



**COLLEGE OF BUSINESS AND ECONOMICS
SCHOOL OF COMMERCE**

**INFLUENCE OF SUPPLY CHAIN FACTORS ON OPERATIONAL
EFFICIENCY: A CASE OF DEGA BOTTLED WATER**

BY:

Tariku Mekonnen Weldemichael

**A Thesis Submitted to Addis Ababa University School of Commerce in Partial
Fulfillment of the Requirements for Master's Degree in Logistics and Supply Chain
Management**

Advisor:

Zellalem Tadesse (PhD).

JUNE 2025

ADDIS ABABA, ETHIOPIA

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DECLARATION

I, the undersigned, declare that this thesis entitled Influence of Supply Chain Factors on Operational Efficiency: A Case of DEGA Bottled Water is my original work and to the best of my knowledge has not been presented for the degree by any other person, and all sources of materials used for the thesis have been duly acknowledged.

Declared by:

Tariku Mekonnen

Signature: _____

Date: _____

CERTIFICATION

This is to certify that Tariku Mekonnen has carried out his Master's Thesis entitled "**Influence of Supply Chain Factors on Operational Efficiency: A Case of DEGA Bottled Water**" under my advisor ship for the award of Masters of Arts Degree in Logistic and Supply Chain Management from the Addis Ababa University, hence, forwarded for final defense for further evaluation by examiner/s.

Advisor: Zellalem Tadesse (PhD)

Signature: _____

Date: _____

THESIS APPROVAL

Addis Ababa University

School Of Commerce

Department Of Logistics and Supply Chain Management

This is to certify that the thesis carried out by Tariku Mekonnen, Influence of Supply Chain Factors on Operational Efficiency: A Case of DEGA Bottled Water submitted in partial fulfillment of the requirement for the Master of Arts in Logistics and Supply Chain Management complies with the regulation of the University and meets the accepted standards with request to originality and quality.

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June 2025

Addis Ababa, Ethiopia

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ABBREVIATION

SCM - Supply Chain Management

JIT - Just-In-Time

ERP - Enterprise Resource Planning

KPI - Key Performance Indicator

PET - Polyethylene Terephthalate (plastic resin used for bottles)

ISO - International Organization for Standardization (e.g., ISO 20018 mentioned for quality certification)

IoT - Internet of Things

AI - Artificial Intelligence

ABSTRACT

This research examines the relationship between SCM aspects and DEGA Bottled Water's operational efficiency in Ethiopia. Using mixed research, the project uses responses from 126 employee surveys together with the views obtained from two in depth interviews with supplier representatives. The outlined evaluation focuses on these main areas of SCM: inventory Management, Production planning, logistics, Supplier relationship, and finance are all part of it.

Overall, the data suggests that both financial efficiency and good relationships with suppliers play the biggest roles in achieving good operations. In fact, production planning shows a poor relationship with efficiency, meaning that planning is often not well aligned with operation implementation.

The results from this study add to existing knowledge in SCM by looking at emerging water bottling market contexts, which have different supply chain features than developed countries. Suggestions for action include moving to digital SCM, using lean production, partnering more closely with suppliers, and making logistics operations more efficient. Based on these findings,

Key words: supply chain management, operational efficiency, bottled water industry, Ethiopia, inventory management, logistics, Production Planning, Finance, and Supplier Relationship

CHAPTER ONE

INTRODUCTION

This chapter introduces the study by providing an overview of supply chain factors influencing operational efficiency. It presents the background of the study, the statement of the problem, the research objectives, research questions, significance, scope, and limitations of the study.

1.1 Background of the Study

Operational efficiency is the ability to maximize output while minimizing resource consumption is a critical determinant of success for a business across various sectors (Porter, 1985). Within the domain of supply chain management, achieving operational efficiency relies heavily on optimization of inventory management, logistics, finance, and production planning and supplier relationship. These factors are essential in reducing cost enhancing productivity and boosting customer satisfaction (Christopher, 2011). Inefficiencies within any of these domains can escalate cost create delay and lead to inefficient resource usage ultimately undermining a company's competitive edge (Simchi-Levi et al, 2023).

Supply chain dynamics are pivotal in shaping operational efficiency, especially within manufacturing industries where inventory management, production planning, finance, logistics and supplier relation must be harmonized effectively (Chopra &Meindl, 2016). An effective supply chain system ensures that materials are available as needed, production is optimized and product reach customer with minimal disruption all of which contribute to a reduction in inefficiencies (Mentzer et al., 2001). On the other hand, unreliable supplier inadequate inventory control and inefficient logistics can lead to delay, increased holding cost and supply chain disruption significantly compromising operational performance (Simchi-Levi et al., 2003).

In Ethiopia's bottled water sector business face supply chain challenge including sourcing of raw material both locally and in the international market, transportation constraint and ensuring consistent production to meet rising consumer demand (Gebre, 2020). DEGA bottled water is one of the key players in the industry contending similar obstacles that affects its operational efficiency particularly in areas such as Logistics, supplier reliability, inventory management and production planning (DEGA Bottled Water, 2022). The company sources PET resin, shrink film and technical material from international market while relaying on local suppliers for caps and label. Disruption

in the supply of these materials can cause delay in production, increase operational cost and lower overall efficiency (DEGA Bottled Water, 2022).

Effective inventory management is another crucial factor. Overstocking can lead to excess capital tied up in inventory and increased storage cost, whereas under stocking can cause production stoppages and an inability to meet customer demand (Simchi-Levi et al., 2003). Efficient inventory control allows companies to minimize waste optimize warehouse space and maintaining a steady supply of materials without over burdening their financial resource (Chopra & Meindl, 2016). Similarly, production planning requires seamless coordination between procurement and manufacturing processes to avoid resource wastage and ensure timely product availability (Mentzer et al., 2001). A well-integrated production schedule minimize machine down time and improves workflow continuity while ensuring consistent product availability (Simchi-Levi et al., 2003).

Logistics is similarly vital to operational efficiency. Poor route planning limited transportation options and inadequate monitoring can result in higher transportation cost and delay negatively impacting customer satisfaction. Companies that invest in efficient logistics infrastructure can reduce lead times lower transportation cost and enhance service level thereby improving their overall competitiveness and operational efficiency (Mentzer et al., 2001).

Strong supplier relationships are also a key component of efficient supply chain management. Reliable supplier ensures consistent material quality timely deliveries and cost stability of which contribute to streamlined production and enhanced operational performance. Cultivating strong supplier relationship through strategic sourcing long term partnership and collaborative communication can align production requirement with supplier capabilities driving improvements in operational efficiency (Mentzer et al., 2001).

Finance plays a pivotal role in enabling effective supply chain management by directly impacting operational activities. Sound financial management ensures the availability of liquidity allowing for timely supplier payment, strategic investment and reduction in the supply disruption (Gelsomino et al., 2016). Studies have shown that firms with well-structured financial system tend to achieve stronger operational efficiency therefore examining finance as a key supply chain factor

is not only relevant but necessary to understand how it contributes to sustainable operational efficiency (Wuttke et al., 2013).

Given these considerations the study aims to assess the impact of key supply chain factors supplier relation, inventory management, production planning and logistics on operational efficiency at DEGA Bottled water.

1.2 Statement of the Problem

Operational efficiency is a vital factor in determining competitive advantage particularly for business operating in industries characterized by high demand and complex operation (Porter, 1985). In theoretical term operational efficiency refers to the ability to maximize output while minimizing the consumption of resource. This includes key process such as inventory management, production planning, finance, logistics and supplier relationship which are total factors of supply chain. When these elements are efficiently utilized business can significantly lower cost enhance resource usage and improve customer satisfaction all of which contribute to higher profitability and grater market resilience (Simchi-Levi, et al., 2003).

Within the framework of supply chain management, operational efficiency is influenced by several interconnected factors which consist of supplier relation, finance, inventory control, production planning and logistics. Inefficiencies in production planning and inventory management such overstocking and stock shortage can lead to higher holding cost and disruption in production scheduling (Chopra and Meindl 2016). In addition, unreliable suppliers increase procurement cost extend lead times and weaken the overall supply chain structure (Simchi-Levi, et al., 2003).

DEGA Bottled Water faces challenges within its supply chain which is comprised of both imported raw materials such as PET resin, shrink film and technical materials and locally sourced components like perform, caps and labels these materials are essential for maintain the company product quality. However, DEGA struggles with inventory management leading to frequent occurrence of either overstocking or stock shortage (DEGA, 2022). inventory imbalance not only increase holding cost but also raise the risk of product obsolescence further disrupting production scheduling and diminishing customer satisfaction (Chopra and Meindl 2016).

An additional concern for DEGA is supplier reliability delay in the delivery of both imported and locally sourced material hinder production timelines escalating procurement cost and creating inefficiencies in resource allocation (Simchi-Levi, et al., 2003).

Furthermore, DEGA's production planning is often hindered by production planning that lacks real time data concerning material availability. This lack of synchronization results in operational inefficiencies (Simchi-Levi, et al., 2003) stressing the importance of integrated planning system in optimizing resource utilization and minimizing disruptions.

Logistics inefficiencies also remain persistent challenge in DEGA. Issues such as choosing the correct route, instability of routes and increased fuel cost contribute to delay untimely reducing end user satisfaction. As efficient logistics management is crucial for ensuring timely deliveries and reducing overall operational costs (Chopra and Meindl 2016).

