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FINAL RESEARCH FOR PARTIAL FULFILEMENT OF MASTER'S DEGREE IN LOGISTICS AND SUPPLY HCAIN MANAGEMENT.

EFFECTS OF REVERSE LOGISTICS PRACTICE ON OPERATIONAL PERFORMANCE; IN CASE OF HABESHA BREWERIES S.C.

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Declaration

I declare that the thesis entitled "The Effect of Reverse Logistics Practices on Operational Performance in Case of Habesha Breweries S.C submitted in partial fulfillment of the requirements for the award of the Degree of Masters of Art in logistics and supply chain management. This study is my original work and close direction with my advisor and has not been presented to any other institution to acquire degree. The assistances I received during this study have been duly acknowledged.

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Approval of Thesis for defense

This is certify that the thesis entitled “The Effect of Reverse Logistics Practice on Operational Performance in Case of Habesha Breweries S.C done by Zewudu Solomon under my guidance for partial fulfillment for the award of the Degree of Masters of Art in logistics and supply chain management. This thesis fulfills the requirement for defense.

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Approval of Thesis for defense result

As members of the board of examiners, we examined this thesis entitled "The Effect of Reverse Logistics Practices on Operational Performance in the Case of Habesha Breweries S.C. This is to certify that the thesis prepared by Zewudu Solomon is submitted for the fulfillment of the requirements for the masters of Art in Logistics and Supply Chain Management. It complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

Signed by the Examining Committee:

Name	Signature	Date
External Examiner		
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Internal Examiner		
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Acronyms

RBV- Resource based view.

SCM- Supply chain management

GSCM - Green supply chain management

SPSS - Statistical package for social science

TCE – Transaction cost economics

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Abstract

The primary goal of this study is to assess the effect of reverse logistics practice on operational performance at Habesha Brewery Factory. Reverse logistics, encompassing remanufacturing, reusing, recycling, and repackaging, has emerged as a vital strategy for enhancing supply chain efficiency, reducing environmental impacts, and achieving cost advantages. However, the adoption of these practices in Ethiopia remains limited due to perceived challenges such as high costs, lack of awareness, and inadequate infrastructure. The research employed a quantitative approach with descriptive and explanatory designs, leveraging stratified sampling to collect data from seven departments within the factory. Findings from different scholars indicate that while remanufacturing and recycling practices significantly improve operational performance by optimizing costs and conserving resources, challenges such as bottle and keg collection inefficiencies persist. This study contributes to filling the knowledge gap on reverse logistics within Ethiopian manufacturing contexts, offering actionable insights for policy makers and organizations aiming to enhance operational flexibility, delivery performance, and environmental sustainability. It also serves as a valuable resource for academicians and researchers exploring the integration of reverse logistics in developing economies.

Key words: Reverse logistics, Operational performance, Remanufacturing, Reusing, Recycling, Repackaging.

CHAPTER ONE

1.1. Background

Reverse logistics involves managing the backward flow and recycling of used products from the consumer back to the supplier, with the objectives of creating value, minimizing costs, and protecting the environment (Waqas et al, 2018).

This initiated a trend that persists to this day. However, Carter and Ellram (1998) suggest that until the 1980s, organizations concentrated on the forward logistics process of delivering products to customers. At the time, product returns were considered of little importance, and the scope of reverse logistics throughout the 1980s was limited to the movement of materials against the primary flow. There was minimal evidence on how reverse logistics could benefit a company's bottom line, contribute to environmental protection, or enhance customer service and increase sales.

According to Bernon et al. (2011), recent access to extensive information about the reverse logistics field has highlighted the importance of product returns as a crucial part of the product lifecycle. This sector has grown into a $36 billion industry, with 90 to 95 percent of all starters and alternators sold for replacement being remanufactured. Lee and Lam (2012) propose that companies implementing reverse logistics can enhance customer relationships, reduce environmental pollution, increase delivery speed and flexibility, lower logistics costs, and improve competitiveness. It is evident that reverse logistics is gaining momentum as a significant aspect of the supply chain management process. Additionally, the success of a reverse logistics program is positively correlated with the presence of an incentive system that rewards employees and managers for their participation. Huang and Yang (2014) have found that reverse logistics is positively correlated with both environmental and economic performance. Dowlatshahi (2000) also notes that an organization's strategy to reuse, refurbish, and recycle products can benefit the environment, increase profits, and save money. Additionally, they can effectively reduce carbon emissions, improve air quality, and potentially lower costs. It is undeniable that organizations are harming the environment due to poor management of waste disposal, collection, and the reuse of after-sale products.

According to Fikru (2020), reverse logistics has received limited attention and is a poorly understood concept in most Ethiopian companies, as it is perceived to be an expensive, complex, and challenging process. According to Addisu (2018), Ethiopia is one of the rapidly developing economies globally, with significant beer production. International companies import standard-sized glass bottles (330ml) from Saudi Arabia, Egypt, Tanzania, and the UAE for use in Ethiopia. The growth rate of beer consumption in Ethiopia increased rapidly by 14.5% from 2002 to 2017 (Dessalew et al., 2017). However, companies in Ethiopia including Habesha Brewery have not focused on reverse logistics, resulting in suboptimal supply chain performance. This neglect places additional pressure on the environment and leads to the loss of cost advantages.

1.2. Background of the organization

Habesha Brewery S.C. is one of the prominent players in Ethiopia's brewing industry, known for its flagship product, Habesha Beer. It was established in 2012 and the company raised quickly with modern production technology. The company is very committed to quality, innovation and sustainability to ensure the products meet maximum standard.

The Factory located in Debre Birhan the location allows the company to establish robust distribution network reaching customer across the country through different retailer and distributer.

Habesha Breweries focus strictly on environmental responsibility and focus on waste reduction recycling and efficient resource utilization in its operation. Habesha Breweries have different types of Alcoholic and malt products like Habesha Beer, Kidame Beer, Feta Beer, Habesha Kostara Beer and Negus as a malt drink. Among the lists Habesha Beer is its premium brand and dominantly supplying in central part of the country. As a nature of the industry Habesha Breweries are engaged on reverse logistics practice including reuse, repackaging such as bottle, crates and Kegs.

1.3. Problem Statement

Adoption of reverse logistics practice like repackaging, reuse, remanufacturing and recycling plays a crucial role in minimizing environmental prolusion by minimizing environmental burden of end-of-life products, Ashby et al. (2012). From the total logistics cost reverse logistics covers 3-4% and by implementing reverse logistics practice the companies can save 10% of their annual logistics. However implementation of reverse logistics system is minimal in practices in many manufacturing industries and it remains rhetorical, Bernon et al. (2018). Lack of integrated corporate supply chain strategy insufficient top management knowledge regarding reverse logistics, higher processing cost, lack of supportive government policies, limited awareness of environmental laws, poor organizational culture and insufficient community pressure are the major challenges for implementation of reverse logistics practice, (Prakash & Barua, 2015).

According to their research findings, Rao and Holt (2005) demonstrated a positive relationship between reverse logistics practices and operational performance. In contrast, De Giovanni and Vinzi (2012) found no significant relationship, while Azevedo et al. (2011) identified a combination of positive and significant relationships, as well as additional correlations. Ongombe (2012) examined the relationship between reverse logistics and competitive advantage, focusing specifically on water bottling companies in Nairobi. The results of his study indicated a positive relationship between the two variables. Consequently, global literature reveals a lack of consensus on the effect of reverse logistics on operations performance. Poor logistics management system and lack of coordination in goods transport are the characteristics of reverse logistics in Ethiopia. Additionally, there is a low level of infrastructure development and an inadequate number of freight vehicles, many of which are damaged. This results in the deterioration of goods quality during handling, transportation, and storage (Debela, 2013). Based on the researcher's observations, the aforementioned issues are the current major problems at Habesha Brewery. These include a lack of a proper collection system for beer bottles and kegs, delays in the return of bottles, and difficulties in predicting the availability of bottles and kegs due to the absence of a collection center. This results in high transportation costs and inefficiency in supply chain. Consequently, the factory's operational performance is negatively impacted, leading to a decrease in the timely delivery of goods, and an increase in scrap rates.

Some researchers have been conducted on reverse logistic practice in Ethiopian, the researcher review a research conducted on reverse logistics in Ethiopian by Bethlehem Fikru (2020), analysis of reverse logistics practice of water and soft drink plastic bottle companies in Ethiopia By Berhe Syum (2018), developing a reverse logistics model for Raya brewery company and By Betelhem Guta (2016) the linkage between organizational performance and reverse logistics activities in case of East Africa bottling Share Company.

The researcher finds no studies has specifically addressed reverse logistics practices at Habesha Brewery. The unique challenges and operational constraints faced by Habesha Brewery remain unexamined, leaving a critical knowledge gap in understanding how reverse logistics can influence its operational performance. Therefore, no clear evidence as to whether Habesha Brewery Factory can achieve improved operational performance through adoption of reverse logistics practices. This research aims to bridge this gap by investigating the relationship between reverse logistics practices and operational performance at Habesha Brewery. By identifying the impact of practices such as remanufacturing, reusing, recycling, and repackaging, the study seeks to provide insights and recommendations to enhance operational efficiency, reduce costs, and achieve sustainability goals.

Research Question

RQ1: How does remanufacturing practice affect the operational performance of Habesha Breweries S. C.?

RQ2: How does reusing practice influence the operational performance of Habesha Breweries S. C.?

RQ3: What is the nature of the relationship between recycling practice and operations performance of Habesha Breweries?

RQ4: How does the implementation of repackaging practice influence the operational performance of Habesha Breweries ?

1.4. Objective of the Study

General Objective

Investigating the effect of reverse logistics practice on operational performance in case of Habesha Breweries S.C is the General objective of the study.

Specific Objective was to:

1. Evaluate the impact of remanufacturing practice on operational performance of Habesha Breweries S.C.
2. Assess the effect of reusing practices on operational performance of Habesha Brewery Factory.
3. Investigate/Evaluate the effect of recycling practice on operational performance of Habesha Breweries S.C.
4. Analyze the effect of repackaging practices on operational performance of Habesha Brewery Factory.

1.5. Hypothesis of the Study

The main construct of this study was to investigate the effect of reverse logistics practice on operational performance of Habesha Breweries S.C. In line with this, this study had the fallowing hypothesis.

H1: Remanufacturing practices has statistically significant effect on operational performance of Habesha Brewery Factory.

H2: Reusing practices have a statistically significant effect on opeaartions performance of Habesha Breweries S.C.

H3: Recycling practices has statistically significant effect on operational performance of Habesha Brewery Factory.

H4: Repackaging practices has statistically significant effect on operational performance of Habesha Brewery Factory.

1.6. Significance of the Study

The results of the study have the following significances for researcher, Habesha Brewery Factory, academicians, researchers and government policy makers. The study provides enough knowledge and necessary information for Habesha Brewery Factory and also it have significance to understand the role and gape of reverse logistics practices on operational performance. By understanding the area, which is low performance, they will take corrective actions for solving the problems they face through flexibility, quality, cost and delivery performance for enhancing operational performance to compete with competitors. Academicians and researchers will be used the finding of the study for who needs to investigate related future study in the areas of reverse logistics practices on operational performance. For researchers, it provides a starting ground for doing additional studies and gain brief knowledge about the effect of reverse logistics practices on Operations Performance.

1.7. Scope of the Study

The Study tries to investigate the effect ofreverse logistics practice on operations performance of Habesha Breweries S.C. Reverse logistics practice is wide in nature and important in every organization to satisfy customers, decreasing wastage, keeping environment safety and generating better profit. There were many brewery factories; Due to time, finance and research manageability, it is difficult to make the study areas of reverse logistics practices in every organization. Conceptually the study delimited to reverse logistics practices on operational performance, the subject scope of reverse logistics was be delimited into remanufacturing, reusing, recycling and repackaging practices, and also operational performance delimited into flexibility, cost, and quality and delivery performance. Methodologically, the study delimited to quantitative research approach, stratified sampling technique, regression and correlation analysis. Method of data analysis. Target populations of the study include seven department employees of Habesha Brewery Factory.

1.8. Limitations of the Study

Limitations that the study has impact its applicability and depth. Firstly, the research focuses solely on Habesha Brewery Factory, limiting the generalizability of its findings to other organizations or industries and may not reflect reverse logistics practice in other sectors or geographical locations. Time and financial constraint limit the scope preventing the examination of multiple organization in the sector. Limited sample has also delimited to have Reacher insight and robust conclusion. Methodologically, the study delimits to quantitative approach focus on the statistical analysis. Even if it is effective for measuring relationships between variables it may overlook qualitative insight such as employee perception or deeper contextual understanding, which could have make more sounding findings. As the study is conducted in developing countries it had a constraint on infrastructure, lack of government support and also limited awareness of reverse logistics practice which negatively affected effectiveness and adoption of reverse logistics practice.

