement and grammatical correction. Following the application of these tools, the author(s) comprehensively reviewed, verified, and edited the resulting text. The author(s) maintain full accountability and responsibility for the accuracy, integrity, and final content of the publication.

References:

[1] Abdulrahman, M.D., Gunasekaran, A. and Subramanian, N., 2014. Critical barriers in implementing reverse logistics in the Chinese manufacturing sectors. International Journal of Production Economics, 147, pp.460-471. doi: https://doi.org/10.1016/j.ijpe.2012.08.003

[2] Abu-Alhaija, A.S., 2019. From epistemology to Structural Equation Modelling: An essential guide in understanding the principles of research philosophy in Selecting the Appropriate Methodology. Australian Journal of Basic and Applied Sciences, 13(9), pp.122-128.

[3] Ahlin, E.M., 2019. Semi-structured interviews with expert practitioners: Their validity and significant contribution to translational research. doi: http://dx.doi.org/10.4135/9781526466037

[4] Ahmed, R.R. and Zhang, X., 2021. Multi-stage network-based two-type cost minimization for the reverse logistics management of inert construction waste. Waste Management, 120, pp.805-819. doi: https://doi.org/10.1016/j.wasman.2020.11.004

[5] Asha, L.N., Dey, A., Yodo, N. and Aragon, L.G., 2022. Optimization approaches for multiple conflicting objectives in sustainable green supply chain management. Sustainability, 14(19), p.12790. doi: https://doi.org/10.3390/su141912790

[6] Astete, D.S., 2022. A Review of the Impacts of Reverse Logistics on Retailers of Fast-Moving Consumer Goods. Journal of Enterprise and Business Intelligence, pp.177-187. doi: https://doi.org/10.53759/5181/JEBI202202018

[7] Bag, S. and Gupta, S., 2020. Examining the effect of green human capital availability in adoption of reverse logistics and remanufacturing operations performance. International Journal of Manpower, 41 (7), pp.1097-1117. doi: https://doi.org/10.1108/IJM-07-2019-0349

[8] Behmanesh, E. and Pannek, J., 2023. Taguchi analysis for improving optimization of integrated forward/reverse logistics. Journal of the Operations Research Society of China, 11(3), pp.529-552. doi: https://doi.org/10.1007/s40305-021-00380-7.

[9] Blanchard, D., 2021. Supply chain management best practices. John Wiley & Sons. 3rd Edition. ISBN: 9781119738213

[10] Bottani, E., Vignali, G., Mosna, D. and Montanari, R., 2019. Economic and Environmental assessment of different reverse logistics scenarios for food waste recovery. Sustainable Production and Consumption, 20, doi: https://doi.org/10.1016/j.spc.2019.07.007

[11] Chahal, H., Gupta, M., Bhan, N. and Cheng, T.C.E., 2020. Operations management research grounded in the resource-based view: A meta-analysis. International Journal of Production Economics, 230, doi: https://doi.org/10.1016/j.ijpe.2020.107805

[12] Chalmeta, R. and Santos-deLeon, N.J., 2020. Sustainable supply chain in the era of industry 4.0 and big data: A systematic analysis of literature and research. Sustainability, 12(10),

p.4108. doi: https://doi.org/10.3390/su12104108

[13] Cricelli, L., Greco, M. and Grimaldi, M., 2021. An investigation on the effect of inter-organizational collaboration on reverse logistics. International Journal of Production Economics, 240, p.108216.

[14] Dayanandi, A., Sarmah, S.P. and Dutta, K., 2021. Barriers in reverse logistics: scale development and validation. Annals of Operations Research, 305(1), pp.249-271.

[15] Dhamija, P. and Bag, S., 2020. Role of artificial intelligence in operations environment: a review and bibliometric analysis. The TQM Journal.