While finance is recognized a key driver of operational success many organizations struggle to integrate financial strategies within the supply chain management resulting in inefficiencies. Dega bottled water face challenges such as limited access to proper financial cash flow management with disrupts its operational efficiency and delay its production process (Hofmann, 2005).

Despite these challenges DEGA Bottles water has significant potential to improve its operational efficiency by addressing the core issues within its supply that can in turn increase its efficiency. This study aims to assess the impact of supply chain factors on operational efficiency of DEGA Bottled Water.

1.3 Research Objective

1.3.1 General Research Objectives

The general objective of the study is to assess the influence of supply chain factors on operational efficiency of DEGA Bottles Water.

1.3.2 Specific Research Objectives

The Research aims:

- ✓ To assess the impact of inventory management practice on operational efficiency at DEGA bottled water.

- ✓ To assess the effect of production planning on DEGA's operational efficiency.
- ✓ To identify the role of supplier relationship in influencing DEGA's operational efficiency.
- ✓ To analyze the influence of logistics management on DEGA's operational efficiency.
- ✓ Examine the impact of finance as a supply chain factor on the operational efficiency (OE) of DEGA bottled water.

1.4 Research Question

1. How does inventory management affect the operational efficiency of DEGA Bottled Water in terms?
2. To what extent does production planning influence operational efficiency of DEGA bottled water?
3. How does suppliers' relation impact DEGA's operational efficiency?
4. What role does logistics play in enhancing or hindering DEGA's operational efficiency?
5. What role does finance as supply chain factor play on operational efficiency (OE) of DEGA bottled water?

1.5 Significance of the Study

The need to understand supply chain management proactive and their impact on operational efficiency and how to optimize the key elements such as inventory, production planning, logistics, finance, and supplier relations makes the study relevant as a result hopefully this study will have its contribution on identifying key supply chain factors that influence operational efficiency and analyzing the current supply chain characteristics of DEGA Bottles Water, which in turn offer insight to specific operational strength and challenges.

Furthermore, business striving to strengthen their competitive position this research presents practical implication for implementing cost effective strategies that drive efficiency. While the study maintains a focused scope its insight can serve as foundational reference for future research or strategic guide for organization seeking to optimize their supply chain practice.

1.6 Scope of the Study

This study will focus on the supply chain practice at DEGA Bottled Water, one of the prominent entities within the bottled water manufacturing and distribution industry in Ethiopia. Especially it will explore how the companies supply chain management practice consisting of inventory, production planning, logistics, finance and supplier relation affect its operational efficiency.

The study will target employees and management staffs at DEGA Bottled Water who are directly involved in the supply chain functions including production manager, warehouse managers, logistics coordinators and supply chain officials and management. Additionally, the company's suppliers will be considered to evaluate the effectiveness of supplier relationship.

Moreover, external factors such as market fluctuations, regulatory changes and geopolitical events each of which could impact operational efficiency fall outside the scope of this research. These uncontrollable influences may limit the ability to isolate the effect of supply chain on operational efficiency

1.7 Limitations of Study

This study is limited by its exclusive focus on DEGA Bottled Water Company, which may restrict the applicability of its findings to other companies in the bottled water industry or different sectors. The research's conclusions are thus primarily relevant to DEGA Bottled Water and may not fully reflect the dynamics of other organizations with different operational contexts. Additionally, the accuracy of comprehensive data collected from DEGA present a potential limitation. Any gaps or inconsistencies in the data could affect the reliability of the study's outcomes.

Future studies could address these limitations by extending the research to multiple companies within the bottled water industry or across related sectors offering a broader perspective longitudinal studies that track changes over extended period could also provide deeper insight into long term impact of supply chain practice on operational efficiency.

1.8 Definitions of Terms

- ✓ **Supply Chain Management (SCM):** The process of overseeing the flow of goods, services, and information from raw materials to end consumers. SCM focuses on optimizing

procurement, production, and distribution to improve cost efficiency and customer satisfaction (Christopher, 2016).

- ✓ **Operational Efficiency:** The ability of a company to deliver products or services using the least amounts of resources while maintaining quality. It includes waste reduction, effective resource management, and cost minimization (Slack et al., 2010).
- ✓ **Inventory Management:** The process of overseeing the stock of goods and materials. It includes ensuring optimal inventory levels to meet demand without excessive overstock, which impacts costs (Heizer et al., 2017).
- ✓ **Production planning:** is the process of determining how production processes should be organized to meet demand while efficiently utilizing resources. It involves scheduling, resource allocation, and coordinating activities to ensure that production is aligned with business objectives. (Heizer et al., 2017).
- ✓ **Finance:** refers to the strategic management of monetary resources, including working capital, investments, credit arrangements, and cash flow, to support and optimize supply chain operations (Gelsomino et al., 2016).
- ✓ **Supplier Relationships:** The management of partnerships with suppliers, aimed at improving product quality, reducing costs, and ensuring reliable supply chain operations (Monczka et al., 2016).
- ✓ **Product Quality:** The degree to which a product meets customer expectations and regulatory standards, including factors like durability, reliability, and safety (Evans & Lindsay, 2014).
- ✓ **Logistics:** The management and coordination of the movement of goods, services, and information from the point of origin to the point of consumption (Coyle et al., 2013).
- ✓ **Supply Chain Resilience:** The ability of a supply chain to quickly adapt to disruptions and continue to deliver products or services without significant delays or losses (Harrison & van Hoek, 2011).
- ✓ **Supply Chain Optimization:** The use of various techniques and technologies to improve the efficiency and effectiveness of the supply chain, including cost reduction and performance enhancement (Simchi-Levi et al., 2000)

1.9 Organization of the Paper

This study is structured into five chapters. Chapter One introduces the study by providing an overview of supply chain factors influencing operational efficiency. It presents the background of the study, the statement of the problem, the research objectives, research questions, significance, scope, and limitations of the study.

Chapter Two reviews relevant literature to establish a theoretical foundation for the research. It also explores key concepts, supply chain management theories, and empirical studies. The chapter also presents an overview of the Ethiopian bottled water industry and the role of supply chain management in improving its performance and finally this chapter end with conceptual framework.

Chapter Three discusses the research methodology used to conduct the study. It explains the research approach, study design, sampling techniques, data collection methods, and sources of data. Additionally, it details the tools and techniques employed for data analysis and presentation.

Chapter Four presents and analyzes the research findings. It provides an assessment of the supply chain factors affecting operational efficiency, interprets data collected from field research, and discusses key insights relevant to the study's objectives.

Finally, Chapter five summarize the major finding of the study and present recommendation based on the research outcome.

CHAPTER TWO

LITERATURE REVIEW

This chapter reviews relevant literature to establish a theoretical foundation for the research. It explores key concepts, supply chain management theories, and empirical studies finalizing with the conceptual frame work.

2.1 Theoretical Review

2.1.1 Supply Chain Management

Supply chain management (SCM) is a critical function that involves the strategic oversight of all processes related to the movement of goods and services from sourcing raw material to delivering finished product. This complex system includes planning sourcing, manufacturing distribution and return management. Effective SCM requires a comprehensive strategy that addresses inventory management, production planning, supplier relationship and logistics. By integrating these processes business can ensure smooth operation and meet customer demand efficiently. (Simchi-Levi et al., 2003).

By reducing excess stock and adjusting production like lean methodologies and just-in-time inventory systems, offer remarkable operational efficiencies, cost reductions, and superior business results. Eliminating waste and optimizing production flow are at the core of lean principles, which is why they give organizations like Dega Bottled Water of doing business. Indeed, a study published in the Journal of Operations Management reveals that the implementation of advanced SCM technologies, a fast-paced global economy, supply chain management has matured into a strategic differentiator from a cost demand, companies can cut operational costs while improving their ability to meet customer expectations (Simchi-Levi et al., 2003).

Furthermore, establishing solid client relationships requires a timely and effective supply chain. Customer happiness and loyalty are largely influenced by timely deliveries, product availability, and first-rate customer service, (Ganeshan & Harrison, 1997). Fostering client retention and brand loyalty heavily depends on a company's ability to continuously exceed customer expectations, particularly with regard to delivery speed and reliability. A key component of Dega Bottled

Water's supply chain, on-time delivery and consistent product quality has a direct impact on customer satisfaction and company performance (Ganeshan & Harrison, 1997).

Businesses can establish more cost-effective and agile operations by streamlining supply chain management (SCM) procedures, guaranteeing that products are accessible when needed and satisfy consumer expectations for quality. SCM procedures including inventory control, supplier relationships, and production planning are essential for striking a balance between cost-effectiveness and customer satisfaction. According to recent studies, supply chain visibility and flexibility are further increased by integrating digital technology and data analytics, which eventually improves business outcomes (Chopra & Meindl, 2016).

2.1.2 Bottled Water Industry

The bottled water industry is one of major players in the global beverage market operating within a complex environment influenced by consumer preference, environmental issues and ethical concerns. While it initially grew by offering convenience and purity it future now depends on how well it can balance growth with sustainability. (Gleick, 2010)

One of the main reasons for the industry growth is the widespread believe that bottled water is better option than tap water. This belief has been heavily influenced by marketing which often plays on consumers concern about water quality especially in areas with old infrastructure or contamination problems. Marketing of bottled water has been extraordinarily successful in creating an image of purity and health even though tap water meets or even sometimes exceed the same safety standard. The combination of perceived quality and convenience has made bottled water a regular part of daily life (Gleick, 2010).