1.9. Definitions of Operational Terms

Reverse Logistics Practice: is a process of returning final product from point of consumption to its origin through recycling, remanufacturing, reuse, and repackaging or proper disposal, (Chent et al., 2021; Zhang et al., 2018).

Operational Performance: The extent to how efficiently and effectively the organization achieves its operational objective, such as cost reduction, quality enhancement and, delivery performance, and it is evaluated through metrics such as Leadtime, customer satisfaction and flexibility (Ahmad et al., 2019).

Flexibility: defined as a capacity to cop up with changing environment in which reverse logistics implemented to improve operational performance of the organization, (Morgan et al., 2018).

Remanufacturing: (Bhatia & Srivastava, 2018), states that remanufacturing is an industrial process in which worn out or non-functional product can be rebuilt and recovered.

Recycling: Involves the collection and processing of materials that would otherwise be discarded to recover raw materials for creating new products (Peloso et al., 2020).

Reusing: It means the use of material again and again for the same purpose or for different purpose without altering the form of the product (Allwood et al., 2011).

Repackaging: the process of packaging something again or a new for present or sold in order to make it seem more attractive or interesting (Tamaki, 2019).

Quality: is the extent to which product or service meet or exceed customer expectation in terms of performance, reliability, and usability. It is crucial factor for customer satisfaction and operational efficiency (Nikolaidis et al., 2020).

Cost: The total monetary expenditure incurred in the production, transportation, and management of goods and services. Effective cost management involves optimizing resources while maintaining quality and operational goals (Ahmad et al., 2018).

Delivery performance: an organizations ability to supply goods per the standards expected by its customers (Gunasekaran, 2004).

1.10. Organization of the Study

This paper is covered by 5 chapters followed by subparts under each chapter. Chapter one presents background for the study, problem statement, general and specific objectives, hypothesis, significant, the scope, Limitation, and definition of operational terms. Chapter two cover literature review it covers: overview of logistics, emphatical and theoretical review, conceptual framework and research gap. Chapter three describes the methodology; research paradigm, approach and design population sample, source and data collection instrument, reliability and validity instrument, research ethics and method of data analysis and interpretation. Chapter Four presents research findings, analysis and discussion. Chapter Five Covers findings, cocluson and recommendation. Lastly it covers reference and Annex for Questioner.

CHAPTER TWO

2. LITRATURE REVIEW

2.1. Introduction

Literature review is a detailed review of existing literature that have relation with topic if the study.

2.2. An Overview of Reverse Logistics

Reverse logistics encompasses the logistical processes involved in the collection, reuse, disassembly, and processing of used products, materials, and components to ensure environmentally sustainable recovery. This includes the return flow of materials to a company for various reasons, such as customer returns, packaging returns, and the return of products and materials to comply with legislative requirements (Fleischmann et al., 2003). According to Rogers and Tibben (2001), reverse logistics involves strategic planning, execution, and management of the raw material by efficient and cost effective way, in process inventories, finished good and associated information from customers place to its origin. This process aims to recover value or ensure proper disposal.

The challenges associated with reverse logistics are becoming increasingly significant and require resolution. These challenges may arise from various factors, including product recalls, remanufacturing, warranty returns, disposal, damage, seasonal inventory, restocking, salvage, excess inventory, service returns, economic benefits, environmental legislation, and the return of products at the end of their life cycle or end of use (Bouton et al., 2016).. Effectively implemented logistics facilitate the forecasting of customer needs, the procurement of capital, materials, human resources, technologies, and information necessary to meet those needs. They also support the enhancement of the goods or service production network to satisfy customer demands and provide mechanisms for utilizing the network to fulfill these demands in a timely and cost-effective manner (Arya, 2014).

2.3. Theoretical Review

The study which is adopted with the aim of enlightening reverse logistics practice on operational performance and comprises key aspects of three existing theories: transaction cost theory, institutional theory and resource-based view theory. The reasons for the researcher choose, these theories are relevant for the study to limit the scope of the relevant data by focusing on specific variables and defining the specific viewpoint that the researcher was taken in analyzing and understand the data to be gathered, understanding concepts and constructs according to the given definitions, and building knowledge by confirming or challenging theoretical statement.

2.3.1. Institutional Theory

Institutional theory focuses on the processes through which organizations meet both customer and legal requirements. Internal and external pressures, including environmental management issues and pressures from the government and the general community, drive companies to institutionalize reverse logistics practices. This is motivated by the understanding consequences of noncompliance of environment regulation and losing market share on competition (Williams et al., 2009).

According to (Harris, 2006), consumers in developing countries have heightened environmental awareness and favor green products. Now a days, customers have shown low tolerance for poor quality products, which is leading to frequent product returns. For that matter, reverse logistics can expedite return of products more efficiently and swiftly without compromising customer loyalty. Frequent engagement of the organization on reverse logistics is due to pressure from customers who perceive environmentally friendly companies as legitimate. Furthermore, products are more frequently returned due to customers low tolerance for poor quality products, (Harris, 2006).

2.3.2. RBV (Resource Based View)

RBV theory, popularized by Barney (1986), examines the behavior of firms and their competitive advantage. The theory posits that a firm's ability to outperform its rivals and achieve superior performance depends on its unique resources and capabilities, particularly when these resources and capabilities are valuable, rare, costly to imitate, and non-substitutable. These resources encompass physical (tangible) assets, such as equipment, facilities, and location, and also intangabel asset, including expertise, knowledge and organizational assets (Brahma et al., 2011). The Resource-Based View (RBV) is the most recent and rapidly expanding theoretical approach for exploring operational strategy, competitive strategy, and environmental issues (Hart et al., 2011). Firms adopt reverse logistics practices to enhance their environmental friendliness. This adoption positively impacts operational performance by optimizing resource utilization and minimizing waste. Consequently, it improves the corporate image, attracting more customers to purchase the firm's products, thereby generating higher profits and increasing market share compared to competitors. Therefore, firms implement reverse logistics practices to enhance operational performance through cost savings achieved by recycling, reusing, and remanufacturing materials, as well as improving quality by repairing returned products.

2.3.3. Transactional Cost Analysis Theory

According to (Anderson et al., 2009), Transaction Cost Economics (TCE) defines a condition which firms manage internal and external or inter organizational arrangements economic exchange. Minimizing transactional cost associated with manufacturing and distribution of product and service is the focus of transactional cost analysis. The internal environment factors are overall quality strategic cost, environment concern, customer service and legislative service and operational factors are remanufacturing, reuse, repackaging and recycling. Firms' strategy for reverse logistics should align with transactional cost economics in order to optimize internal resource utilization and in turn maintain profitability and competitiveness (Ochry et al., 2015).According to (Lee et al., 2012), compared to the competitors firms that has implemented reverse logistics practice has reduced cycle time, higher efficiency and effectiveness, higher marketing and operations performance.

2.4. Empirical Review

According to (Carter & Ellar, 1998), management of product at the end of their Lifecyle and returning materials from the customer to production center for remanufacturing, reusing, repackaging recycling or safe disposal is called reverse logistics. And for logistics it involves handling of transportation recyclable material, packaging waste and customer return. (Wu & Dunn, 1995) argued the reducing waste at the source and fining alternative than prioritizing reuse and recycling is the focus of reverse logistics.

2.4.1. Remanufacturing Practice

Remanufacturing involves refurbishing, repairing and replacement of any defective component of the product that has collected back from the market (Khor et al., 2016). Remanufacturing will be alternative if direct re use of the product is not feasible. Remanufacturing involves a set of process from first inspecting returned item, disassembling, cleaning, sorting, repair, refurbish, or replacing any defected part finally reassembling and testing the product. According to (Stingier, 2001), parts and modules that are repairable can be re-used once they have been repaired.

Remanufacturing is important for operational performance improvement, Firstly, the initial step in remanufacturing is returning of the product which ensures and reclaim significant value that would otherwise consider as lost. According to (Backbite et al., 2014) remanufacturing conserves at least 85% of the original energy and material used in production. Secondly, it provides the opportunity for the manufacturer to analyze product design and functionality thoroughly, which leads to improvement in quality. Thirdly, remanufacturing leads to shorter cycle time for the production and delivery to customers, than starting production from the scratch which insures quicker delivery and improved customer satisfaction. According to (Mbuvi and Mburu, 2018) investigation competitiveness of a firm can be impacted by reverse logistics practice, of manufacturing firm in Kenya, in case of East Africa Breweries Limited. They have concluded that remanufacturing significantly enhances competitiveness of the company. Therefore the below its effect can be proposed as

Hypothesis 1- Remanufacturing has a significant effect on Operations performance.

2.4.2. Reusing Practice

The reusing manner encompasses several key steps. It starts offevolved with the inspection and sorting of products to determine their suitability for reuse. Next, any important maintenance are done without big processing. The products are then thoroughly wiped clean to put together them for reuse. Finally, the refurbished objects are allotted to clients, completing the cycle of reusing (Elmas et al. (2011). Certain again goods may be repurposed with best minimal cleansing and repairs, as opposed to being reintegrated into the production manner. By repurposing those transportation substances, agencies can effectively extend their lifecycle and reduce waste. Reusing can beautify operational overall performance in numerous approaches. It conserves electricity due to the fact no additional processing is needed, and it also reduces prices. By doing away with the want for in addition production, reusing now not simplest saves electricity but also cuts down on prices. According to Panya (2021), reusing gadgets permits them to be swiftly reintroduced to the marketplace, thereby improving transport reliability and pace. Additionally, Moses and Salome (2015) found that reusing practices have a statistically full-size impact on Operations performance. Therefore, reusing practices impact on operations overall performance can be proposed as

Hypothesis 2 – Reusing practice has a significant effect on Operations Performance.

2.4.3. Recycling Practice

According to Peloso et al. (2010), recycling involves gathering used items, parts, or materials so they can be repurposed as raw materials for creating new products or packaging. Babu et al. (2007) describes recycling as breaking down used products into their individual components and reusing them to create new or original items. Examples of recyclable materials include plastics, paper, glass, batteries, bulbs, and metals. The recycling process begins with collecting these items in bins, followed by sorting, cleaning, and treating them before they can be reused.

Betelhem (2016) found a strong link between recycling activities and operational efficiency. The study highlights that effective recycling practices can significantly enhance performance. Recycling helps businesses cut costs by minimizing expenses related to material disposal and land acquisition. For instance, in New Zealand, building a landfill can cost anywhere between $2 million and $30 million, with annual capacities ranging from 10,000 to 500,000 tons (Klass, 200). By recycling, companies can avoid these significant expenses. Recycling helps companies' lower energy consumption and improve material recovery, according to Sharma et al. (2014), such residual products gain value as potential raw materials for new products.

Recycling plays a crucial role in environmental protection. For instance, Nairobi produces approximately 2,000,000 plastic bags (Panya, 2021), highlighting a growing recognition of the importance of recycling. Khadija (2016) suggests that consumers are more likely to perceive a company's products as legitimate if the company engages in recycling to demonstrate ecological responsibility. Ochiri et al. (2015) found that implementing a recycling strategy can positively influence organizational performance, as highlighted in their study on the effects of recycling strategies on firm performance.

Betelhem Guta (2016) explored the extent to which recycling practices are adopted in their study on the relation between two variables. Their findings indicate a strong correlation between recycling practices and organizational performance. Additionally, Khadija (2016) found that recycling practices significantly impact operational performance. Therefore, the effect of recycling practice on operational performance can be proposed as

Hypothesis 3 - recycling practices have significant effect on operational performance.

2.4.4. Repackaging Practice

Saruchera et al. (2021) describe repackaging as the process that encompasses providing physical protection, handling, shipping, and marketing of goods, from raw materials to final products. Emblem (2012) identifies three levels of repackaging: primary, secondary, and tertiary. Primary repackaging involves packaging that directly contacts the product, such as toothpaste tubes. Secondary repackaging is utilized for marketing purposes, exemplified by a toothpaste box that showcases the brand, features, and functionality. Tertiary repackaging is employed for distribution and warehousing, such as the use of pallets or containers. Cooper (2013) states that a closed-loop logistics infrastructure is essential for reusable packaging. Examples include reusable pallets, Euro containers, milk, soda, and beer bottles, compressed gas cylinders, and beer kegs.

Aronsson (2006) highlights that repackaging's crucial role in enhancing a organizations brand and reducing marketing expenses. Additionally, sharing information throughout the reverse logistics chain can decrease information costs and improve flexibility.

Hazen et al. (2012) assert that repackaging significantly influences a company's operational performance. Firstly, repackaging is more cost-effective compared to recycling and remanufacturing. Secondly, it enhances operational flexibility by offering resources in various package sizes, allowing clients to choose the size that best meets their needs. Mwaura et al. (2016) note that repackaged items occupy less storage space compared to unpackaged materials. This increased open space in a warehouse facilitates easier movement for both workers and materials, thereby enhancing overall productivity. Therefore, the effect of repackaging practice on operational performance can be proposed as.