[16] Dhl.com. (2022), The Logistics Trend Radar. Available at: https://www.dhl.com/content/dam/dhl/global/csi/documents/pdf/csi-logistics-trend-radar-6-dhl.pdf [Assessed: 18/5/2025]

[17] Frei, R., Jack, L. and Krzyzaniak, S.A., 2020. Sustainable reverse supply chains and circular economy in multichannel retail returns. Business Strategy and the Environment, 29(5), pp.1925-1940.

[18] Giannopoulos, G.A. (2004) 'The application of information and communication technologies in transport', European Journal of Operational Research, 152(2), pp. 302-320.

[19] Guarnieri, P., Cerqueira-Streit, J.A. and Batista, L.C., 2020. Reverse logistics and the sectoral agreement of packaging industry in Brazil towards a transition to circular economy. Resources, conservation and recycling, 153, p.104541.

[20] Husband, G., 2020. Ethical data collection and recognizing the impact of semi-structured interviews on research respondents. Education Sciences, 10(8), p.206.

[21] Jayasinghe, R.S., Chileshe, N. and Rameezdeen, R., 2019. Information-based quality management in reverse logistics supply chain: A systematic literature review. Benchmarking: An International Journal.

[22] Jović, M., Felicitas Schlierf, J., Heinen, B. and Tijan, E., 2020. Information management in Reverse logistics. Pomorski zbornik, 58(1), pp.155-167. doi: https://doi.org/10.18048/2020.58.10.

[23] Kaviani, M.A., Tavana, M., Kumar, A., Michnik, J., Niknam, R. and De Campos, E., 2020. An integrated framework for evaluating the barriers to a successful implementation of reverse logistics in the automotive industry. Journal of Cleaner Production, 272, doi: https://doi.org/10.1016/j.jclepro.2020.122714

[24] Kazancoglu, Y., Ekinci, E., Mangla, S.K., Sezer, M.D. and Kayikci, Y., 2021. Performance evaluation of reverse logistics in food supply chains in a circular economy using system dynamics. Business Strategy and the Environment, 30 (1), pp.71-91. doi: https://doi.org/10.1002/bse.2610

[25] Khanra, S., Kaur, P., Joseph, R.P., Malik, A. and Dhir, A., 2022. A resource- based view of green innovation as a strategic firm resource: Present status and future directions. Business Strategy and the Environment, 31(4), pp.1395-1413. doi: https://doi.org/10.1002/bse.2961

[26] Khoei, M.A., Aria, S.S., Gholizadeh, H., Goh, M. and Cheikhrouhou, N., 2023. Big data-driven optimization for sustainable reverse logistics network design. Journal of Ambient Intelligence and Humanized Computing, 14(8), pp.10867-10882. doi: https://doi.org/10.1007/s12652-022-04357-z

[27] Lahane, S., Kant, R. and Shankar, R., 2020. Circular supply chain management: A state-of-art review and future opportunities. Journal of Cleaner Production, 258, doi: https://doi.org/10.1016/j.jclepro.2020.120859

[28] Mahadevan, K., 2019. Collaboration in reverse: a conceptual framework for reverse logistics operations. International Journal of Productivity and Performance Management, 68(2), pp.482-504. doi: https://doi.org/10.1108/IJPPM-10-2017-0247

[29] Makarova, I., Shubenkova, K., Buyvol, P., Shepelev, V. and Gritsenko, A., 2021. The role of reverse logistics in the transition to a circular economy: a case study of automotive spare parts logistics. FME Transactions, 49(1), pp.173-185. doi: 10.5937/fme2101173M

[30] Mishra, A.R., Rani, P. and Pandey, K., 2022. Fermatean fuzzy CRITIC-EDAS approach for the selection of sustainable third-party reverse logistics providers using improved generalized score function. Journal of ambient intelligence and humanized computing, doi: https://doi.org/10.1007/s12652-021-02902-w

[31] Muhammad, A., Hussein, M.Z., Veera, M.H. and Sundram, P.K., 2020. Reverse logistics activities for household E-waste management: A Review. Int. Journal of

Supply Chain Management, 9(1), pp.312-318.