However, this convenience comes with significant environmental cost. The large-scale production and disposal of plastic bottle are major contributors to global plastic pollution. Plastic packaging represents the vast majority of plastic entering the ocean and bottle water containers are big part of that waste. While the industry has tried to address this by using the recycled plastic and investment in recycling process critics argue that these efforts are not enough many believe a more fundamental change is needed such as using reusable alternatives to tackle the core issue. (Ellen MacArthur Foundation, 2016)

Along with the environmental concern there are growing ethical questions about selling water a vital resource for human survival. Water is a human right not a commodity and bottle water industry often make access to water less fair. This issue is especially serious in areas where water is scarce as commercial production can drain local resource and harm vulnerable communities these practices raise important question about the role of companies in managing vital resources (Barlow 2008).

2.1.3 Supply Chain in The Bottled Water Industry

The bottled water industry supply chain is a multi-step process that starts with sourcing water from spring, wells or municipal supplies. This initial stage is crucial as the location of water source directly impact transportation cost and environmental footprint as concern about water sustainability grow companies are under increasing pressure to ensure responsible sourcing practice. Additionally, the production of bottles primarily made from PET plastic presenting significant environmental challenges due to high energy consumption and its contribution to plastic waste. (Ellen MacArthur Foundation, 2016).

After sourcing and bottle production the water treatment and bottling phase play a critical role in ensuring product safety and compliance with regulation. Bottling facilities are located near water source to minimize transportation cost. During this stage strict quality control measures are enforced to meet industry and health standard. Despite these precautions concerns continue regarding the industry environmental impact particularly in terms of water use efficiency and waste generation. (Ellen MacArthur Foundation, 2016).

Distribution is the backbone of the bottled water supply chain requiring careful logistics to transport product effectively while minimizing cost and carbon emission. Due to the weight and volume of bottled water optimizing transportation routes and managing inventory effectively. The retail phase further complicates the supply chain with products distributed through supermarkets, convenience stores, grocery stores, each catering different consumer preference. However, the post consumption phase remains an ongoing challenge the industry focus on close-loop supply chain aims to tackle this by collecting processing and reintegrating used bottles into production reducing the need for virgin plastic and alleviating environmental damage. (UNEP 2018)

2.1.4 Supply Chain Challenges in the Bottled Water Industry

The bottled water industry faces a range of supply chain challenges requiring flexibility to adapt to market uncertainties and demand fluctuation. Issues like market volatility, seasonal shift and unexpected disruption such as natural disaster or regulatory changes demand agile supply chain strategies. If not properly addressed these challenges can lead to inefficiencies, stock outs or excess inventory which intern negatively affect profitability and customer satisfaction. To manage these risks companies must adopt strong demand forecasting models and flexible logistics strategies that enhance adaptability without sacrificing cost efficiency (Kyeremeh, 2019)

Strategic purchasing is crucial for improving supply chain performance as it directly affects vendor reliability, material quality and inventory optimization. By establishing long term relationship with trusted suppliers particularly for key material like PET resin and packaging component companies can ensure a steady supply of raw material. Studies have shown that effective procurement strategies improve vendor performance and reduce lead times which is essential for maintain a competitive edge. Additionally diversifying suppliers and sourcing locally can help minimizing disruption while supporting sustainability goals (Coban, 2012)

Environmental concerns remain significant challenge with greenhouse gas emission primarily stemming from plastic pallets disposable packing and energy intensive production process. The heavy reliance on PET plastic not only contributes to carbon emissions but also add to the global plastic waste crisis. Additionally, the energy consumption in bottling facilities and distribution network worsen the industry environmental foot print. To address these issues many companies are integrating green supply chain management practice such as reducing plastic use and adopting circular economic principles. This measure helps improve environmental sustainability while also enhancing cost efficiency in the long term to minimizing waste and optimizing resources (Misopoulos et al., 2020)

One promising solution to these supply chain challenges involves using mathematical programming techniques for optimization. Advanced modeling methods can improve decision making in area such as production planning, transportation and inventory management. Therefore, these techniques not only optimize logistics and resource allocation but also foster a more resilient supply chain (Liu, 2011).

2.1.5 Inventory Management

Efficient inventory control is a cornerstone of supply chain optimization and plays a pivotal role in enhancing operational performance. Just In Time (JIT) inventory system based on lean principal are designed to minimize inventory caring cost while promoting a more streamlined production process. JIT minimized waste and reduced excess inventory and improves supply chain agility (Womack et al. 2011)

Moreover, effective inventory management has direct impact on cash flow one of the critical components of operational success. Reducing surplus inventory enhance cash flow by freeing up capital. He also highlighted cash flow is frequently impacted by high cost related to raw material purchase stating that he concluded JIT practice and maintain lean inventory levels company can release valuable cash for reinvestment in other operational need or growth opportunity. (Andala, 2019)

High inventory turnover is practically important in industries that manufacture where product quality is important. Rapid inventory turnover not only reduces storage cost but also ensures product quality, quick inventory turnover is essential for minimizing the risk of food borne illness which has become an issue of great concern therefore maintain high inventory turnover rate is crucial to safe guarding the quality and safely of products untimely driving operational success.(Chopra and Meindl 2016)

2.1.6 Production Planning

Production planning is a critical element in optimizing resource utilization and aligning production schedules with fluctuation demand both of which are important for achieving operational efficiency. Accurate production planning and capacity management are essential to avoid both production delay and surplus output. Importance of planning in matching production levels to demand thus given the seasonality of 50% of world items production planning is an important factor to enhance operational efficiency. (Jacobs et al., 2014),

Additionally, production planning based on lean manufacturing principles offer a pathway to minimizing waste boosting throughput and reducing operational cost. Explaining how these principles streamline production process contributing to lower expenses such as adopting lean

strategies that reduces down time, improve machine efficiency and minimizing excess inventory resulting in substantial cost saving and enhanced operational performance. (Rother et al., 2003)

Lastly quality control is inherently tied to effective production planning assert that quality management system ensures high standard throughout the manufacturing process this paramount importance as maintaining high quality production process such as efficient packing which is essential for compliance with health and safety regulation. (Juran et al.,2008),

2.1.7 Logistics

The logistics plays a pivotal role in ensuring the timely and cost-effective delivery of product to consumer. Optimizing transportation routes and reducing transportation cost are critical to improving supply chain efficiency. Strategies for enhancing operation as one of its components features its distribution network is vital to ensure efficient delivery especially intermesh of perishable natured material. (Coyle et al. 2013).

Recent studies by the World Shipping Council (2021) emphasize the importance of packaging standards and proper handling techniques in maintaining product quality during transport. For Dega Bottled Water, investing in durable and secure packaging materials is crucial to safeguarding product integrity during delivery.

The other important point is that speed of delivery is directly linked to customer satisfaction. Timely deliveries significantly impact customer retention and satisfaction thus ensuring fast deliveries to retailer and consumer is essential for maintain a competitive edge in the bottled water market (Payne et al., 2005) A recent Sales force of (DEGA.,2023) report from highlight that consumers now expect swift and dependable deliver.

Preserving product integrity during transportation is vital to maintain its quality. (Christopher ,2016), Discuss the risk associated with transporting perishable goods including potential damage or contamination during transit. Proper packaging and handling proactive are essential to ensure that product quality is preserved throughout the transportation process.

2.1.8 Supplier Relationship

Collaborations with supplier is a critical factor in effective supply chain management. Developing strong partnership with supplier creates a more flexible and innovative supply chain. effective

supplier relationship can lead to reduced cost improve quality and enhanced innovation. Thus, as describe establishing and maintain strong ties with suppliers ensures a consistent flow of high-quality inputs which is essential for optimizing production efficiency. (Monczka et al. 2016), how strong supplier relation can enhance supply chain resilience particularly when faced with disruption such as natural disaster, pandemics or supply shortage (Kleindorfer et al, 2005),

The sharing of knowledge and fostering innovation is key driver for improving operational efficacy. Collaborating with supplier foster innovation in both products design and process improvement. Therefore, working closely could lead to significant gain in operational efficiency resulting in cost reduction and enhanced product quality. (Tidd et al., 2013),

2.1.9 Finance

Recent studies emphasize finance as a critical enabler of supply chain efficiency. financial strategies like dynamic discounting and inventory financing directly reduce operational costs by optimizing cash flow across supply networks and firms with integrated financial and operational planning achieve 18-22% faster inventory turnover, highlighting the synergy between working capital management and logistical performance (Gelsomino et al. 2016).

Operational efficiency in manufacturing hinges on aligning production planning with supplier reliability. Just-in-time scheduling reduces warehousing costs by 30% when supported by dependable suppliers. For perishable goods like bottled water, Chen et al. (2019) stress that logistics management errors can increase spoilage rates by up to 15%, directly eroding profitability (Lummus et al. 2001). Collectively, the literature underscores that DEGA's efficiency improvements require simultaneous optimization of financial levers (e.g., payment terms) and physical processes (e.g., inventory routing).