Hypothesis 4 - repackaging practices has significant effect on operational performance.

Additionally, an empirical review of reverse logistics practices reveals numerous studies examining their impact on operational performance. Successful implementation of Green Supply Chain Management practices, including reverse logistics, leads to enhanced environmental and economic performance, thereby supporting overall operational performance, Green et al. (2011). Furthermore, they indicated the reverse logistics practices on cost-saving aspects contribute to enhancement on environmental and economic performance. Improved economic performance, in turn, leads to greater operational efficiency. These saving of cost costs increase the capacity of an organization to meet the demands of customers for environmentally durable products and services.

Rao and Holt (2005) assert that green supply chains confer a competitive advantage to firms and enhance economic performance. Their study observed that companies in the Philippines utilizing reverse logistics experienced improved product perceptions, thereby gaining a competitive edge. Organizations performance on the outcomes of finance was the main focus of the research. Eltayeb et al. (2011) examined initiative of green supply chain outcomes and environmental sustainability between qualified companies in Malaysia. They investigated four potential outcomes: environmental, economic, cost reductions, and intangible outcomes. Their study tested the hypothesis that reverse logistics practices positively impact cost reductions, financial performance, and economic performance, thereby enhancing operational performance.

Azevedo et al. (2011) investigated the effect of green practice on supply chain performance within the automotive industry in Portugal. Their research findings provide that green practices positively influence quality, customer satisfaction, and productivity. However, the research also highlights that the implementation of green practices incurs significant costs, which negatively affect the financial performance of firms. Waithaka (2012), on the other hand, examined reverse logistics practices in medical supplies in case of Kenya Medical Supply chain Agency. The findings indicated despite low implementation of reverse logistics practices at the agency, there was a positive correlation between these practices and the agency's operational performance.

Serut (2013), who conducted research closely to this study, focused primarily on organizational performance of the financial aspect. His finding recognized the relation ship between two variable is positive, and argued about the broad concepts of reverse logistics. Therefore, it is better to divide into subcomponents, as reuse, remanufacturing, recycling, and repackaging practices.

2.5. Operational Performance

Chopra and Meindal (2001) state that the concept of operational performance originates from supply chain strategy, which in turn is derived from the overall business strategy. A competitive strategy defined as "the set of customer needs that it seeks to satisfy through its products and services" (Ibd). Performance can be defined as the nature and quality of actions undertaken by an organization to fulfill its primary mission and functions, ultimately aimed at generating profit (Brulhart et al., 2017). From a quantitative standpoint, performance is associated with a generalized scale and can be measured in various ways. Operational performance is a construct in management research wherein all organizational functions—such as cost, quality, and flexibility—are ultimately evaluated based on their contribution to overall organizational performance (Richard and Devinney, 2009).

According to Ninlawan (2010), enhanced operational performance yields numerous benefits. These benefits include improved customer service and retention, which contribute to a stronger competitive position in the market. Additionally, organizations experience faster delivery of goods and services, leading to greater productivity. Effective risk management is another advantage, along with increased visibility of performance metrics. Furthermore, enhanced operational performance results in reduced costs and improved capacity utilization, thereby optimizing overall organizational efficiency.

Each organization endeavors to adopt a competitive strategy that aligns with its overall objectives. Subsequently, it seeks to acquire the appropriate capabilities and resources necessary to achieve these goals. Gimenez et al. (2011) examined flexibility, delivery performance, and lead time as key performance measures. According to Vanichchinchai (2014), a firm's operational performance comprises flexibility, delivery performance, and responsiveness. According to Frohlich and Westbrook (2001), eliminating non-value-added activities, reducing order variance, and accelerating product flows positively impact organizational performance. Harison and New (2002) emphasized the significance of operations performance metrics as a standardized context of assessing operational performance. This framework encompasses both internal and external linkages within the firm Vaidya and Hudnurkar (2013), which outlined different performance evaluation criteria. In their study, operational performance was assessed using the dimensions of flexibility, cost, quality, and delivery performance, as these are the most commonly investigated dimensions in previous research.

2.5.1. Flexibility

Organizations developing a competitive strategy to enhance flexibility must commit to specific actions and activities. These include educating employees for diverse tasks, motivating them for flexible work schedules, promoting teamwork, and improving communication within the organization (Shimizu and Hitt, 2004). According to Rosenzweig et al. (2013), flexibility refers to a firm's ability to develop adaptable operations within a highly competitive environment, enabling it to respond effectively to any changes". And also, flexibility is the ability of organizations to cope up with changes in demand of the customers. Tang & Tomlin (2008) assert that organizational flexibility, along with adaptable reverse logistics channels, is essential for managing uncertainty and mitigating the higher likelihood of disruptions within these channels. Since the 1980s, organizational flexibility has emerged as a crucial factor for competitiveness in both national and international markets. This is due to rapid changes in product technology, trends towards free trade, deregulation in capital markets, and increasing fluctuations in exchange rates (Kuo et al., 2003). Consequently, flexibility enables organizations to expand their options, reduce uncertainty, and enhance operational performance.

2.5.2. Cost

According to Patterson and Anders (2013), numerous indices can enhance an organization's operational performance, with cost reduction being fundamental. Effective cost management entails the optimal utilization of resources to maximize organizational efficiency and create value for customers. This approach fosters customer satisfaction, loyalty, and long-term organizational wealth. Additionally, effective cost management is a direct outcome of strategic decision-making. The cost structures of different organizations can vary significantly. When other performance objectives—such as high quality, high speed, and high flexibility—are effectively managed, they not only yield their own external benefits but also contribute to operational cost savings. Cooperation and process integration among members of the same supply chain led to reductions in cost and time, as well as improvements in quality and flexibility. This allows each organization to concentrate on its core competencies (Johnston, 2013).

In reverse logistics, businesses maintain responsibility for the return of products, whether for recycling or improved disposal. Consequently, their costing systems must adopt a comprehensive approach, such as total life cycle costing. This system enables managers to manage costs "from cradle to grave" (Atkinson et al., 2000).

Returned and recalled products in reverse logistics activities are significant cost elements, influencing manufacturers' perceptions. Therefore, managing these processes is of vital importance. Key elements in effectively managing reverse logistics costs include recycling products from customers, handling semi-finished products, and managing waste generated from the classification, disassembly, and disposal of recalled products in a controlled manner, or repairing them (Dirik, 2012). Recovery, reuse, repackaging, and recycling of products, which are key parameters of reverse logistics, significantly impact operating costs. These returns can reduce direct business profitability, and the presence of obsolete products in logistics flows further increases the cost burden on companies. Therefore, it is essential for the analysis of products to be renewed accurately and for cost advantages to be assessed by experts (Batuk, 2013). Properly managing the costs associated with reverse logistics practices is crucial for improving operational performance.

2.5.3. Quality

According to Nikolaidis (2013), quality involves meeting or surpassing customer needs and expectations. It encompasses performance, appearance, product durability, availability, timely and proper delivery, reliability, maintainability, cost-effectiveness, and affordability. Given that repairs restore used products to a "working order" rather than an "as good as new" condition, replacing a significant portion of conventional repairs with remanufacturing or reconditioning leads to higher service levels for consumers and improved product quality.

The quality of communication is inferred from the information system in place. Outsourcing and other related organizational relationships are considered key variables in the interactions among supply chain partners (Lee & Kim, 1999). A years later, Bloomberg et al. (2002) analyzed various companies that derive value from product returns, noting that the variety and quality of returns are predetermined upon receipt. It is crucial for a company to promptly evaluate its returns to ascertain their quality level. Recently, Wong et al. (2005) provided empirical evidence on the performance value of asset recovery. Specifically, they emphasized the potential value of the product recovery process within closed-loop supply chains and its implications for product quality and operational performance. Therefore, quality is a crucial construct for enhancing the operational performance of Habesha Brewery Factory.

2.5.4. Delivery Performance

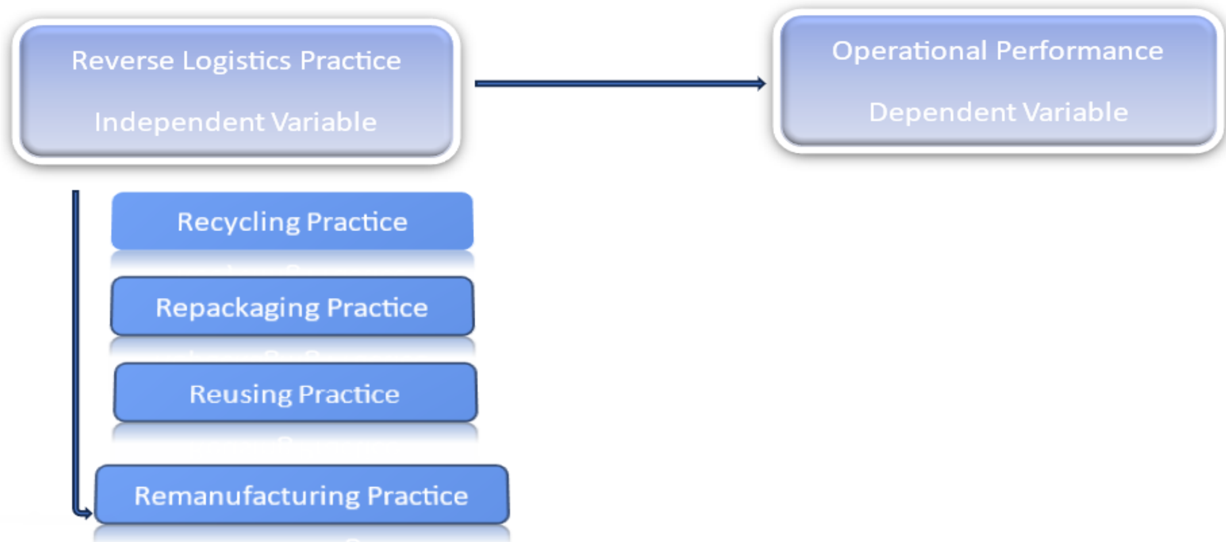
Delivery performance is the extent to which product and service of the organization meet customer expectations. It serves as an indicator of the logistics capability to provide products and services to customers (Rao et al., 2011).

Delivery performance encompasses delivery accuracy, delivery reliability, and on-time delivery. On-time delivery, also known as delivery precision, is one of the most common metrics for measuring order-to-delivery performance (Forslund et al., 2008). It assesses whether a perfect delivery has been achieved. This measurement serves as a key driver for customer satisfaction and supply chain excellence (Gunasekaran, Patel & Tirtiroglu, 2001). Delivery performance can be assessed based on various dates, such as the delivery-to-request date and the delivery-to-commit date (Stewart, 1997). Delivery performance is heavily dependent on the quality of information exchanged across distribution channels and the manner in which this information is presented. Key factors for achieving high delivery performance include location, delivery channel, and vehicle scheduling. Additionally, reducing lead time is crucial for improving delivery performance (Stewart, 1997).

2.6. Conceptual Framework

Conceptual framework establish relationship between reverse logistics practice and operational performance in diagrammatical representation and also explains concepts and possible connection between the variables. The purpose is to show the objective which research study strives to achieve (Eriksson and Westerberg, 2011). The study proposes reverse logistics practice have an effect on operational performance. Reverse logistics practices is conceptualized as remanufacturing practices, reusing practices, recycling practices and repackaging practices dimensional construct. Below figure 2.1 indicated that, reverse logistics practices has effect on operational performance of the company.

Figure 2.1 Conceptual Framework



Source: Researcher (2024) by reviewing different literature.

2.7. Research Gaps

Numerous research has been done globally to examine the effect of reverse logistics practice on operational performance. with different findings. Accordingly, Rao and Holt (2005) demonstrated reverse logistics practice and operations performance has positive relationship. In contrast, Azevedo et al. (2011) identified a mix of favorable and other relationships, while De Giovanni and Vinzi (2012) found the relationship to be insignificant. Ongombe (2012) in other hand examined found out a positive relationship between competitive advantage and reverse logistics, focusing on water boiling company in Nairobi, Kenya. However, evidence from global literature reveals inconsistency on the effects of reverse logistics on operational performance. Some studies have primarily focused on the relationship between two variables, such as (Betelhem Guta, 2016) in case of EABSC (East Africa Bottling Share Company. This literature primarily focuses on the reverse logistics practice (reuse and recycling) practices and their effect on the performance of East Africa Bottling Share Company. Additionally, previous studies have analyzed the reverse logistics practices of water and soft drink plastic bottle companies in Addis Ababa (Bethelhem Fikru, 2020). These studies have comprehensively addressed the subject, including driving forces, implementation barriers, and challenges in reverse logistics. However, they do not examine the effect of reverse logistics on operational performance. However, this study addresses the knowledge gap concerning Habesha Brewery Factory by examining the organizations reverse logistics practices effect on operational performance, which includes aspects such as remanufacturing, reusing, recycling, and repackaging. The analysis is based on quantitative primary data collected from a representative sample of Habesha Brewery Factory employees.