[32] Mulisa, F., 2022. When Does a Researcher Choose a Quantitative, Qualitative, or Mixed Research Approach?. Interchange, 53(1), pp.113-131. doi: https://doi.org/10.1007/s10780-021-09447-z

[33] Ni, Z., Chan, H.K. and Tan, Z., 2023. Systematic literature review of reverse logistics for e-waste: overview, analysis, and future research agenda. International Journal of Logistics Research and Applications, 26(7), pp.843-871. doi: https://doi.org/10.1080/13675567.2021.1993159

[34] Nikoličić, S. and Peraković, D. (2016) 'Telematics as a means of improving reverse logistics', Technical Gazette, 23(2), pp. 529-535.

[35] Obilor, E.I., 2023. Convenience and purposive sampling techniques: Are they the same. International Journal of Innovative Social & Science Education Research, 11(1), pp.1-7.

[36] Orth, C.D.O. and Maçada, A.C.G., 2021. Corporate fraud and relationships: a systematic literature review in the light of research onion. Journal of Financial Crime, 28(3), pp.741-764. doi: https://doi.org/10.1108/JFC-09-2020-0190

[37] Paula, I.C.D., Campos, E.A.R.D., Pagani, R.N., Guarnieri, P. and Kaviani, M.A., 2020. Are collaboration and trust sources for innovation in the reverse logistics? Insights from a systematic literature review. Supply Chain Management: An International Journal, 25(2), pp.176-222. doi: https://doi.org/10.1108/SCM-03-2018-0129

[38] Phochanikorn, P., Tan, C. and Chen, W., 2020. Barriers analysis for reverse logistics in Thailand's palm oil industry using fuzzy multi-criteria decision-making method for prioritizing the solutions. Granular Computing, 5, pp.419-436. doi: https://doi.org/10.1007/s41066-019-00155-9

[39] Plaza-Úbeda, J.A., Abad-Segura, E., de Burgos-Jiménez, J., Boteva-Asenova, A. and Belmonte-Ureña, L.J., 2020. Trends and new challenges in the Green Supply Chain: The Reverse Logistics. Sustainability, 13(1), p.331. doi: https://doi.org/10.3390/su13010331

[40] Pokharel, S. and Mutha, A., 2009. Perspectives in reverse logistics: A review. Resources, Conservation and Recycling, 53(4), pp.175-182. doi: https://doi.org/10.1016/j.resconrec.2008.11.006

[41] Rezigalla, A.A., 2020. Observational study designs: Synopsis for selecting an appropriate study design. Cureus, 12(1). doi: 10.7759/cureus.6692

[42] Russo, I., Confente, I., Gligor, D. and Cobelli, N., 2019. A Roadmap for applying qualitative comparative analysis in Supply Chain research: The Reverse Supply chain case. International Journal of Physical Distribution & Logistics Management, 49(1), doi: https://doi.org/10.1108/IJPDLM-02-2018-0056

[43] Safdar, N., Khalid, R., Ahmed, W. and Imran, M., 2020. Reverse logistics network design of e-waste management under the triple bottom line approach. Journal of Cleaner Production, 272, p.122662. doi: https://doi.org/10.1016/j.jclepro.2020.122662

[44] Shahidzadeh, M.H. and Shokouhyar, S., 2022. Shedding light on the reverse logistics' decision-making: a social-media analytics study of the electronics industry in developing vs developed countries. International Journal of Sustainable Engineering, 15(1), pp.161-176. doi: https://doi.org/10.1080/19397038.2022.2101706

[45] Sharma, N.K., Kumar, V., Verma, P. and Luthra, S., 2021. Sustainable Reverse Logistics Practices and Performance Evaluation with Fuzzy TOPSIS: A study on Indian retailers. Cleaner Logistics and Supply Chain, 1, p.100007. doi: https://doi.org/10.1016/j.clscn.2021.100007