2.1.10 Current Supply Chain Trend in Ethiopian Bottled Water Industry

Ethiopia's bottled water industry is undergoing a transformation driven by growing environmental concern, market demand and operational inefficiencies. Recent research highlights a shift towards green supply chain managements practice marking a move away from superficial sustainability claims toward tangible environmental and economic benefits. Sustainable practice such as water conservation and the use of recycled material are gaining a moment contributing to the industry long terms viability. Unlike past instance of green washing where sustainability claims by

marketing, companies are now investing in eco-friendly initiatives that align with regulatory requirement and consumer expectation. These efforts not only improve brand reputation but also helps businesses achieve cost saving and comply with Ethiopia's evolving environmental regulation (Ababulgu et al., 2025)

Despite these positive shift and plastic waste management remain significant challenges for Ethiopia's Bottled water supply chain. The prevalent use of PET plastic bottles coupled with limited recycling infrastructure increase environmental issues. Although some manufacturing have started using recycled PET these efforts are still inadequate due to weak enforcement low public awareness and inefficient waste collection system. The lack of a structured reverse logistics network which would involve the collection, processing and reintegration of used bottles into the supply chain limits the industry ability to manage waste effectively. To tackle these challenges a collaborative effort between the government, private sector, and consumers is essential to establish efficient recycling programs, incentivize waste collection, and implement policies that support a circular economy (Matiwos Ensermu, 2014).

A crucial aspect of improving supply chain efficiency in Ethiopia's bottled water sector is supply chain integration which refers to the coordination between suppliers, manufacturers, distribution and retailers. Research indicates that Ethiopian firm faces challenges due to fragmented communication and reliance on traditional operational methods which hinder responsiveness and efficiency. Many businesses still use manual record keeping and outdated information sharing practice making it difficult to manage inventory and optimize production planning this lack of integration leads to delay in decision making and higher operational costs. Adopting digital supply chain solutions enterprise resource planning system and tracking system significantly enhance coordination and streamline operations (Georgise et al., 2014)

2.2 Empirical Review

2.2.1 Lean Supply Chain Management: A Simplified Overview

Lean principles emphasize the reduction of waste at every stage of the supply chain. By focusing on minimizing excess inventory and reducing lead times business can significantly lower cost and boost efficiency. JIT which is a core principle aligns with inventory and actual demand helps reduce storage cost and avoid over production industries like manufacturing have successfully

applied JIT which leads to production cost reduction of 12-15% and improvement in delivery speed by 10%. (Oluwaseyi, K. O. 2024).

The integration of emerging technologies such as internet of things and artificial intelligence has further enhanced the effectiveness of lean supply chain strategies. These technologies enable real time inventory tracking and improve demand forecasting. By combining lean methodologies companies can achieve even greater level of efficiency. Adoption of IoT system alongside lean practice resulted in 20% reduction in production lead time. (Baihaqi at el.2012)

Lean practice also increases organizational resilience particularly in times of crisis or disruption. During the COVID 19 pandemic companies that utilized lean supply chain showed greater adaptability compared to those relaying on the traditional approach. Firms employing lean strategies saw 15% increase in order fulfillment rate during the crises highlighting the importance of flexibility in navigating supply chain challenges. (Ivanov, D. (2023)

In conclusion Lean supply chain management remains a highly effective method of improving operational efficiency. When integrated with digital technologies lean practice not only reduce cost and enhance customer satisfaction but also strengthen a firm ability to responds to dynamic market condition these finding underscores the enduring relevance and efficiency of lean method in today competitive business environment (Baihaqi at el.2012; Ianov, D. 2023; Oluwaseyi, K. O. 2024).

2.2.2 Supply Chain Integration Theory and Its Impact on Operational Efficiency

Supply Chain Integration (SCI) is an essential idea that signifies the collaboration and coordination among various supply chain partners, such as suppliers, manufacturers, and retailers. Recent empirical research further emphasizes the beneficial effect of SCI on enhancing operational efficiencies, cost reduction, quicker delivery, and better quality.

Combining information among different supply chain partners resulted in notable enhancements in operational performance. In particular, they noted a 17% enhancement in inventory turnover and a 15% increase in on-time delivery. Firms that adopted integrated systems, like cloud-based Enterprise Resource Planning (ERP) solutions, attained improved visibility and coordination throughout their entire supply chain. This integration improved communication and minimized delays, resulting in more efficient operations and lower costs.(Huo et al, 2021)

Digital integration tools fostering real time collaboration among supply chain partners their research conducted in manufacturing industry demonstrated that firms aligning their production and logistics planning system with those of their suppliers achieved 20% reduction in lead times and 10% decrease in transportation cost. Furthermore, this integration resulted in a 12% improvement in customer satisfaction driven by faster delivery and minimized stock shortage. (Oubrahim et al. 2023)

Collectively these studies underscore the deeper supply chain integration especially through digital technologies that enhance operational efficiency which in turn lower cost and boost customer satisfaction. By fostering stronger coordination enabling faster decision making and increasing flexibility therefore SCI provides companies with a competitive advantage in an increasingly dynamic business landscape. (Huo et al., (2021); Jean, G. (2024); Oubrahim et al.(2023).

2.3 Summary of the Literature Review and Knowledge Gaps

Existing literatures show the critical role of key supply chain components like inventory management, production planning, logistics and supplier relationships in enhancing operational efficiency. Effective inventory controls minimize cost and prevent disruption while a well-structured production scheduling enhances resource utilization and reduces downtime. In the meantime, well-crafted logistics and finance system can accelerate delivery times and improve user satisfaction additionally strong supplier relationship enhance reliability and mitigate risk associated with delay and quality inconsistencies.

However, there is a significant research gap. While these supply chain factors have been extensively analyzed in industries such as manufacturing and retail, their specific impact on operational performance within the water bottling sector particularly in the emerging market like Ethiopia has received limited attentions.

This study aims to bridge these gaps by evaluating the effect of the stated supply chain factors on operational efficiency at DEGA Bottled Water. By focusing on these fundamental supply chain elements within the Ethiopian market the research will provide insight and practical strategies to enhance efficiency and drive sustainable growth.

2.4 Conceptual Framework

Operational efficiency entailing the maximization of outputs while minimizing input (time, money, labor) is crucial for a company success. Well-structured supply chain is essential for achieving operational efficiency (Christopher, 2016; Slack, Brandon-Jones, & Burgess, 2019).

Based on an overall review of related literatures and particularly the works of Simchi-Levi et al. (2003), Chopra & Meindl (2016), Christopher (2011), and Mentzer et al. (2001), the following conceptual model is derived from these authors.

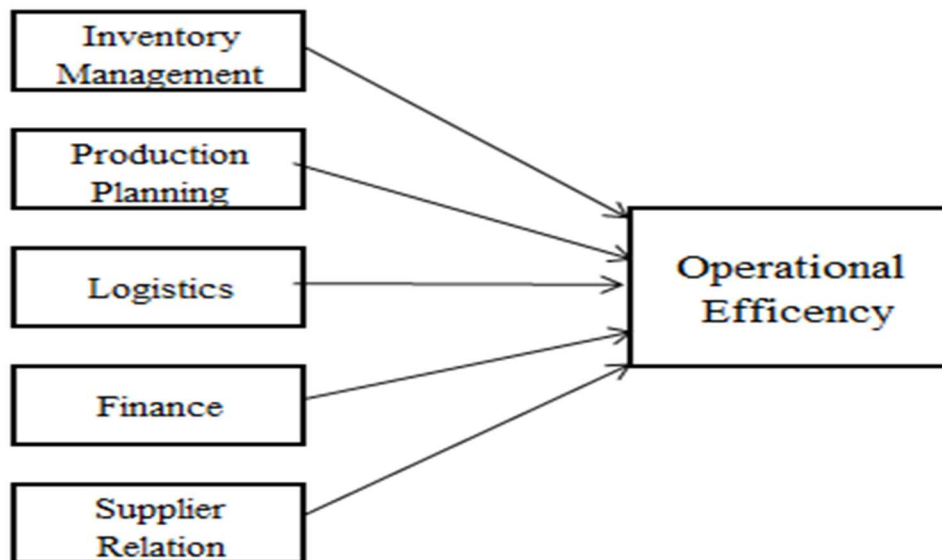


Figure 2. 1: Conceptual Framework

Source: This framework is the author's own elaboration

CHAPTER THREE

METHODOLOGY

This chapter focuses on the approach adopted for the study which describes the method and techniques that were adopted to collect data for the analysis of the filed data as a result the research design data requirement and source, sampling techniques, data collection and techniques, data analysis and presentation methods have discussed. Research methodology defines what the activity of research is how to proceed, measure the progress and what constitutes success. (Yin, 2003)

3.1 Description of Study Area

This study investigates the impact of key supply chain factors such as inventory management, production planning, logistics and supplier relationships on the operational efficiency of DEGA Bottled Water, a prominent company in Ethiopia's Bottled Water industry. It was established by BNT Industry and Trading plc and currently operates its bottling facility in Debrebrhan located approximately 130 kilometers from Addis Ababa. The company sources it water from BosonaWerana, Komargefiya in the Amhara National Regional State, North Shoa Zone. DEGA's distribution network is both retail and wholesale customers with a particular focus on urban areas like Addis Ababa where demand for clean drinking water is steadily increasing. By exploring these factors, the study aims to provide valuable insights.

3.2 Research Approach

This study adopts a mixed method approach of descriptive and explanatory to examine the impact of supply chain factors on operational efficiency of DEGA Bottles Water. The mixed method allows for both qualities and quantities data collection and analysis providing a comprehensive understanding of how inventory management, production planning, logistics, finance and supplier relationship contribute to operational efficiency (Bryman, 2016; Saunders, Lewis, & Thornhill, 2019).