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Introduction

Research methodology refers to the systematic approach employed to address the research problem, encompassing the methods used by researchers (Kothari, 2004). This chapter presents the methodologies applied in the study.

3.2. Research Paradigm

According to Guba (2005), a research paradigm is a essential set of attitudes or worldview that publications studies activities or investigations. Paradigms replicate the researcher's perspective, which encompasses their popular philosophical orientation concerning the sector and the nature of research. This worldview shapes the approach the researcher adopts in the take a look at. Research paradigms are typically labeled into 4 vast categories: positivism, constructivism, transformative, and pragmatism (Creswell, 2017).

Based on given studies hassle, this studies become carried out in the framework of the positivist studies paradigm. According to Fadhel (2002), the positivist paradigm is employed to look at phenomena and make generalizations approximately what can be expected in other contexts. This method emphasizes objectivity and helps the usage of quantitative studies methods, permitting the researcher to exactly describe the parameters and coefficients in the information collected, analyzed, and interpreted. The aim is to understand the relationships embedded inside the facts. The positivist paradigm is in particular appropriate for exploring purpose-and-impact relationships and is considered the preferred worldview for research centered on deciphering observations in phrases of records or measurable entities. The researcher trusts that the consequences of reverse logistics on operational overall performance can be objectively tested, with know-how and know-how derived thru cause, bearing in mind generalizations based totally at the findings (Guba, 2005).

3.3. Research Approach

Research processes provide strategies and frameworks for engaging in studies, encompassing the entirety from popular assumptions to precise strategies for data series, analysis, and interpretation.

These approaches are extensively classified into 3 sorts: quantitative, qualitative, and combined strategies. To efficaciously pick out the maximum appropriate studies technique, it's miles critical to align it with the targets of the take a look at (Creswell, 2017).

For this take a look at, the quantitative forms of research method have been carried out. Selecting studies technique is guided by the nature of problem of the observe or difficulty being investigated. Consequently, the researcher followed a quantitative technique, which involves using numerical measurements and statistical strategies for statistics analysis. This technique changed into utilized to test objective theories with the aid of exploring the relationships between variables. The design of the quantitative approach facilitated statistical generalizations, allowing the researcher to attract conclusions approximately the pattern population primarily based on statistics accumulated from selected assets (Kothari, 2004). The researcher examined reverse logistics effect on operations performance by collecting numerical data and conducting statistical analyses for theory testing.

3.4. Research Design

Research Design refers to systematic prearrangement of tactics to acquire after which examine facts, aiming to balance efficiency with relevance to the studies goals. It serves as a framework manual gathering, measuring and studying records. The layout encompasses a detailed framework of the research technique, from formulating the theory or speculation and its insinuations for engaging in information analysis (Anol, 2012).

Kothari (2004) identifies 3 number one kinds of research design: descriptive, exploratory, and explanatory. And explanatory studies design is hired for this look at. Descriptive studies is targeted on appropriately depicting the traits of people, agencies, institutions, or companies in their modern state, supplying particular information inside the area of research. It is also instrumental in explaining the observe in terms of present conditions, drawing at the researcher's understanding, understanding, and enjoy with the phenomenon underneath research (Kothari, 2004).

In different hand Explanatory studies layout is employed to discover the connection among variables, particularly to examine how one variable have an impact on any other. Its primary aim is to offer an empirical explanation of the causal dating among variables, that specialize in cause-and-effect dynamics (Saunders et al., 2007). Additionally, explanatory research layout is used to test hypotheses regarding the causal relationships among unbiased and dependent variables (Kothari, 2004).

Selecting the best time horizon is crucial for making plans the research, because it relies upon at the research method adopted with the aid of the researcher. Based at the time horizon, studies designs may be labeled as move-sectional or longitudinal. A pass-sectional study examines a specific phenomenon or set of observations at a selected factor in time and is frequently desired via instructional researchers because of time constraints (Saunders et al., 2007). According to Malhotra and Birks (2007), a pattern of the populace is commonly taken for cross-sectional research.

In contrast, longitudinal studies contain a couple of observations over an extended length, or the take a look at of two or greater samples at unique points in time (Kothari, 2014). Longitudinal research is particularly useful for identifying patterns of change over time, with the study population being contacted at regular intervals over a prolonged period to collect the necessary data.

For this study, a cross-sectional design was employed, as it involves data collection from a sample at a specific point in time, allowing for the analysis of different groups at a particular moment.

3.5. Population and Sampling Method

3.5.1. Population of the study

Population is a collection of people, event or elements that are aimed to be investigated (Schutt, 2011). Mugenda (2003) defines population as the complete set of individuals who share common characteristics. It represents the collection of elements from which the study intends to draw conclusions (Cooper, 2013). For this study 300 employees across seven different departments of Habesha Breweries staff are selected as a target group.

3.5.2. Sampling technique and sample size

In this study, the sample was selected from seven departments at the Habesha Brewery Factory, based on the judgment of the researcher, as the researcher is relevant to the topic of reverse logistics practice and operations performance. These departments include Production, Packaging, Quality Assurance, Finance, Sales & Marketing, Logistics & Warehousing, and Procurement & Supply. After figuring out the applicable departments the usage of judgmental sampling, information turned into gathered from each management and personnel at the manufacturing unit the use of proportional stratified sampling approach.

The target populace became divided into seven strata in keeping with the departments which might be expected to be at once involved with reverse logistics practices and operational performance. Consequently, three hundred personnel from those seven departments at Habesha Brewery Factory are selected as target populace. These departments are selected based on their direct involvement in reverse logistics practices and operational overall performance, making their insights essential to reaching the have a look at objectives.

Due to time, monetary, and complexity of records evaluation, it is impractical to collect records from every individual in the population. Therefore, a pattern size became decided using Yamane's (1967) components, a extensively widely wide-spread method in social sciences for deciding on unbiased sample sizes. The formula ensures the right illustration of the goal population while preserving statistical rigor.

To make sure truthful illustration across all departments, a proportional stratified sampling approach become hired. This approach divides the goal population into seven strata (one for every department), and the pattern size turned into allocated proportionally primarily based on the wide variety of employees in each department. This method ensures that personnel from all applicable departments make a contribution to the have a look at, aligning with the examine's cognizance on reverse logistics practices.

3.6. Source of Data and Data Collection Techniques

3.6.1. Development of Data Collection Tool and Source of Data

Questioner gadgets are primely derived and followed from earlier studies specializing in opposite logistics exercise and its effect on operational overall performance in production context. Studies such as those by Rao and Holt (2005), Betelhem Guta (2016), and Mbuvi and Mburu (2018) provided a basis for know-how a way to degree practices like remanufacturing, reusing, recycling, and repackaging. The research goals and conceptual framework had been used to guide the choice and customization of questions. Each construct (remanufacturing, reusing, recycling, repackaging, flexibility, cost, quality, and delivery performance) was mapped to specific questionnaire items to ensure comprehensive coverage.

Data collection involves gathering information from respondents as well as from existing sources. According to Zikmund (2003), data sources can be categorized into two types: primary data and secondary data. Information collected firsthand by the researcher directly from the relevant participants, specifically for the purpose of the study, making it original in nature are primary data. On the other hand, information that are already collected, analyzed, and processed by other sources (Kothari, 2004). Secondary data can be obtained from sources such as company records or archives, government publications, industry analyses from media outlets, websites, and online databases.

For this study, the researcher mainly rely on primary data which was provided by staff of Habesha Brewery Factory.

3.6.2. Techniques of Data Collection

Data collection refers to the process of gathering information or data from various sources to address the fundamental research questions. Various data collection methods can be employed, including observation, interviews, and questionnaires as primary methods, alongside secondary data collection methods such as related studies, journal articles, books, and literature reviews (Saunders, 2012).

For this study, the researcher utilized the questionnaire method in order to study the effect of reverse logistics practice on operational performance of Habesha Brewery Factory. The questionnaire was used to obtain relevant, first-hand information from the selected respondents. The researcher believes that this method is appropriate for collecting standardized and quantifiable data from the sample population (Nunan, 1992).

Structured, close-ended questionnaires was distributed to employees in selected departments of the factory. The distribution and collection of the questionnaires was managed by the researcher to ensure effective data collection and to facilitate the study. The questionnaire consists of 32 gadgets, each object makes use of five factor scale starting from "strongly disagree" to "strongly agree" (1 is for strongly disagree, 2 for disagree, 3 impartial, 4 for agree and 5 is for strongly agree). These questions measured the outcomes of opposite logistics practices on the operational performance of the Habesha Brewery Factory.

3.6.3. Research Validity

Research Validity stands for the truthfulness of studies results and the level to which employed research tool as it should be measures what it is meant to measure. In other words, it determines whether or not the studies device effectively aligns with the studies objectives (Kazemian, 2015). To make certain validity, the look at included objective questions inside the questionnaire. This turned into further stronger through the pretesting of the instrument, which helped pick out and cope with any ambiguous or difficult questions and strategies (Mugenda, 2003, as referred to by means of Kiprop, 2015).

In this have a look at, the researcher ensured validity via formulating clear and goal questions, engaging in a comprehensive evaluation of the relevant literature, and adopting contraptions formerly utilized in similar research. These measures was helped to ensure that the studies tool is each legitimate and dependable, correctly capturing the studies objectives and making sure the authenticity of the results.

To verify the validity of the instrument, distinct varieties of validity exams become applied, consisting of content, criterion-related, and assemble validity (Sekaran, 2003). Validity that evaluates alignment between the items at the device and the supposed idea is referred to as content material validity or face validity. This may be assessed thru professional opinions, pre-checks, or pilot studies carried out with a couple of sub-populations (Hair et al., 2010). In this study, content material validity became measured by having academic professionals' evaluation the questionnaire prior to the primary look at. To further beautify validity, expert judgments were employed in this research.

Construct validity refers to the level to which the stop result obtained from the usage of a measurement device align with the theoretical foundations upon which the test is primarily based. In different words, it guarantees that the instrument accurately reflects the theoretical know-how of the idea being measured (Peter, 1981). Construct validity can be further divided into two subtypes: convergent validity and discriminant validity.

Convergent validity examines whether or not exclusive measures of equal construct are strongly correlated, even as discriminant validity assesses whether measures of various constructs are not excessively correlated with each other (Sekaran, 2000). In different terms, convergent validity shows that objects inside a particular assemble should converge or percentage a large proportion of variance (Hair et al., 2010). In other words, convergent validity assesses the extent to which two occasions of the identical perception are correlated, with a excessive correlation indicating that the size item correctly measures the meant idea (Hair et al., 2010). Discriminant validity, some other thing of assemble validity, is confirmed whilst a measure indicates a low correlation with measures of unrelated standards (Zikmund et al., 2010). According to the applicable literature, the maximum widely prevalent sorts of validity are convergent and discriminant validity (Peter, 1981).

Construct validity may be set up via correlation evaluation, which evaluates both convergent and discriminant validity. Criterion-associated validity, that's synonymous with convergent validity (Zikmund et al., 2010), is demonstrated by means of calculating suitable statistical measures. This form of validity is used to determine whether the size items are aligned with the equal construct or idea. In this take a look at, similarly to the aforementioned validity assessments, the items in the very last model of the questionnaire were assessed for criterion-related validity.

3.7. Data Analysis and Interpretation Method

For information analysis the researcher employed SPSS. Both descriptive and inferential statistical strategies were used to check the facts. Quantitative data's are summarized and presented using Descriptive statics, through frequency distributions and measures of central tendency, including means and standard deviations. Inferential statistics, specifically correlation and regression analyses, was employed to measure the effect of reverse logistics practice on operational performance, dependent and independent variables repetitively. The findings are presented in the form of tables and diagrams to ensure clarity and ease of interpretation.

3.8. Regression Analysis

It is a statistical technique that shows the relationship between two variables (dependent and independent) (Kothari, 2004) to deal with the creation of mathematical models. Multiple regression model was used to link the effect of two variables.

By using multiple regression equation (Y=a+b1x1+b2xw+b3x3+b4x4+e), the study showed existing effect of reverse logistics practices on operational performance level of Habesha Brewery Factory, where (Y = Operational performance, a=Y intercept, e=error, b1,b2,b3 & b4 =regression coefficient of reverse logistics practice and X1,X2,X3,X4 are remanufacturing, reusing, recycling and repackaging practice, respectively.)

3.9. Research Ethics

The moral concept that directs research, from its initiation through completion & disclosure of results and beyond is known as research ethics. Ethical issues are becoming a crucial element in social science research (Saunder and Thorn, 2001). A social science researcher has an obligation to respect the rights, needs, and desires of the informants.