[46] Singh, V. (2020). Step up ROI from Reverse Logistics in Supply-chain Management. Available at: https://erpsolutions.oodles.io/blog/reverse-logistics-supply-chain-management/

[47] Souza, G.C., 2013. Closed- loop supply chains: A critical review, and future research. Decision Sciences, 44(1), pp.7-38. doi: https://doi.org/10.1111/j.1540-5915.2012.00394.x

[48] Taherdoost, H., 2022. Different types of data analysis; data analysis methods and techniques in research projects. International Journal of Academic Research in Management, 9(1), pp.1-9. doi: https://ssrn.com/abstract=4178680

[49] Tuomala, V., Kovacs, G., Aminoff, A. and Ely, K., 2022. Waste management and reverse logistics in the humanitarian context. In NOFOMA 2022 conference proceedings, Reykjavik, June 8-10, 2022.

[50] Voigt, D., Casarotto Filho, N., Macedo, M.A., Braga, T.G. and da Rocha, R.U.G., 2019. Performance evaluation of reverse logistics: Opportunities for future research. Sustainability, 11(19), p.5291. doi: https://doi.org/10.3390/su11195291

[51] Wang, X. and Chen, X. 2017. An overview of telematics-enabled Reverse Logistics Strategy, International Journal of Economics, Finance and Management, 6(1), pp. 1-5.

[52] Waring, S.M., 2021. Integrating primary and secondary sources into teaching: The SOURCES framework for authentic investigation. Teachers College Press. Available at: https://elifesciences.org/articles/74893.pdf

[53] Wijewickrama, M.K.C.S., Chileshe, N., Rameezdeen, R. and Ochoa, J.J., 2021. Quality assurance in reverse logistics supply chain of demolition waste: A systematic literature review. Waste Management & Research, 39(1), pp.3-24. doi: https://doi.org/10.1177/0734242X209677

[54] Wilson, M., Paschen, J. and Pitt, L., 2022. The circular economy meets artificial intelligence (AI): Understanding the opportunities of AI for reverse logistics. Management of Environmental Quality: An International Journal, 33(1), pp.9-25. doi: https://doi.org/10.1108/MEQ-10-2020-0222.

[55] Pawar, A., Ojo, O. O., Hasan, S. M., & Shah, S. R. (2026). Digitalisation in Reverse Logistics: Risk Strategies for Circular Supply Chains. In IEEE International Conference on Technology Management, Operations and Decisions (ICTMOD) (pp. 1-5). IEEE https://doi.org/10.1109/ICTMOD66732.2025.11372045

[56] Rodrigues, S. P., Gomes, L. D. C., Peres, F. A. P., Correa, R. G. D. F., & Baierle, I. C. (2025). A Framework for Leveraging Digital Technologies in Reverse Logistics Actions: A Systematic Literature Review. Logistics, 9(2), 54.

[57] Shah, S., Chen, S., & Ganji, E.N. (2024). An Investigative Study to Examine Impact of Digitalisation on Manufacturing Supply Chains. Engineering World, 6(1), 61-89.

[58] Shah, S., & Patil, V. (2024). Exploring the Challenges and Opportunities for Globalisation of Logistics and Supply Chains. WSEAS Transactions on Business and Economics, 21, 2806-2827.

[59] Solanki, S., Shah, S., & Hasan, S. (2024, November). Industry 4.0 Deciphered: Mapping Key Technologies Adoption in Industry. In 2024 IEEE International Conference on Technology Management, Operations and Decisions (ICTMOD) (pp. 1-6). IEEE.

[60] Balaji, L., Ganji, E. N., & Shah, S. (2024). An Evaluation of Industry 4.0 Capabilities for Sustainable Innovation in Food Sector. International Journal of Applied Sciences and Development, Vol.3, pp299-326.

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