3.3 Research Design

The research design that employed in this study is descriptive and explanatory research. It is mixed research technique that can incorporate both qualitative and quantitative methods. A design which allows ways of formulating a problem for more clear explanation of events which is called explanatory research. (Mugenda ,2003)

3.4 Target Population and Sampling Size Determination

3.4.1 Population of the Study

The study involve two distinct populations the internal population at Dega Bottles Water and the external population consisting of suppliers who provide critical raw material.

The internal population of this study consist of 206 employees from various department within Dega Bottled water that consists employees represent key areas of the company including Operations, Supply Chain, Logistics, Finance, Warehouse, Marketing, and Distribution. This population includes employees, supervisors and Section Managers who are directly involved in the production process.

The external population in this study consists of supplying companies that provides essentials raw materials such as PET resin, preform, shrink film, cups and labels from production of bottled water at DEGA. These suppliers play a critical role in the company's supply chain making it essential to gather their perspective.

3.4.2 Determination of Sample Size

Internal Population at Dega Bottled Water

A sample is a subset of a broader population on which a study is conducted (Bordena and Abbott, 2011). In a research study, sampling is a key action that necessitates a detailed examination. The population element is utilized to form inferences about the entire population. In this study, sampling is utilized to produce results that are accurate to draw inferences from (Zikmund, Babin, Carr, Adhikari, 2010).

A pilot survey was conducted to gather information about the study area in order to create data for questionnaire design and to choose sample representative for the final studies report. Aside from that the pilot survey aids in the gathering of comprehensive information about the variables studied as well as the identification of methods for disseminating and collecting questionnaires from the target group. According to the result of the pilot survey there are 206 peoples in the research area including 49 Administration, 77 Quality and Production, 14 Technical, 23 Warehouse and logistics, 3 Supply chain, 40 sales and marketing.

A representative sample was chosen based on Yamane's formula from a total of 206 participants, which includes Administration, Quality and Production, Technic, Warehouse and logistics, Supply chain, sales and marketing of DEGA bottled water producing firm (Yamane, 1967). As a result, the required sample size was calculated at a 95% confidence level with 5% degree of variability and a 5% level of precision to generate a sample size that represents a true population.

$$n = \frac{N}{1 + N(e)^2} = \frac{206}{1 + 206(0.05)^2} = 136.243 \approx 136$$

External Population: Suppliers to Dega Bottled Water

The external population comprises six supplying companies that provides essential raw material such as PET resin, preform, shrink film, cups, and labels to Dega Bottled Water. For the external population purposive sampling is employed to select two individuals from each two supplier resulting in a total of 4 participants, this participant are be selected based on their direct involvement in the supply chain process and their capacity to provide relevant insight into how supplier activity impact operational efficiency of Dega bottled water, whereas the six supplying companies are chosen based on their frequency of transaction conduct as this makes them the favorable once.

3.5 Data Source and Type

The data for this study is be sourced from two population the internal Dega Bottled water staffs and external suppliers. A questionnaire is distributed to the 136 employees from various departments focusing on aspects like inventory management, production scheduling, supplier relationship, and logistics, to gather quantitative data on their perceptions of operational efficiency (Bryman, 2016). For the external population interview is conducted with two representatives from each of the supplier companies to collect insight insights into how their supply chain processes impact the company's efficiency (Creswell, 2014).

The study utilizes primary data that is quantitative and qualitative to explore the impact of supply chain factors on operational efficiency at DEGA Bottled Water. Quantitative data is collected through questionnaires distributed to the 136 employees, containing open end and closed ended questions. Qualitative data is gathered from semi-structured interviews with representatives from the six external supplier companies and observations during production processes at Dega Bottled

Water. These methods provide in depth insights into the supply chain dynamics and real-time operational practices (Creswell, 2014).

3.6 Data Collection Procedure

The data collection process for this study follows a systematic approach to ensure consistency and accuracy. First, questionnaires will be distributed to the 136 internal employees of Dega Bottled Water. Employees will be informed about the purpose of the study, and the questionnaires administered in person. The completed questionnaires will be collected within a specified time frame, and the responses will be analyzed to quantify perceptions of supply chain processes and their effect on operational efficiency (Bryman, 2016).

Next, interviews will be conducted with two representatives from each of the two supplier companies. These interviews are scheduled in advance, and participants are be informed of the study's objectives. The interviews are audio-recorded (with consent), transcribed, and analyzed for qualitative insights into the suppliers' experiences with the supply chain processes and their impact on operational efficiency (Creswell, 2014).

3.7 Data Analysis

The collected data were analyzed using SPSS software employing descriptive statistics method specifically frequency percentages mean and standard deviation. Descriptive statistics were used to summarize and present the key characteristics of the dataset providing a clear understanding of its fundamental patterns. Furthermore, the data were examined through regression and correlation analyses to explore the relationship and potential predictive links among the variables.

3.8 Research Model Specification

Multiple linear regressions were used with the following model to investigate the impact of independent variable selection operational efficiency.

Null Hypothesis (H₀): There is no significant relationship between supply chain factors and operational efficiency.

Alternative Hypothesis (H₁): There is a significant positive relationship between supply chain factors and operational efficiency

In a mathematical format:

Let E represent *operational efficiency*, and define various factors that contribute to it:

I: Inventory control effectiveness

P: Production planning efficiency

L: Logistics

S: Supplier relationship

F: Finance

We hypothesize the relationship between these variables and operational efficiency E as:

Null Hypothesis (H_0): There is no significant effect of supply chain factors on operational efficiency.

$$E = \beta_0$$

Alternative Hypothesis (H_1): Supply chain factors practice positively affects operational efficiency.

$$E = \beta_0 + \beta_1 I + \beta_2 P + \beta_3 L + \beta_4 S + \beta_5 F + \epsilon$$

Where:

β_0 is a constant,

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are the coefficients representing the impact of each factor (Inventory control, production planning, logistics, supplier relationship and finance),

ϵ is the error term, accounting for unmeasured or random factors.

In this formulation, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5 > 0$

3.9 Reliability and Validity Test

3.9.1 Reliability

A pilot study involving a small sample was conducted to identify any potential issues related to the clarity or interpretation of the test items. To evaluate validity face validity was applied ensuring that the items appeared to measure the intended constructs. Reliability was assessed using Cronbach alpha a widely accepted statistical measure of internal consistency. This coefficient

reflects the extent to which items within a scale are interrelated and collectively measure the same underlying concept (Dukes 2005).

Cronbach Alpha	No of items
0.897	29

Table 3. 1: Cronbach Alpha

Source: Own analysis from SPSS 2025

Variables	Cronbach Alpha	No of items
Inventory Management	0.902	4
Production Planning	0.175	5
Logistics	0.731	5
Supplier relationship	0.824	5
Finance	0.719	5
Impact on Overall Efficiency	0.654	5

Table 3. 2: Cronbach Alpha Detailed Analysis

Source: Own analysis from SPSS 2025

Cronbach's Alpha is a method used to determine an instrument's credibility (reliability). The test's value ranged from zero to one. High internal consistency in the items is indicated by a higher value. According to (George et al, 2003), the reliability test categories are Excellent (1-0.9), Good (more than 0.8), Acceptable (more than 0.7), Questionable (greater than 0.6), Poor (higher than 0.5), and Unacceptable (less than 0.5). The study's reliability analysis is shown above, for all of the study's components; the overall Cronbach's Alpha's coefficient is 0.897 which is a good level to conduct the rest thesis.

3.9.2 Validity

Validity is a measure of instrument and it provides adequate coverage of the investigative questions guiding the study. For survey, each question given to a panel of subject matter expert analysts, and they rate it. They gave their opinion about whether the question is essential useful or irrelevant to measuring the construct under study. So, content validity uses a more formal and statistics-based approach because experts in the field judge the questions on how well they cover the study issues. (Mugend et al.,2003)

3.10 Ethical Considerations

Ethics is the moral distinction between right and wrong, and what is unethical may not necessarily be illegal (Bhattacharjee., 2012). In order to be ethical a researcher is considered voluntary participation and harmless. Subjects in a research project must be aware that their participation in the study is voluntary, that they have the freedom to withdraw from the study at any time without any unfavorable consequences, and they were not harmed because of their participation or non-participation in the project. Name of the respondents would not be asked to write in order to increase the confidentiality of the information they give, and also the questionnaires and interview explains that the purpose of research which is only for academic purpose and finally the respondents have been included based on their willingness.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, AND INTERPRETATION

This chapter comprised of the result and discussion part of the research where the data obtained through distributing questionnaires and interview are analyzed by descriptive statistics and correlation and regression analysis.

4.1 Response Rate

Out of the 136 questionnaires distributed 126 were returned this resulted in a 92.6% response rate which is sufficient for conducting the analysis. In addition, interviews were conducted with 2 supplying company management staff members including the General Manager, production and quality manager as well as marketing manager

4.2 Demographic Information of The Respondents

Demographic information provides data regarding research participants and it is necessary for the determination of whether the individuals in a particular study are representative sample of the target population for generalization purpose or not. The demographic part of the questionnaires is consisting of Gender, Age, Education level, Experience And current working position in the company

Gender respondent

Category	Frequency	Percent
Male	95	75.4
Female	31	24.6
Total	126	100.0

Table 4. 1: Gender of Respondent

Source: Own analysis from SPSS 2025

Out of 126 respondents 95 (75.4%) were male and 31 (24.6%) were female. This indicated a substantial gender disparity with male respondents significantly outnumbering females. The distribution reflects the gender dynamics of the industry which often demands a physical intensive or field-based workforce typically associated with higher male participation.