In light of this, the researcher has given the following ethical concerns. First, the researcher asked consent from the factory to get permission to conduct the study. The willingness and consent of all participants are confirmed before distributing the questioner and the purpose of the study was appropriately informed. In addition, samples assured that the gathered data were used only for the study purpose; the respondents are not required to write their name in order to secure the right to privacy of the respondent.

CHAPTER FOUR

4. RESEARCH FINDINGS, ANALYSIS AND DISCUSSIONS

The findings of the study and also outlines of analytical procedures undertaken to address the research questions introduced in Chapter One, are presented in this chapter. It began with demographic characteristics of the respondents, detailed statistical analysis including descriptive statistics, correlation analysis, and regression analysis, all conducted using SPSS software. The data collected via structured questionnaires were analyzed systematically.

Out of 172 questionnaires distributed, 172 were successfully retrieved, resulting in a 100% response rate. This high response rate enhances the reliability and validity of the data, suggesting that the sample closely reflects the target population and minimizes the risk of non-response bias.

4.1. Demographic Information

The study participants exhibited a variety of personal characteristics, including gender, age group, department, educational background, and work experience. These variables help to contextualize the findings and assess their generalizability across different subgroups of the workforce. The demographic profiles of respondents are summarized in the sections below.

Table 4.1: Demographic Character

Demographic Characteristic	Frequency	%	Valid %	Cumulative Percent
Sex				
Male	86	50	50	50
Female	86	50	50	100
Age Group				
20-30	67	39	39	39

31-40	64	37.2	37.2	76.2
41-50	33	19.2	19.2	95.3
51 and above	8	4.7	4.7	100
Department				
Packaging	27	15.7	15.7	15.7
Production	31	18	18	33.7
Finance	24	14	14	47.7
Logistics and Warehouse	26	15.1	15.1	62.8
Sales and Marketing	32	18.6	18.6	81.4
Quality Assurance	12	7	7	88.4
Supply and Purchasing	20	11.6	11.6	100
Education Level				
Diploma	29	16.9	16.9	16.9
First Degree	39	22.7	22.7	39.5
Masters	85	49.4	49.4	89
Certificate	19	11	11	100
Experience (Years)				
0-5	91	52.9	52.9	52.9
6-10	52	30.2	30.2	83.1
11 and above	29	16.9	16.9	100

Source: Survey data, 2025

As shown in the above table, an equal proportion of participants identified as male (n = 86, 50.0%) and female (n = 86, 50.0%), suggesting gender parity among the respondents.

Regarding age distribution, ages of 20 to 30 years (n = 67, 39.0%) are where majority of respondents are, followed closely by those aged 31 to 40 years (n = 64, 37.2%). Fewer participants fell within the age brackets of 41 to 50 years (n = 33, 19.2%) and 51 years and above (n = 8, 4.7%). This indicates that the workforce is predominantly young to middle-aged, which may influence technology adoption and PMIS usage patterns.

In terms of departmental affiliation, respondents represented diverse functional areas. The largest groups came from Sales and Marketing (n = 32, 18.6%) and Production (n = 31, 18.0%), followed by Packaging (n = 27, 15.7%), Logistics and Warehouse (n = 26, 15.1%), Finance (n = 24, 14.0%), Supply and Purchasing (n = 20, 11.6%), and Quality Assurance (n = 12, 7.0%). This broad departmental representation supports a well-rounded understanding of PMIS applications across different organizational units.

Educationally, nearly half of the respondents held a master's degree (n = 85, 49.4%), while others reported holding a first degree (n = 39, 22.7%), a diploma (n = 29, 16.9%), or a certificate (n = 19, 11.0%). The high level of academic attainment suggests a knowledgeable workforce, which could enhance the comprehension and effective use of PMIS tools.

With respect to work experience, over half of the respondents had between 0 and 5 years of experience (n = 91, 52.9%), followed by those with 6 to 10 years (n = 52, 30.2%) and more than 11 years (n = 29, 16.9%). This distribution implies a predominantly early-career employee base, which may affect familiarity with legacy systems versus modern digital tools. Overall, the demographic characteristics highlight a young, educated, and departmentally diverse workforce, providing a meaningful context for interpreting the study's findings.

4.2. Descriptive Statistics Analysis

4.2.1. Descriptive statistics analysis of Remanufacturing Practice

This section presents the descriptive statistics related to remanufacturing practices in the factory, including refurbishment mechanisms, employee training, and material upgrading. Table 4.2.1 provides the sample size (N), MIN and MAX scores, mean values, and standard deviations for each item assessed using a five point scale. Remanufacturing, as a component of sustainable and circular production, involves refurbishment, upgrading, or replacement of returned products or components to restore them to usable condition. Table 4.2 below summarizes the results in terms of the number of valid responses (N), minimum and maximum scores, mean values, and standard deviations.

Tabel 4.2.1 Descriptive Statics Analysis of Remanufacturing practice

Descriptive Statistics					
	N	Min	Max	Mean	Std. Deviation
There is a remanufacturing of returned bottles and cases in the factory through refurbishing or replacement of parts	172	2	5	3.47	.834
The factory has an upgrading mechanism of returned materials	172	1	5	3.55	.720
There is a training in the factory for employees on remanufacturing processes	172	1	5	3.47	.861
The factory facilitates set up to refurbishment of returned materials	172	2	5	3.44	.818
Valid N (listwise)	172				

Source: Survey Data,2025

Note. M=Mean, SD=Standard Deviation.

Per the above table the item stating “The factory has an upgrading mechanism of returned materials” received the highest mean score (M = 3.55, SD = 0.72), indicating that respondents view this practice as relatively well-established. The statement “The factory facilitates set up to refurbishment of returned materials” had the lowest mean score (M = 3.44, SD = 0.82), though it remains above the neutral point of the scale, suggesting a generally favorable perception. Both “There is a remanufacturing of returned bottles and cases in the factory through refurbishing or replacement of parts” and “There is training in the factory for employees on remanufacturing processes” recorded identical mean scores (M = 3.47), reflecting moderate agreement from respondents. These findings suggest that while remanufacturing practices are not exceptionally strong, they are implemented at a moderate level and are positively regarded by employees.

4.2.2. Descriptive Statistics Analysis of Reuse and Renewable Practices

This subsection presents the descriptive statistical findings on the factory’s reuse practices and its integration of renewable energy initiatives. These practices are essential components of sustainable manufacturing and Reverse logistics practice strategies. For the statements related to reuse systems, design considerations for reuse, and renewable energy capabilities, respondents were asked to evaluate their level of agreement using a five-point Likert scale. Table 4.3 provides a summary of the final result, (N) valid response number, minimum and maximum scores, (M)mean values and standard deviations (SD).

Table 4.2.2 Descriptive Statics Analysis of Reuse and Renewable Practices

Descriptive Statistics					
	N	Min	Max	Mean	Std. Deviation
There is a return system of used packaging materials for reuse	172	2	5	3.42	.787
The factory has a quality standard set for reuse of packaging materials.	172	2	5	3.51	.761
The factory design materials for reuse	172	1	5	3.51	.908

The factory is capable to generate energy from renewable sources of energy.	172	2	5	3.51	.798
Valid N (listwise)	172				

Source: Survey Data,2025

Per the above table, the statement "The factory has a quality standard set for reuse of packaging materials" recorded a relatively high mean score (M = 3.51, SD = 0.76), implying that participants moderately agree with the presence of such quality control measures. Similarly, both "The factory designs materials for reuse" (M = 3.51, SD = 0.91) and "The factory is capable of generating energy from renewable sources" (M = 3.51, SD = 0.80) received identical mean scores, though with slight differences in variability. These consistent mean values suggest that employees hold a generally favorable view of the organization's approach to material reuse and renewable energy practices.

The item "There is a return system of used packaging materials for reuse" received the lowest mean within this group (M = 3.42, SD = 0.79). Although this score remains above the neutral midpoint of the scale, it may indicate that respondents perceive the return system as less effective or less visible compared to other sustainability efforts.

Overall, the responses reflect a positive perception of the factory's reuse and renewable energy practices. The relatively low standard deviations (ranging from 0.76 to 0.91) further indicate a consistent level of agreement among respondents, supporting the conclusion that such practices are fairly uniform and accepted across the organization.

4.2.3. Descriptive Statistics Analysis of Recycling and Waste Management Practices

This section presents the descriptive statistical analysis of recycling and waste management practices within the factory. These practices are integral to sustainable production systems and environmental conservation. The analysis explores respondents' perceptions of processes related to the receipt and reuse of returned packaging, policy implementation, and environmentally friendly packaging. Respondents rated their agreement with various statements using a five-point Likert scale. Table 4.2.3 summarizes the findings, including the number of valid responses (N), minimum and maximum scores, mean values (M), and standard deviations (SD).

Table 4.2.3 Descriptive Statistics for Recycling and Waste Management Practices

Descriptive Statistics					
	N	Min	Max	Mean	Std. Deviation
The factory receives returned bottles and cases for repackaging	172	2	5	3.54	.861
Returned bottles are repackaged for distributing to the customers	172	2	5	3.40	.762
The factory has a documented repackaging policy	172	1	5	3.48	.841
The Factory is used environmentally friendly materials for packaging the product	172	1	5	3.51	.791
Valid N (listwise)	172				

Source: Survey Data,2025

Note. M = Mean; SD = Standard Deviation.

As illustrated in the above table the highest M score was reported on the item “The factory receives returned bottles and cases for repackaging” (M = 3.54, SD = 0.86), indicating that respondents generally perceive this practice as moderately established within the factory’s operations. This is followed closely by “The factory uses environmentally friendly materials for packaging the product” (M = 3.51, SD = 0.79), reflecting positive perceptions of the factory's efforts to integrate eco-friendly materials in its packaging process.

The statement “The factory has a documented repackaging policy” received a mean score of 3.48 (SD = 0.84), suggesting moderate awareness or agreement regarding the formalization of repackaging practices. The lowest mean score was associated with “Returned bottles are repackaged for distributing to the customers” (M = 3.40, SD = 0.76), though it still lies above the neutral midpoint, indicating general support for this initiative, albeit to a slightly lesser extent.

Overall, all four gadgets received imply values above 3.00, demonstrating a widely favorable notion of recycling and waste management practices among respondents. The widespread deviations, ranging from 0.76 to 0.86, suggest a mild stage of agreement inside the responses, helping the reliability of these perceptions. These findings recommend that even as recycling and waste management practices are definitely considered, there is capacity for in addition enhancement, especially in terms of increasing transparency and strengthening the reuse mechanisms of again materials.

4.2.4. Descriptive Statistics Analysis of Cost-Efficiency Practices

This subsection presents the descriptive statistical analysis of the manufacturing unit’s cost-performance techniques, which might be important for reinforcing competitiveness and sustainability. Cost-efficiency not only allows in streamlining operations but also allows the factory to provide more low-priced products to its customers. By minimizing needless fees in production, materials, and shipping techniques, the enterprise can allocate assets more successfully. Table four.2.4 summarizes the perceptions of respondents regarding diverse value-discount projects employed by using the factory. The records encompass the range of legitimate responses (N), minimum and maximum values, mean (M), and preferred deviation (SD), all primarily based on a five-factor Likert scale.

Table 4.2.4 Cost-Efficiency Practices

Descriptive statics for cost effective practive					
	N	Min	Max	M	SD
The factory provides lower price products to customers	172	1	5	3.56	.818
The factory has reduced cost of production	172	1	5	3.53	.790
The factory reduces costs of material purchasing by using their own products	172	1	5	3.40	.820
The factory reduces cost of imperfect delivery (defective or excess) returns to customer.	172	1	5	3.55	.900
Valid N (listwise)	172				

Source: Survey Data,2025

Note. M = Mean; SD = Standard Deviation. Source: Survey Data, 2025.

As reflected in the above table the highest average rating was given to the item "The factory provides lower price products to customers" (M = 3.56, SD = 0.82), suggesting that many respondents recognize the factory's efforts to transfer cost savings directly to its clientele. This finding aligns with the broader aim of cost-efficiency—delivering value while maintaining financial sustainability.

Closely following was the item "The factory reduces cost of imperfect delivery (defective or excess) returns to customers" (M = 3.55, SD = 0.90). This indicates a general agreement that measures are in place to minimize the financial impact of delivery errors, a critical aspect of both customer satisfaction and operational efficiency.

Respondents also expressed moderate agreement with the statement "The factory has reduced cost of production" (M = 3.53, SD = 0.79), highlighting an awareness of internal efforts to streamline manufacturing processes. The item with the lowest mean score in this category was "The factory reduces costs of material purchasing by using their own products" (M = 3.40, SD = 0.82). While still above the neutral midpoint, this score may suggest either limited visibility or mixed effectiveness of in-house material reuse practices.