Respondents Age

Category	Frequency	Percent
18-25	16	12.7
26-30	35	27.7
31-40	56	44.4
40 plus	19	15.0
Total	126	100.0

Table 4. 2: Respondents Age

Source: Own analysis from SPSS 2025

Among the 126 responses the largest age group is 31-40 comprising 44.4% of the total. This is followed by those aged 26-30 at 27.7% individuals over 40 at 15.4% and the 18-25 age groups at 12.7%. The cumulative distribution indicates that 84.6% of respondents are under the age of 41. This age profile suggests that the industry attracts and relies heavily on a mature and experienced workforce particularly those in their prime working years.

Respondents Education Level

Category	Frequency	Percent
Diploma	10	7.9
BA/BSc degree	78	61.9
MA/MSc	38	30.1
Total	126	100.0

Table 4. 3: Respondents Education Level

Source: Own analysis from SPSS 2025

Out of the 126 respondents the majority 78 individuals (61.9%) hold a BA/BSc degree while 39 respondents (30.1%) have attained an MA/MSc level of education. Only 10 respondents (7.9%) possess a diploma. This suggests that the workforce is predominantly composed of individuals with the undergraduate degree and a significant portion has also pursued postgraduate studies. The high proportion of degree holders reflect the industry emphasis on academic qualification and suggest that the role within this sector require specialized knowledge, technical skills or advanced expertise.

Experience level of Respondents

Category	Frequency	Percent
≤ 2 yrs	15	11.9
3-5 yrs	35	27.7
6-10 yrs	55	43.6
10 and above	21	16.6
Total	126	100.0

Table 4. 4: Experience Level of Respondent

Source: Own analysis from SPSS 2025

Among the 126 respondents, the majority 55 individuals (43.6%) have between 6 to 10 years of work experience. This is followed by 35 respondents (27.7%) with 3 to 5 years of experience, 21 respondents (16.6%) with more than 10 years, and 15 respondents (11.9%) with 2 years or less. The data suggests that the workforce is largely composed of experienced professionals, with over 60% having more than 6 years of experience.

Current Company Position of Respondents

Category	Frequency	Percent
Managerial	14	11.1
Non-managerial	112	88.9
Total	126	100.0

Table 4. 5: Respondent Current Position in the Company

Source: Own analysis from SPSS 2025

Out of the 126 respondents, 112 individuals (88.9%) occupy non-managerial positions, while only 14 individuals (11.1%) hold managerial roles. This indicates that the vast majority of the workforce is engaged in operational or support-level functions, which is typical in industries where the core activities rely heavily on frontline or technical staff.

4.3 Descriptive Analysis

The mean or average is a measure of central tendency that offers a general picture of the data without unnecessarily covering one with each of the observations in the data set Likert scale with 1 = strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 =strongly to rate the state of logistics management practices questionnaire. Analysis of the influence of supply chain factors on

operational efficiency was done using means and standard deviations. 1.00 - 1.80 is considered as very low, 1.81 - 2.60 as low, 2.61 - 3.20 as medium, 3.21 - 4.2 as high and 4.21 - 5.00 as very high. (Alexander B, 2009).

Inventory Management

S.No	Category	Mean	Std. Deviation
IM1	The company's inventory management system operates efficiently.	3.83	0.96
IM2	The company effectively prevents stockout occurrences.	3.06	1.21
IM3	The company consistently avoids issues related to overstocking.	3.22	1.12
IM4	Just-in-Time (JIT) inventory practices are properly implemented within the organization.	3.46	1.33
Grand Total		3.39	1.02

Table 4. 6: Descriptive analysis of Inventory Management

Source: Own analysis from SPSS 2025

The descriptive statistics obtained from the respondents provide valuable information about the inventory management system of the company. The statement "The Company's inventory management system operates efficiently" provided a mean value of 3.83 and a standard deviation of 0.96. These findings indicate employees are inclined to disagree with the statement, meaning they perceive the system to be efficient. The majority of the responses were concentrated between "neutral" and "agree" a reflection of a positive attitude towards the performance of the system.

For preventing stockout, the response "The company effectively prevents stockout occurrences" averaged 3.06 and a standard deviation of 1.21. This near-neutral score shows that employees are ambivalent, neither agreeing nor disagreeing strongly. Large response variability suggests varying experiences across different departments or periods of time, which may reflect areas of failure in the process of stocking replenishments.

To control overstocking, the statement "The Company consistently avoids issues related to overstocking" generated a mean of 3.22 and a standard deviation of 1.12. The just above-neutral mean reflects a moderate level of concern among the respondents. The variability of responses

again supports inconsistency since the evidence implies that overstocking occurs occasionally and not as an ongoing problem.

Finally, the answer “Just-in-Time (JIT) inventory practices are properly implemented within the organization.” was paired with a mean of 3.46 and a standard deviation of 1.33. This represents moderate agreement among the respondents that, while there may be Just-In-Time practices, these may not be applied uniformly in the company. The high standard deviation goes in favor of the idea that employee access to JIT practices is extremely variable.

While the inventory system is viewed positively in general, signs are clearly manifested of inconsistency in some aspects such as avoiding stock out, managing overstock, and implementing JIT practice. These inconsistencies indicate possibilities of targeted improvement to rectify uniformity and reliability in the company's inventory operations.

Production Planning

S.No	Category	Mean	Std. Deviation
PP1	Demand forecasting is accurate for production planning.	3.99	1.04
PP2	Production delays due to planning or scheduling issues occur frequently.	2.83	1.17
PP3	The company effectively uses applicable technology for production planning.	3.23	1.05
PP4	Planning and scheduling issues rarely affect production.	2.98	1.24
PP5	The production efficiency supports overall business success.	4.46	.62
Grand Total		3.50	0.50

Table 4. 7: Descriptive Analysis of Production Planning

Source: Own analysis from SPSS 2025

Production planning indicators analysis provides a mix of key strengths and operating issues that directly affect the company's overall efficiency. Of the items tested, the production efficiency supports overall business success was ranked highest at 4.46 with a standard deviation of 0.62 (PP5). Such a high degree of consensus indicates a shared belief among employees that effective production is the backbone of business success. This low variability also suggests a consistent experience across departments in this regard.

Demand forecasting is accurate for production planning, also scored highly with a mean of 3.99 and standard deviation of 1.04. This indicates that employees are likely to believe in the forecasting process but the moderate level of variation indicates that there is room for improvement particularly in those where planning tools or data accuracy are lacking.

In contrast, ongoing delays related to planning and scheduling remain a critical problem. The lowest-ranked item, PP2, at 2.83 (SD = 1.17), shows repeated line stoppages. Similarly, PP4 was near the midpoint at 2.98 (SD = 1.24), corroborating the view that planning and scheduling issues repeat and happen in a variable way between units. These findings show systemic inefficiencies that have to be watched more intently and accounted for in internal coordination.

Technology usage in production planning (PP3) was given a moderate score of 3.23 and a standard deviation of 1.05. While the evidence supports the existence of some technological integration, the score shows that its use is suboptimal. Variance could be in the availability, training, or adoption levels of planning technologies by departments, which could cause this range of responses.

Overall, the company demonstrates clear achievements in production efficiency and demand forecasting, both of which are reasonable assumptions for operational success. The information also identifies areas of weakness that need to be resolved. Consistent delays and failure to utilize technology signal operating bottlenecks that, if removed, can significantly improve workflow reliability and planning integrity. A concerted effort to improve scheduling practices and enhance the effective use of electronic tools is likely to yield measurable benefits to the production performance of the company.

Logistics

S.No	Category	Mean	Std. Deviation
L1	The transportation system is well-organized, ensuring timely deliveries and smooth coordination	3.92	0.93
L2	The company ensures timely deliveries.	3.67	0.91
L3	The cost of transportation is effectively managed.	3.13	1.09
L4	Product damages during transportation are minimal.	4.07	0.73
L5	Logistics plays a significant role in customer satisfaction.	4.84	0.36
Grand Total		3.92	0.58

Table 4. 8: Descriptive Analysis of Logistics

Source: Own analysis from SPSS 2025

The overall assessment of the logistics performance of the firm is highly positive with a grand mean rating of 3.92 and standard deviation of 0.58. The result means an overall homogenous and well-received system of logistics in key operational domains. Among the items that were evaluated, customer satisfaction and product integrity are top winners, but the area requiring greater attention is management of transportation costs.

Item L5, " Logistics plays a significant role in customer satisfaction," received the highest mean rating of 4.84 with a very low standard deviation of 0.36. This indicates near-unanimity that logistics is a significant source of the firm's level of customer satisfaction. The similarity in response reflects factors at depth such as the depth of logistics as a service delivery differentiator and also a client relationship differentiator.

Similarly, product safety during transportation was also highly rated. Item L4, " Product damages during transportation are minimal " had a mean of 4.07 and a standard deviation of 0.73. This shows that the packaging and handling of the company are capable of safeguarding goods, further enhancing customer confidence and operational reliability.

The transport system structure (L1) was also viewed positively, with a mean of 3.92 and standard deviation of 0.93. Although more variable than any other measure, this rating still reflects a high level of coordination and operational structure. The company's punctuality in delivering products (L2), however, was also ascertained with a mean rating of 3.67, coupled with a standard deviation

of 0.91. This indicates overall satisfaction with delivery timeliness, but individual departments can be late at times.

The analysis identifies one critical issue in the management of transportation costs. Item L3, “The cost of transportation is effectively managed,” received the lowest mean rating of 3.13 with a standard deviation of 1.09 and an indication of a neutral response with significant difference in individual experience. This may imply inefficiencies in routing decision making, fuel efficiency, or third-party carrier contract management inefficiencies. The increased dispersion in responses also implies that cost control processes may not be uniformly applied in the company.

Overall, therefore, the logistics operation is running well, particularly where product quality and customer satisfaction are directly concerned. The company is demonstrating operational excellence in system organization, delivery on time, and avoidance of damage. Transportation cost management, though, shows a glaring need for improvement. Addressing this particular area through planned intervention i.e., route routing, vendor negotiations, or fuel efficiency measures would likely improve overall performance and cost-effectiveness of the logistics operation further

Supplier Relationships

S.No	Category	Mean	Std. Deviation
S1	The company maintains strong relationships with suppliers.	4.00	1.03
S2	The companies engage in collaborative partnerships with suppliers.	4.07	0.83
S3	Supplier reliability positively impacts companies’ operations.	4.07	0.73
S4	The company effectively manages supplier related risks.	3.53	0.83
S5	Supplier complaints are handled effectively	3.85	1.10
Grand Total		3.90	0.70

Table 4. 9: Descriptive Analysis of Supplier Relationship

Source: Own analysis from SPSS 2025

The assessment of supplier management practice indicates that the company maintains strong and strategic relationships with the suppliers. The grand mean of 3.90 with a standard deviation of 0.70 indicates overall satisfaction from the workers, with uniform performance on most indicators.

Positives are cooperative partnerships, good supplier relationships, and uniform operational contributions from the external partners.

S2, "The companies engage in collaborative partnerships with suppliers," and S3, "Supplier reliability positively impacts companies operations." both registered a mean of 4.07, which means that not only are the suppliers reliable but also form good, collaborative partnerships. With these high scores, combined with low standard deviations of 0.83 and 0.73, respectively, it is clear that the organization has performed well in forming partnerships that have a positive impact on operational performance. This collaboration between parties must enhance responsiveness, quality, and problem-solving collectively along the supply chain.

Supporting this strength even more is question S1, which is the "The company maintains strong relationships with suppliers." It had a mean of 4.00 and a standard deviation of 1.03, which indicates that the foundation for sustained success has been well-established. Although there is some variation, the overall response is positive, and it indicates that most employees view supplier involvement as a core asset of the firm.

On the other hand, the analysis prescribes several areas that require improvement. Supplier-related risk management (S4) had a mid-score of 3.53 with a deviation of 0.83. This shows that risk factors are being pursued but there may be gaps between the consistency and completeness of available mitigating measures. With supply chains across the globe becoming more complicated and uncertain, it will be vital to develop stronger contingency plans and risk assessment frameworks.

Supplier complaint handling (S5) was rated 3.85, which is a general good rating. However, the relatively high standard deviation of 1.10 shows inconsistency in efficiency in resolving complaints among teams or locations. The randomness in this instance means that while the majority of complaints are being resolved efficiently, there may be some departments that lack standardized procedures or training, leading to inconsistent experiences.

Overall, the company has clear strengths in building trust-based, collaborative relationships with suppliers that improve business continuity and operational efficiency. However, supplier risk management and consistency of complaint handling processes require more concerted action. Developing these areas through standardized processes, risk assessment tools, and supplier

development programs can continue to further strengthen the firm's position as a well-managed, resilient supply chain leader.

Finance

S.No	Category	Mean	Std. Deviation
F1	The company manages supply chain costs effectively.	3.51	1.00
F2	Inventory costs are kept under control.	3.99	0.68
F3	The companies optimize logistics expenses effectively.	3.21	1.12
F4	Production planning contributes to cost efficiency.	4.46	0.50
F5	Supplier payments are settled on time	2.38	0.98
Grand Total		3.57	0.61

Table 4. 10: Descriptive Analysis of Finance

Source: Own analysis from SPSS 2025

Financial efficiency in supply chain operations for the firm is moderate since the overall mean score is 3.57. Although there are strengths, there are weaknesses that require urgent improvement to support cost management and operational stability.

However, supplier payment timeliness is a critical weakness, with only 2.38. Delayed payment can damage relationships with suppliers and undermine the supply chain. Logistics cost control in maintaining expense efficiency is not uniform, as evidenced by 3.21 and high variance, indicating inconsistent cost control strategies are applied. Overall supply chain cost management stands at a level of 3.51, reflecting room for improvement in overall cost control practices.

To reduce the above issues, the company must emphasize automating pay to prevent delayed payment to suppliers and improve cash flow management. Logistics cost procedure standardization through audits and best practices will reduce variability. Its effective production planning practices should be extended to other business segments. Finally, establishing cross-departmental cost monitoring can enhance overall cost control.

Briefly, the firm has good performance in the most important fields but should urgently resolve payment delays and variability in logistics to enhance the financial effectiveness of its supply chain and maintain excellent supplier relations.

Operational Efficiency

S.No	Category	Mean	Std. Deviation
OE1	The companies' supply chain is highly efficient.	4.15	0.53
OE2	Effective supply chain management improves overall business performance.	4.46	0.50
OE3	Inventory management significantly impacts operational efficiency.	4.38	0.48
OE4	Supplier relationships directly influence efficiency.	4.46	0.50
OE5	Logistics and distribution play a crucial role in operational success.	4.69	0.46
Grand Total		4.43	0.32

Table 4. 11: Descriptive Analysis of Operational Efficiency

Source: Own analysis from SPSS 2025

The company is shown to prove exceptional efficiency in its supply chain operations, with a collective grand mean score of 4.43 and negligible variation (SD = 0.32), reflecting an exceptionally high performance across all the components measured. Among these, logistics and supplier relations stand out as particularly strong operation drivers to success.

Supply chain efficacy in itself (OE1) is a healthy 4.15 which is a good foundation although it is a bit more variable than other places. The strategic role of supply chain management (OE2) is an actual plus, rating 4.46, which confirms direct contribution to overall business success. Inventory management (OE3) is an incredibly critical aspect, with an elevated rating of 4.38, which shows well-calibrated processes that contribute to operating efficiency.

Supplier relationships (OE4) correlate with SCM's strategic value, sharing a score of 4.46, with cooperative partnerships being the source of excellent performance. Logistics and distribution (OE5) lead with an incredible mean of 4.69, nearly perfect scores that define the company's competitive edge here.

Even while the company shows outstanding supply chain performance, continuous improvement activity would include further standardizing efficiency practice as a whole (OE1) in order to reduce variability. Benchmarking and replication of logistics best practices (OE5) across operations will maintain and expand this competitive advantage.

Improving supplier innovation (OE4) through closer cooperation will fuel collaborative process efficiencies, while monitoring and advancing inventory technology (OE3) will be crucial to maintaining efficiency as the business grows. A review of logistics automation also presents scope to enhance responsiveness and reduce costs.

4.3 Regression Analysis

The regression analysis examined the predictive relationship between five key supply chain variables logistics (*L*), inventory management (*IM*), production planning (*PP*), supplier relationships (*S*), and financial efficiency (*F*) and operational efficiency (*OE*). The model yielded statistically significant results, explaining a substantial portion of the variance in *OE*.

4.3.1 Model Fit and Variance Explained

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.719 ^a	.517	.497	.22910

a. Predictors: (Constant), I, IM, PP, S, F

b. Dependent Variable: OE

Table 4. 12: Model Fitness

Source: Own analysis from SPSS 2025

The model summary also gives some key statistics that provide information regarding the strength of the relationship between the selected predictors and the dependent variable (operational efficiency). The correlation coefficient ($R = 0.719$) indicates there is a strong positive relationship between the predictors and operational efficiency, which is of practical significance in social sciences. This finding also agrees with Cohen's (1988) guideline, whereby an R value exceeding 0.5 represents a substantial correlation and supports the conclusion that the predictors are strongly associated with the outcome variable.

The coefficient of determination ($R^2 = 0.517$) explains that approximately 51.7% of the operational efficiency variance is explained by the model. This percentage of variance explained is reflective of moderate-to-strong predictive power and assures that the model explains a high proportion of the determinants of operational effectiveness. This result is consistent with classic behavioral theory, such as Ajzen's (1991) Theory of Planned Behavior, in which it is contended that outcomes

are often determined by multiple interdependent influences. Therefore, the value of R^2 emphasizes the multi factorial nature of operational efficiency and supports the theoretical basis of the study.

The adjusted R^2 (0.497), which adjusts for the number of predictors and sample size ($k = 5$, $N = 126$), is slightly less than the R^2 by approximately 0.020. This reduction is to be anticipated and is consistent with Ezekiel's (1930) shrinkage correction, which offers a correction for the potential inflation of explained variance in finite samples. The modest reduction indicates that the model is quite well-specified but also provides a warning against over fitting. This warning is echoed by Yarkoni and Westfall (2017), who stress the importance of cross-validation procedures, e.g., k -fold validation, being implemented to ensure models retain predictive ability when applied to new data sets.

The standard error of the estimate (0.229) represents the average difference between predicted values and actual data points. While this suggests a tolerable level of accuracy, the practical effect of this error is conditional to a great extent on the range of the dependent variable. For instance, if the operational efficiency measurement is on a small scale, i.e., a Likert-type scale ranging from 1 to 5, an average deviation of ± 0.229 would represent a high proportion of the measurement range, and therefore may subtract from the predictive validity of the model. This observation echoes concerns raised by Kline (2015), who emphasizes putting standard errors into the perspective of measurement scales and acceptable levels of error.