In summary, the findings suggest a generally positive perception of the factory's cost-saving initiatives. Although all gadgets were rated above the midpoint (3.00), indicating agreement standard, the variety in responses (SD starting from 0.79 to 0.90) indicates that studies with fee-efficiency strategies may additionally range barely among employees. These outcomes factor to an opportunity for more conversation or enhancement of positive practices, in particular the ones concerning inner material reuse.

4.2.5. Descriptive Statistics Analysis of Product Quality and Customer Satisfaction

This subsection provides a top-level view of respondents' perceptions regarding the factory's product nice and purchaser satisfaction efforts. Product durability, criticism frequency, and product disorder costs are crucial to gauging how properly the manufacturing unit meets client expectations and continues exceptional requirements. These insights are vital for expertise in how inner techniques translate into outside patron reviews. Table 4.2.5 presents the descriptive facts for gadgets associated with these areas, inclusive of the variety of legitimate responses (N), minimal and maximum scores, mean (M), and popular deviation (SD), as measured by a five-point Likert scale.

Table 4.2.5: Product Quality and Customer Satisfaction

Descriptive statics for product quality and customer satisfaction					
	N	Min	Max	M	SD
The factory provides durable packaging materials for customers	172	2	5	3.58	.809

The factory receive minimum complaints on quality of products	172	1	5	3.50	.820
The factory has reduced defects of the products	172	1	5	3.40	.820
The factory provides quality products to customers	172	1	5	3.45	.847
Valid N (listwise)	172				

Source: Survey Data,2025

Note. M = Mean; SD = Standard Deviation.

Per the above table, the highest average score was reported for the item "The factory provides durable packaging materials for customers" (M = 3.58, SD = 0.81). This suggests that respondents largely agree that the packaging materials used by the factory are robust and meet durability standards, which is a key factor in maintaining product integrity during handling and transportation.

The next highest-rated item, "The factory receives minimal complaints on quality of products" (M = 3.50, SD = 0.82), indicates a generally favorable view of customer satisfaction and product reliability. Although this does not imply the absence of complaints, it does suggest that issues related to product quality may not be prevalent or are effectively managed.

The statement "The factory provides quality products to customers" (M = 3.45, SD = 0.85) and "The factory has reduced defects of the products" (M = 3.40, SD = 0.82) received slightly lower ratings. While both remain above the neutral midpoint of the scale, they point to areas where improvements in production consistency and defect prevention could enhance the overall quality profile of the factory's output.

Despite the version in suggested ratings, all objects passed the impartial threshold (3.00), reflecting an overall high-quality notion of the factory's efforts in handing over great products and retaining consumer pride. Additionally, the exceptionally tight range of well-known deviations (0.81–0.85) indicates a mild stage of agreement amongst respondents, in addition validating the consistency of these perceptions across the sample. These insights underscore the importance of continued funding in satisfactory warranty structures and responsive customer comments mechanisms.

4.2.6. Descriptive Statistics Analysis of Operational Flexibility

This subsection presents an overview of respondents' views on the manufacturing facility's capability to adapt its operations in response to inner and outside changes. Operational flexibility performs a vital function in preserving performance and client satisfaction in dynamic environments. It displays the company's capacity to regulate manufacturing stages, modify shipping timelines, reply to moving market demands, and tailor merchandise to satisfy unique customer requirements. Table 4.7 gives the descriptive records related to those elements, which includes the number of legitimate responses (N), minimum and most ratings, suggest values, and trendy deviations.

Table 4.2.6: Operational Flexibility

Descriptive statics for operational flexibility					
	N	Mini	Max	M	SD
There is an ability to change the level of output produced in the factory	172	2	5	3.48	.737
There is an ability to change the planned delivery date by unexpected customer order	172	2	5	3.43	.803
There is an ability to respond quickly market demand fluctuations	172	1	5	3.49	.855
There is an ability to change products depending on the customers‟ needs	172	1	5	3.37	.858
Valid N (listwise)	172				

Source: Survey Data,2025

As presented inside the above table the highest-rated item was “There is an capability to respond fast to market call for fluctuations” (M = 3.49, SD = 0.86), indicating that many respondents understand the manufacturing unit as able to adapting production based totally on converting customer or marketplace situations. Nearly equal in rating, “There is an ability to change the level of output produced in the factory” received a mean of 3.48 (SD = 0.74), reflecting a similarly favorable view regarding production scalability.

The mean score for “There is an ability to change the planned delivery date by unexpected customer order” was 3.43 (SD = 0.80), suggesting moderate agreement on the factory’s ability to manage delivery changes in response to customer needs. The lowest mean score, “There is an ability to change products depending on the customers’ needs” (M = 3.37, SD = 0.86), still remained above the midpoint, although it may reflect perceived limitations in the factory’s ability to adapt product specifications or customize offerings.

Despite some variation, all objects validated imply rankings above the neutral point (3.00), indicating a typically effective belief of operational flexibility. Standard deviations, which ranged from 0. 74 to 0.86, show a slight unfold of responses, implying a diploma of variability in how constantly these skills are skilled across departments or roles.

In summary, the findings suggest that at the same time as the manufacturing facility is commonly seen as adaptable, especially in scaling production and responding to marketplace modifications, there can be room for further improvement in terms of product customization and dynamic scheduling. Enhancing those dimensions ought to similarly support the company’s agility and responsiveness in competitive enterprise surroundings.

4.2.7. Descriptive Statistics Analysis of Delivery Performance

This subsection offers insights into how respondents perceive the factory's delivery overall performance—an important thing of operational effectiveness and patron delight. Efficient shipping overall performance encompasses now not just pace, but additionally accuracy, reliability, and the competency of logistics carrier vendors. Table 4.8 provides descriptive statistics reflecting these delivery-related aspects, together with the minimal and maximum rankings, mean values, and trendy deviations.

Table 4.2.7 Delivery Performance

Descriptive statics for delivery performance					
	N	Min	Max	Mean	Std. Deviation
There is high delivery speed of products to customers	172	1	5	3.42	.898
There is an on time delivery of ordered products to customers	172	2	5	3.58	.794
The factory delivers the ordered quantity accurately	172	1	5	3.49	.914
The factory logistic providers are capable to delivery product to customers	172	1	5	3.43	.859
Valid N (listwise)	172				

Source: Survey Data,2025

Note. M = Mean; SD = Standard Deviation.

As shown in the above table the statement “There is an on-time delivery of ordered products to customers” achieved the highest mean score (M = 3.58, SD = 0.79). This suggests that timeliness in delivery is a strong aspect of the factory’s performance and is recognized positively by the majority of respondents.

Next, the item "The factory delivers the ordered quantity accurately" (M = 3.49, SD = 0.91) reflects a moderately favorable view of order accuracy—another key metric in evaluating customer satisfaction. The statements "The factory logistic providers are capable to deliver product to customers" (M = 3.43, SD = 0.86) and "There is high delivery speed of products to customers" (M = 3.42, SD = 0.90) received slightly lower scores, though still above the neutral point of 3.00. These figures suggest that while performance is generally perceived as satisfactory, speed and the efficiency of logistics partners may not be as consistently reliable.

The standard deviations, ranging from 0.79 to 0.91, indicate a moderate level of variability in respondents' views. This variability could reflect differences in delivery performance across different product categories, regions, or customer segments.

In summary, the findings advocate that the manufacturing facility demonstrates stable delivery practices, mainly inside the regions of punctuality and order accuracy. However, possibilities exist to further beautify logistics coordination and shipping speed, that may lead to even extra customer satisfaction and operational excellence.

4.3. Assumptions Test

Testing of Assumptions

In statistical analysis, parametric tests like multiple linear regression rely on several key assumptions. Violation of these assumptions can compromise the validity of results and lead to incorrect conclusions. Thus, before conducting the regression analysis, the assumptions of normality, linearity, independence, homoscedasticity, and multicollinearity were thoroughly examined (Özonur, 2025).

4.3.1. Normality Test

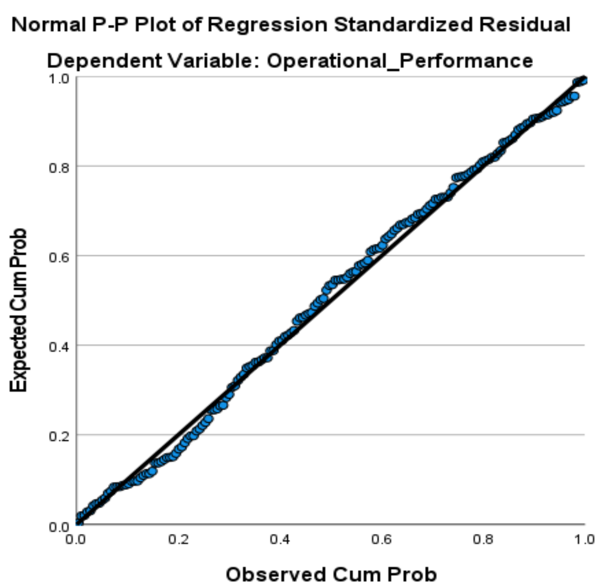
To assess the normality of residuals, both the Kolmogorov–Smirnov and Shapiro–Wilk tests were applied to the standardized residuals. The Kolmogorov–Smirnov test resulted in D(172) = .044, p = .200, and the Shapiro–Wilk test gave W(172) = .992, p = .432. As both p-values exceed 0.05, we are not rejecting null hypothesis that residuals are normally distributed. Based on this it confirmed that the assumption test This confirms that it meets the assumption of normality test.

Table 4.3.1 Test of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Studentized Residual	.044	172	.200*	.992	172	.432

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Figure 4.3.1: Test of Normality



4.3.2. Independence of Residuals

To verify the independence of residuals, the Durbin–Watson test was conducted. The test yielded a statistic of 1.983, which falls within the acceptable range of 1.5 to 2.5. Therefore, the assumption of independence is satisfied.

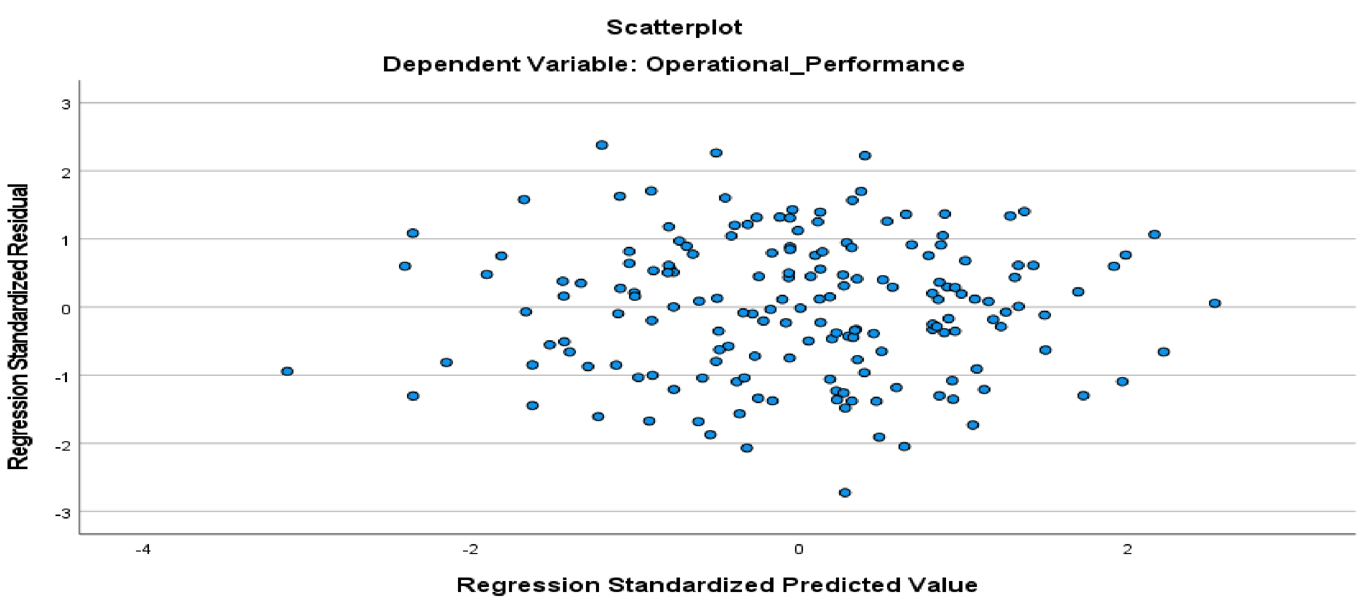
4.3.3. Linearity Assumption

Linearity was evaluated using a scatterplot of standardized residuals against predicted values. The plot showed random dispersion of residuals around zero, indicating no curvilinear patterns. This suggests that a linear relationship exists between the dependent variable (Operational Performance) and the independent variables (Remanufacturing, Reusing, Recycling, and Repackaging).

4.3.4. Homoscedasticity Test

The assumption of homoscedasticity—constant variance of residuals—was examined through a residual scatterplot. The spread of residuals appeared uniform across all levels of predicted values, showing no funnel or curved shape. Thus, the assumption of homoscedasticity is satisfied.

Figure 4.3.4 Scatterplot forhomoscedasticity test



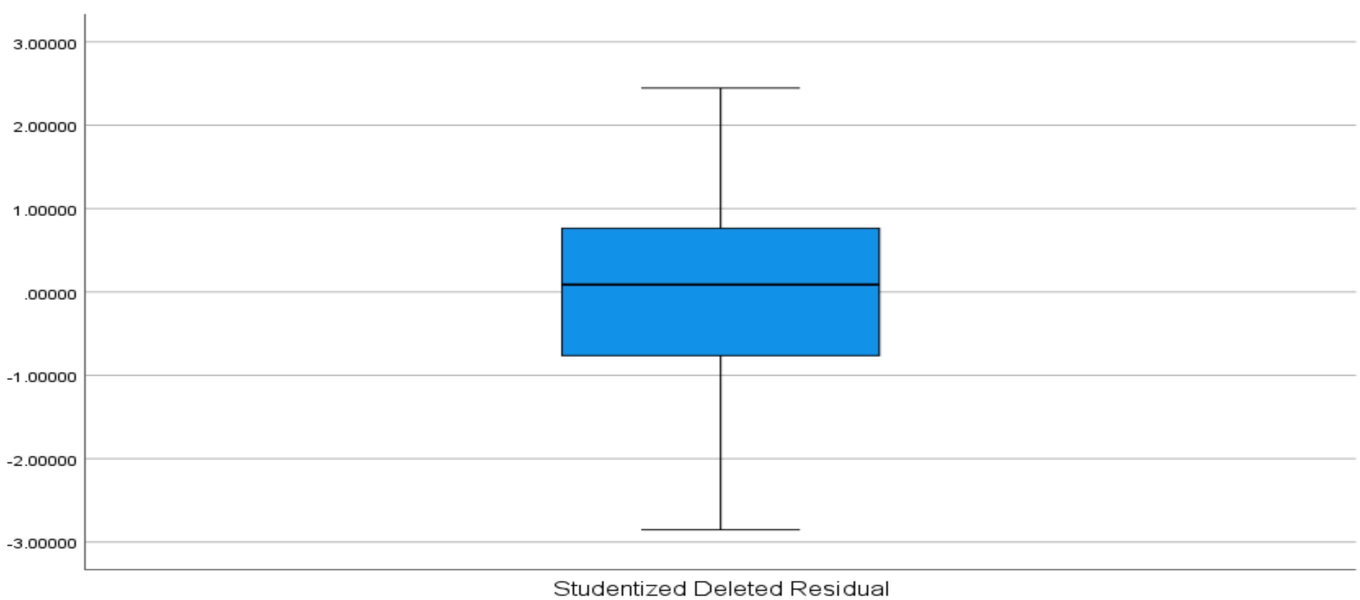
4.3.5. Multicollinearity Test

Multicollinearity was assessed using Tolerance and VIF statistics. All Tolerance values were greater than 0.10 and VIF values were less than 10 (Tolerance range: .972–.996; VIF range: 1.004–1.029), indicating the absence of multicollinearity among the predictors.

Table 4.3.5: Collinearity Statistics

Coefficients[a]			
Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Remanufacturing	.972	1.029
	Reusing	.977	1.023
	Recycling	.996	1.004
	Repackaging	.991	1.009

Figure 4.3.5: Studneized Deleted Reidual



4.4. Multiple Linear Regression Analysis

4.4.1. Summary Model

The regression model explained a small portion of the variance in operational performance. The R value was .193, and the R Square was .037, meaning only 3.7% of the variation in operational performance is explained by the four predictors. The adjusted R Square (.014) accounts for the number of predictors and the sample size. The Durbin–Watson statistic again confirmed no autocorrelation (1.983).

Table 4.4.1: Summary Model

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.193[a]	.037	.014	.102900470453165	1.983

a. Predictors: (Constant), Repackaging, Reusing, Recycling, Remanufacturing
b. Dependent Variable: Operational_Performance

4.4.2. ANOVA Table

Table 4.4.2 shows that the overall model was not statistically significant, $F(4, 167) = 1.618$, $p = .172$. This means there is insufficient evidence to conclude that the set of forecasters significantly clarifies the variability in the operational performance.

Table 4.4.2: ANOVA Test Summary

ANOVA[a]					
Model	Sum of Squares	df	Mean Square	F	Sig.

1	Regression	.069	4	.017	1.618	.172[b]
	Residual	1.768	167	.011		
	Total	1.837	171			

a. Dependent Variable. Operational Performance
b. Predictors. Repackaging, Reusing, Recycling, Remanufacturing (constant)

4.4.3. Coefficients Analysis

The regression coefficients for each predictor are shown in Table 4.4.3. Only Repackaging approached significance (p = .053), suggesting a marginal positive effect on operational performance. Reusing had a negative, near-significant effect (p = .091). Other predictors showed no significant influence.

Table 4.4.3: Regression Coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.394	.310		14.164	.000
	Remanufacturing	.008	.036	.017	.226	.821
	Reusing	-.059	.035	-.131	-1.700	.091
	Recycling	.002	.037	.004	.057	.954
	Repackaging	.071	.037	.148	1.947	.053

Coefficients[a]

Model		95.0% Confidence Interval for B		Collinearity Statistics	
		Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	3.781	5.006		
	Remanufacturing	-.062	.078	.972	1.029
	Reusing	-.128	.010	.977	1.023
	Recycling	-.070	.074	.996	1.004
	Repackaging	-.001	.143	.991	1.009

a. Dependent Variable. Operational Performance

4.4.4. Coefficients Correlation Analysis

Coefficients correlation analysis explores the relationships among the independent variables: Repackaging, Reusing, Recycling, and Remanufacturing, as part of the multiple linear regression model predicting Operational Performance.

4.4.4 Coefficients Correlation analysis

Coefficient Correlations[a]						
Model			Repackaging	Reusing	Recycling	Remanufacturing
1	Correlations	Repackaging	1.000	-.038	.030	.086
		Reusing	-.038	1.000	-.044	-.144
		Recycling	.030	-.044	1.000	.043
		Remanufacturing	.086	-.144	.043	1.000
	Covariances	Repackaging	.001	-4.839E-5	3.982E-5	.000
		Reusing	-4.839E-5	.001	-5.690E-5	.000

		Recycling	3.982E-5	-5.690E-5	.001	5.634E-5
		Remanufacturing	.000	.000	5.634E-5	.001

a. Dependent Variable: Operational_Performance

a. Correlations Among Independent Variables

The table shows the Pearson correlation coefficients between each pair of predictors. These values help assess whether multicollinearity might be present in the regression model. The correlation coefficients are interpreted as follows:

A value close to +1 indicates a strong positive correlation.

A value close to -1 indicates a strong negative correlation.

A value around 0 suggests no correlation.

From the correlation matrix:

Repackaging and Reusing have a weak negative correlation (r = -0.038).

Repackaging and Recycling show a weak positive correlation (r = 0.030).

Repackaging and Remanufacturing have a slight positive correlation (r = 0.086).

Reusing and Recycling are negatively correlated (r = -0.044).

Reusing and Remanufacturing also exhibit a weak negative correlation (r = -0.144).

Recycling and Remanufacturing display a weak positive correlation (r = 0.043).

The above suggests that the correlation are al relatively small and independent variables are not strongly corelated. This further supports the absence of significant multicollinearity in the model, complementing the earlier results from the VIF and Tolerance statistics.

b. Covariances Among Independent Variables

The covariance values indicate the direction and degree to which two variables change together, measured in units of the original variables. Though not standardized like correlation coefficients, they provide additional insight into the relationships among predictors.

The covariance between Repackaging and Reusing is -4.839E-5, suggesting a very slight inverse relationship. Repackaging and Recycling share a small positive covariance (3.982E-5).

Reusing and Remanufacturing have a slight negative covariance (0.000), reinforcing their weak inverse correlation. Overall, the covariances confirm that the relationships between predictors are weak, with minimal shared variability.

The coefficient correlation analysis affirms that there are no strong linear relationships among the independent variables in the model. This is essential because strong correlations can indicate multicollinearity, which inflates the variance of coefficient estimates and undermines the reliability of regression results. The determined low correlation and covariance values confirm that the predictors are distinctly impartial, supporting the robustness and interpretability of the Regression version assessing the effect of circular economic system practices on operational overall performance.

4.4.5. Collinearity Diagnostics

Collinearity diagnostics offer an in-intensity evaluation, amongst independent variables, of the presence of multicollinearity in the regression model. Multicollinearity happens if greater than two independent variables are distinctly corelated, that can distort the significance of the predictors and reduce the accuracy of coefficient estimates.

a. Eigenvalues and Condition Indices

The collinearity diagnostics desk indicates the eigenvalues, condition indices, and variance proportions throughout five dimensions. These are derived from a decomposition of the scaled and focused cross-products matrix of the unbiased variables.

Eigenvalues represent the amount of variance in the data explained by each dimension. Very small eigenvalues (close to 0) indicate potential multicollinearity.

Condition Index is the square root of the ratio of the largest eigenvalue to each eigenvalue. A condition index greater than 30 suggests serious multicollinearity.

<u>From the analysis:</u>

Dimension 5 has an eigenvalue of 0.001 and a Condition Index of 99.084, indicating a potential collinearity problem.

High variance proportions associated with this dimension include:

Remanufacturing (26%)

Reusing (11%)

Repackaging (33%)

Recycling (29%)

This suggests that multicollinearity may exist among these predictors, particularly involving Remanufacturing, Reusing, Recycling, and Repackaging. However, because no variable shows very high variance proportions across multiple dimensions with high condition indices, the multicollinearity does not appear severe enough to compromise the model's reliability.

b. Variance Proportions Breakdown

The variance proportions table further clarifies how the variance of each regression coefficient is distributed across the dimensions. For instance:

In Dimension 5, multiple predictors (Recycling, Repackaging, Remanufacturing, Reusing) contribute non-trivial proportions of variance, suggesting intercorrelation.

However, no single dimension accumulates more than 0.73 of any variable's variance except Reusing, which slightly exceeds this in Dimension 4. This reinforces the idea of mild multicollinearity.

4.4.6. Residuals Statistics

By examining the residual (the difference between predicted and observed values) Residuals statistics evaluate the accuracy and consistency of the model's predictions.

a. Predicted Values

Predicted values of the dependent variable (Operational Performance) range from 4.428 to 4.541, with 4.491 and 0.02 mean and standard deviation, respectively. This small deviation indicates stable and consistent predictions.

b. Standardized and Studentized Residuals

Standardized residuals range from -2.724 to 2.381, and studentized residuals range from -2.792 to 2.412, both well within the acceptable range of ±3. This implies that no extreme outliers are unduly influencing the regression model.

c. Deleted and Studentized Deleted Residuals

The deleted residuals range from -0.294 to 0.251, with a mean close to zero. This shows minimal difference when each observation is removed and the model is recalculated.

The studentized deleted residuals also remain within ±3, further indicating a robust model free from high-leverage points.

d. Leverage and Influence Statistics

Mahalanobis Distance ranges from 0.137 to 23.261, with a mean of 3.977, suggesting that while some observations may exert more leverage than others, most fall within an acceptable range.

Cook's Distance values remain low (maximum 0.079), showing that no single observation has an undue influence on the model.

Centered Leverage Values range from 0.001 to 0.136, with a mean of 0.023, indicating that all data points have moderate influence and none are disproportionately affecting the regression estimates.

The collinearity diagnostics reveal mild multicollinearity, primarily among Remanufacturing, Reusing, Repackaging, and Recycling. However, the overall condition indices and variance proportions suggest that it is not severe enough to undermine the model's interpretability or stability.

The residual analysis confirms the model's reliability, showing well-distributed residuals, minimal influence from outliers, and consistent prediction accuracy. These diagnostic results collectively support the robustness of the regression model examining the effects of reverse logistics practices on operational performance.

Tabel 4.4.6: Collinearity Diagnostics

Collinearity Diagnostics[a]						
				Variance Proportion		
Model	Dimension	Eigen value	Condition Index	Constant	Re manufacturing	Re using
1	1	4.992	1.000	.00	.00	.00
	2	.003	42.413	.00	.34	.13
	3	.002	44.878	.00	.00	.03
	4	.002	47.216	.00	.39	.73
	5	.001	99.084	1.00	.26	.11

Collinearity Diagnostics[a]			
		Variance Proportions	
Model	Dimension	Recycling	Repackaging
1	1	.00	.00
	2	.09	.33
	3	.62	.33

	4	.00	.02
	5	.29	.33

a. Dependent Variable: Operational_Performance

Residuals Statistics[a]					
	Min	Max	M	SD	N
Predicted Values	4.427993297576905	4.541176319122314	4.490529504486668	.020021207313595	172
SD values	-3.123	2.530	.000	1.000	172
Predicted values of the Standard error	.008	.039	.017	.005	172
Adjusted Predicted Value	4.437667369842530	4.540726184844971	4.490576415492911	.020127376797044	172
Residual	-.280296593904495	.245000585913658	.000000000000000	.101689834543264	172
Std, Residual	-2.724	2.381	.000	.988	172
Stud. residual	-2.792	2.412	.000	1.003	172
Deleted residual	-.294450879096985	.251429468393326	-.000046911006243	.104679646934005	172

Stud. Deleted residual	-2.851	2.448	-.001	1.007	172
Mahal. Distance	.137	23.261	3.977	3.194	172
Cook's distance	.000	.079	.006	.009	172
Centered leverage value	.001	.136	.023	.019	172

a. Dependent Variable: Operational_Performance

4.4.7. Hypothesis Test Results

Although none of the predictors were statistically significant at the 0.05 level, Repackaging had the highest standardized Beta coefficient ($\beta = .148$), suggesting the strongest relative contribution to operational performance. Reusing followed with a negative Beta ($\beta = -.131$), indicating a potential inverse relationship.

4.4.8. Regression Equation

The multiple regression equation based on unstandardized coefficients is:

Operational Performance = 4.394 + 0.008(Remanu.) – 0.059(Reusing) + 0.002(Recycling) + 0.071(Repackaging) This equation indicates the expected change in operational performance for a one-unit change in each predictor, holding other variables constant.

Discussion and Results supporting with empirical evidence

This study investigated the influence of reverse logistics practice —remanufacturing, reusing, recycling, and repackaging—on operational performance. Employing both multiple linear regression analysis and descriptive statics, the result offer both practical and theoretical insights.

Descriptive statistics indicated moderate adoption of reverse logistics practices among the participants. Repackaging received relatively higher agreement (M = 4.03, SD = 0.58), suggesting firms are prioritizing product presentation for reuse or resale. Reusing and recycling practices were less consistent (M = 3.65 and M = 3.59, respectively), while remanufacturing was the least reported (M = 3.44). These patterns align with prior research by Kirchherr et al. (2018), who observed that among reverse logistics dimensions, repackaging and recycling are more commonly implemented due to their lower cost and complexity compared to remanufacturing.

The operational performance mean score (M = 4.11) implies that firms generally perceive themselves as performing well, but the correlation between this performance and circular practices remained modest.

The multiple linear regression analysis revealed that the overall model wasn't statistically substantial ($F(4, 167) = 1.618$, $p = .172$), the predictors explained only 3.7% of the variance in operational performance ($R^2 = .037$). This suggests that remanufacturing, reusing, recycling, and repackaging do not significantly influence operational performance within the sampled firms. The finding is consistent with studies by Ranta et al. (2021), who argue that while circular practices are conceptually promising, their tangible impact on short-term performance metrics may be limited due to organizational inertia or implementation inefficiencies.

Among man or woman predictors, repackaging ($\beta = .148$, $p = .053$) approached statistical significance, suggesting a marginally fine have an effect on on overall performance. This aligns with findings by way of Geissdoerfer et al. (2020), who reported that better packaging layout improves logistics performance and customer delight. Conversely, reusing had a negative, nearly extensive coefficient (β = -.131, p = .091), which may additionally reflect the operational demanding situations of product collection, pleasant assurance, and regulatory compliance in reuse practices, a mission additionally highlighted in the paintings of Lieder and Rashid (2016).

Remanufacturing and recycling, despite being center factors of reverse logistics, confirmed negligible affect (p = .821 and p = .954, respectively). These outcomes may be attributed to the useful resource intensity and technological necessities of such practices, in particular in contexts like Ethiopia wherein infrastructure and supply chains for round procedures continue to be underdeveloped (Korhonen et al., 2018).

The insignificant regression version reflects the complexity of linking reverse logistics practices to operational overall performance, mainly in developing economies. Factors along with inadequate generation, lack of skilled exertions, coverage gaps, and restricted market readiness may additionally dilute the expected performance blessings (Govindan & Hasanagic, 2018). The findings suggest that for corporations in this context, round practices can be driven more by means of compliance or environmental obligation rather than strategic performance development.

CHAPTER FIVE

5. SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Major Findings

The outcomes of Reverse logistics exercise, in particular remanufacturing, reusing, recycling, and repackaging, on operational overall performance within a selected factory-primarily based setting turned into the number one objective of the have a look at and both inferential and descriptive statics hired to investigate data accrued from 172 respondent.

The descriptive analysis shows that among the four reverse logistics practices, repackaging had the highest mean score (M = 4.53), indicating that it was the most commonly and effectively implemented practice. Recycling (M = 4.48) and remanufacturing (M = 4.45) followed closely, while reusing (M = 4.39) had the lowest mean score, suggesting relatively limited application. Overall, the respondents exhibited a high level of engagement with reverse logistics strategies, reflecting a positive organizational disposition toward sustainable operational practices.

The multiple linear regression analysis shows that the model explained a modest portion of the variance in operational performance, with an R Square of 0.037. Although this suggests that Reverse Logistics practices contributed only 3.7% of the variability in operational performance, some notable patterns emerged. Repackaging showed the strongest positive influence on operational performance ($\beta = .148$, $p = .053$), approaching statistical significance. In contrast, reusing showed a negative relationship ($\beta = -.131$, $p = .091$), hinting at potential inefficiencies or challenges in its current application. Remanufacturing and recycling had negligible and statistically insignificant effects on operational performance.

Furthermore, collinearity diagnostics showed no severe multicollinearity among predictors, as supported by low correlation coefficients, VIF values below 1.03, and tolerable condition indices. The residuals analysis confirmed the model's stability, with residual values, leverage statistics, and Cook's Distance indicating no undue influence or outliers among individual cases.

5.2. Conclusion

This study concludes that while reverse logistics practices are generally well implemented in the selected organization, their direct influence on operational performance remains limited, as reflected in the low R Square value from the regression model. Repackaging emerged as the most influential factor, albeit only marginally significant, suggesting that efforts in this area are contributing positively to improved operational outcomes. Conversely, reusing appeared to have a counterproductive effect, indicating possible inefficiencies in reuse strategies, such as inadequate systems, poor quality of reused materials, or lack of standardization.

Although remanufacturing and recycling are practiced, their minimal impact on operational performance suggests a need to revisit their implementation processes to ensure they align with performance-enhancing objectives such as cost reduction, efficiency, and quality improvement.

Overall, while the adoption of reverse logistics practices is commendable and reflects strong environmental recognition, their strategic alignment with operational overall performance desires requires strengthening. The effects name for extra targeted efforts to optimize those practices in ways that make contributions meaningfully to efficiency, productiveness, and competitiveness.

5.3. Recommendation

Following the findings and end, the following recommendations are proposed by means of researcher.

1. Enhance Repackaging Strategies: Given that repackaging had the most superb have an effect on on operational performance, the enterprise need to prioritize investments in innovative and efficient repackaging solutions. This could include automation, sustainable materials, and progressed labeling and tracking structures.

2. Reevaluate and Optimize Reuse Practices: Since reusing had a terrible have an impact on on operational performance, it's miles vital to analyze the operational inefficiencies or demanding

situations associated with this exercise. The organization need to conduct a price-benefit evaluation of reuse activities, put into effect first-rate control measures, and train group of workers on powerful reuse procedures to make certain it helps overall performance goals.

3. Improve Integration of Remanufacturing and Recycling: Although those practices are in vicinity, their negligible impact indicates a need for higher integration into the operational workflow. This could involve updating gadget, strengthening supply chain partnerships for recycled/remanufactured inputs, and setting up performance metrics that align those practices with productivity and fee-performance.

4. Develop a Reverse Logistics Strategy Aligned with KPIs: The organisation ought to broaden a complete Reverse Logistics approach this is explicitly aligned with key operational overall performance signs. This could ensure that environmental sustainability projects additionally make a contribution to measurable enterprise consequences.

5. Continuous Monitoring and Evaluation: Implementing a continuous improvement framework that video display units the effectiveness of Reverse Logistics practices in actual-time might help perceive performance gaps early and alter techniques for that reason.

6. Capacity Building and Employee Engagement: Invest in training programs to construct worker capacity round reverse logistics practices. Employee expertise and engagement are crucial for successful implementation and for translating these practices into improved performance effects.

By appearing on these tips, the employer can beautify the effectiveness of Reverse Logistics practices and make sure that they contribute not most effective to environmental sustainability however additionally to stepped forward operational performance and competitiveness.

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Appendix I: Questioner

Addis Ababa University, College of Business and Economics School of Commerce.

Department of Logistics and Supply chain Management.

Questioneir to be filled by Employees of Habesha Breweries S.C

Dear Sir/Maam,

My name is Zewudu Solomon Masters student at Addis Ababa University, College of Business and Economics, School of Commerce Department of logistics and supply chain management. Per the part of the requirement for master's degree, I am conducting a research study titled "Effect of Reverse logistics practice on operational performance; in case of Habesha Breweries S, C.".

This is to collect relevant data for my research. Your genuine participation is highly appreciated, and your response provides a critical insight for the study of the topic.

I would like to express my sincere gratitude for your valuable time to respond to the questions provided in this document. Please be assured that the information you will provide will be treated at most confidentiality and solely used for academic purposes only.

Instructions:

- Please use/put (✓) mark to your choice on the space
- No need to write your name

Thank you for your cooperation!!!

Zewudu Solomon,

Part I: Demographic Characteristics of respondents

1. Sex Male ☐ Female ☐
2. Age 20-30 ☐ 31-40 ☐ 41-50 ☐ 51 and above ☐
3. Employees" department Packaging ☐ production ☐ Finance ☐ logistics and warehouse

Sales and Marketing ☐ Quality assurance ☐ Supply and Purchasing ☐

4. Educational level: G-10 completed ☐ G-12 completed ☐ Certificate ☐ Diploma First degree ☐ Master's and above
5. Work experience: 0-5 year ☐ 6-10-year 11andabove year ☐

Part II: The Key Reverse Logistics practices that affect Operational Performance in Habesha Brewery Factory

The following statements relate to the title of the study. Follow the instructions given for your responses. Please tick mark the appropriate box against each statement according to the degree of agreement based on a given scale (1 for Strongly disagree, 2 for disagree, 3 for neutral, 4 for agree and 5 for strongly disagree).

No	**Remanufacturing practice**	1	2	3	4	5
1	There is a remanufacturing of returned bottles and cases in the factory through refurbishing or replacement of parts					
2	The factory has an upgrading mechanism of returned materials					
3	There is a training in the factory for employees on remanufacturing processes					
4	The factory facilitates set up to refurbishment of returned materials					
	Reusing practices					

1	There is a return system of used packaging materials for reuse					
2	The factory has a quality standard set for reuse of packaging materials					
3	The factory design materials for reuse					
4	The factory is capable to generate energy from renewable sources of energy					
	Recycling practices					
1	There is a recycling management system in the factory					
2	The factory has implemented safe waste disposal mechanisms for sorting product end of life					
3	The factory reuses recycled products as raw materials					
4	The factory has a structured market incentives for recyclable packaging materials					
	Repackaging practices					
1	The factory receives returned bottles and cases for repackaging					
2	Returned bottles are repackaged for distributing to the customers					
3	The factory has a documented repackaging policy					
4	The Factory is used environmentally friendly materials for packaging the product					

PART-III: Operational performance

In this study the measurements of operational performance in terms of cost, quality, delivery performance and flexibility. Please tick mark the appropriate box against each statement according to the degree of agreement based on a given scale (1 for Strongly disagree, 2 for disagree, 3 for neutral, 4 for agree and 5 for strongly disagree).

No	Cost	1	2	3	4	5
1	The factory provides lower price products to customers					
2	The factory has reduced cost of production					
3	The factory reduces costs of material purchasing by using their own products					
4	The factory reduces cost of imperfect delivery (defective or excess) returns to customer.					
	Quality					
1	The factory provides durable packaging materials for customers					
2	The factory receive minimum complaints on quality of products					
3	The factory has reduced defects of the products					
4	The factory provides quality products to customers					
	Flexibility					
1	There is an ability to change the level of output produced in the factory					
2	There is an ability to change the planned delivery date by unexpected customer order					
3	There is an ability to respond quickly market demand fluctuations					
4	There is an ability to change products depending on the customers‟ needs					
	Delivery Performance					
1	There is high delivery speed of products to customers					
2	There is an on-time delivery of ordered product to the customers					
3	The factory delivers the ordered quantity accurately					
4	The factory logistic providers are capable to delivery product to customers					