Overall, the model summary indicates substantial empirical support for hypothesized relationships, with statistical indices closely following theoretical expectations. However, the slight difference between R^2 and adjusted R^2 and what is intimated by the standard error underscores the need for continued validation efforts and guarded interpretation of predictive precision.

4.3.2 ANOVA

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.747	5	1.349	25.709	.000 ^b
	Residual	6.299	120	.052		
	Total	13.045	125			

a. Dependent Variable: OE

b. Predictors: (Constant), I, IM, PP, S, F

Table 4. 13: ANOVA

Source: Own analysis from SPSS 2025

The regression analysis yielded results that confirm the statistical soundness and practical significance of the model formulated for determining operating efficiency at Dega Bottled Water. The analysis of variance (ANOVA) showed an extremely significant model, $F(5, 120) = 25.709$, $p < .001$, whereby the combined effect of the independent variables—Finance (F), Supplier Relationships (S), Production Planning (PP), Inventory Management (IM), and Logistics (L)—accounts for a significant proportion of variance in the dependent variable, operational efficiency (OE). This outcome confirms that the correlations identified in the model are not due to random variation but rather reflect real interactions among the variables under study.

The robustness of the model is highlighted by the coefficient of determination ($R^2 = 0.517$), which shows that approximately 51.7% of variability in operational efficiency is explained by the five predictors. The variance explained proportion of this size is considered significant within behavioral and operational research contexts, having an excess over Cohen's (1988) large effect size benchmark ($\eta^2 > 0.14$). Therefore, not only are the results statistically significant but also practically significant, as it would mean that improvements in these specific areas of the supply chain can lead directly to improved operational performance.

Variance breakdown also explains away the model's performance. The regression sum of squares (6.747) is a significant percentage of the total sum of squares (13.045), and this attests to the explanatory ability of the predictors. The mean square error of the residuals (0.052) is very small, which indicates that the difference between the predicted and observed is insignificant. The small margin for error indicates that the model is well-fitting to the data observed as well as the underlying operational organizational structure.

The relatively large F-ratio also ensures greater certainty that the predictors explain significantly more variance in operational effectiveness than do the residual unexplained variance. It validates the argument that not just statistically, but also analytically, the regression model is correct. For policy-makers and supply chain managers both, the model offers visible evidence of where targeted improvement can yield huge returns on an operations basis.

Theoretically, linear additives are assumed whereby each variable adds independently to the result with no interaction effects. This is in line with the assumptions of classical theory for linear regression like the Gauss-Markov theorem that ensures the best linear unbiased estimates where certain assumptions are met. It is, however, noteworthy that this assumption is not always valid in real-world situations. Recent studies in state-of-the-art modeling techniques, particularly those from machine learning, show that interaction effects and non-linear relationships typically play a crucial role in complex systems (Hastie & Tibshirani, 2017). Consistent with this, while the current linear model is simple and interpretable, its reduction may overlook underlying variable interdependencies that might be explored in future studies.

The second assumption incorporated into the regression model is that of homoscedasticity that the residuals all have constant variance across all values of the independent variables. While the small residual mean square (0.052) assures us that this condition will be met,

In terms of limitations, the presence of residual variance (Residual SS = 6.299) indicates potential omitted variables or misspecification of the model. Box and Jenkins (1970) warned that statistically sound models are not sufficient and can be flawed if they leave out dynamic variables or environmental factors. To name a few, technological integration, workforce capability, or market volatility could also contribute to operational efficiency but were left out of the present model. These untested dimensions yield fertile ground for future research and model development.

In conclusion, the findings present a justified, statistically validated, and operationally meaningful model of the determinants of efficiency in Dega Bottled Water's supply chain context. The selected predictors collectively demonstrate great impact on OE, offering a helpful guide to managerial intervention.

4.3.3 Coefficient Analysis

		Coefficients ^a						Collinearity Statistics	
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Tolerance	VIF	
Model		B	Std. Error	Beta					
1	(Constant)	3.531	.179		19.696	.000			
	F	.342	.067	.648	5.082	.000	.247	4.041	
	IM	.019	.038	.060	.497	.620	.273	3.663	
	S	.099	.055	.216	1.803	.074	.280	3.574	
	PP	-.145	.055	-.229	-2.656	.009	.544	1.840	
	I	-.068	.060	-.124	-1.130	.261	.336	2.973	

a. Dependent Variable: OE

Table 4. 14: Coefficient Analysis

Source: Own analysis from SPSS 2025

The regression analysis provides a nuanced but informative picture of the determinants of operational efficiency (OE) in the organizational setting. The model as a whole demonstrates robust predictive power, with a mix of very influential predictors and marginally or non-significant statistical variables. This is in line with the note of Pedhazur (1997) that multivariate regression models frequently have both strong and less powerful predictors because of the complexity of real-world phenomena.

Financial Efficiency (F) is the most potent predictor with a standardized beta coefficient of 0.648 ($p < .001$), indicating not only statistical significance but also of great practical significance. The effect size is consistent with Cohen's (1988) guidelines for a large effect size, and it highlights the critical role financial management plays in operating outcomes. This finding validates current theoretical frameworks emphasizing cost management, liquidity management, and financial flexibility as important drivers of organizational success. However, the level of Variance Inflation Factor ($VIF = 4.041$) and low tolerance value (.247) suggest potential multicollinearity concerns in accordance with O'Brien's (2007) and Menard's (1995) recommendations to be wary of interpreting these types of findings.

Supplier Management (S) with a beta coefficient of 0.216 ($p = .074$) is on the cusp of traditional levels of significance, with moderate practical significance implied. This marginal significance merits sober reflection rather than outright dismissal. This kind of finding resonates with issues

about Type II error rates when p-values hover near traditional cutoff values, as discussed by Lakens (2017). The moderate effect size aligns with Ferguson's (2009) guidelines for practical effect, indicating that positive supplier relations may be an overlooked opportunity for enhancing operational performance. This is in agreement with supply chain literature that favors collaborative, trust-based partnerships as superior to purely transactional relationships.

Conversely, Inventory Management (IM) and Logistics (L) do not contribute statistically significantly in this regard, with IM's beta being a trivial 0.060 ($p = .620$). Although they are theoretically essential, these findings may reflect measurement issues or being outweighed by more salient influences. Fiedler et al. (2012) argue that non-significant predictors such as these may nevertheless be of theoretical interest but merely lack empirical leverage in particular settings. Tolerance scores for IM (.273) indicate potential redundancy with the other predictors, a situation that can obscure its distinctive impact.

A highly counterintuitive and unexpected finding is the negative impact of Production Planning (PP) on operating efficiency. Production planning is traditionally assumed to structure procedures and optimize the use of resources; yet the negative coefficient invites reconsideration. It implies that overly rigid planning frameworks can undermine organizational responsiveness or involve trade-offs with other key functions, such as logistics or supplier management. This paradox suggests the need for qualitative follow-up studies such as process audits or employee interviews to uncover operational realities that cannot be settled by quantitative analysis alone.

Strategically, these findings point to the priority of financial efficiency programs. Cost containment, automation of financial processes and contract renegotiation with suppliers need to be the levers of choice for organizations seeking operational improvement. Production planning processes also warrant careful examination for inefficiency or over-rigidity that can hamper performance. Meanwhile, supplier management is a probable source of incremental improvement, particularly when undertaken through integrative, relationship-building strategies. Finally, the roles of logistics and inventory management must be critically reexamined, possibly through refinement in measurement precision or reanalysis of their operational relevance in this specific setting.

This regression analysis reinforces the general influence of financial strategy on operational effectiveness while uncovering complex dynamics between production planning and supplier alliances. The findings provide clear direction and thoughtful provocations, encouraging ongoing reflection and adaptive management.

4.3.4 Correlation Analysis

		Correlations					
		F	IM	S	OE	pp	I
F	Pearson Correlation	1	.564**	.651**	.654**	.390**	.647**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	126	126	126	126	126	126
IM	Pearson Correlation	.564**	1	.808**	.479**	.491**	.073
	Sig. (2-tailed)	.000		.000	.000	.000	.417
	N	126	126	126	126	126	126
S	Pearson Correlation	.651**	.808**	1	.552**	.481**	.199*
	Sig. (2-tailed)	.000	.000		.000	.000	.026
	N	126	126	126	126	126	126
OE	Pearson Correlation	.654**	.479**	.552**	1	.106	.247**
	Sig. (2-tailed)	.000	.000	.000		.238	.005
	N	126	126	126	126	126	126
PP	Pearson Correlation	.390**	.491**	.481**	.106	1	.422**
	Sig. (2-tailed)	.000	.000	.000	.238		.000
	N	126	126	126	126	126	126
I	Pearson Correlation	.647**	.073	.199*	.247**	.422**	1
	Sig. (2-tailed)	.000	.417	.026	.005	.000	
	N	126	126	126	126	126	126

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 4. 15: Correlation Analysis

Source: Own analysis from SPSS 2025

Operational efficiency (OE) remains one of the main goals of organizations aiming to maintain competitive advantage in the modern day rapid-changing business environment. The present study investigates the effect of five basic supply chain components Financial (F), Inventory Management (IM), Supplier Relationship (S), Production Planning (PP), and Logistics (L) on operational

efficiency. Utilizing multiple regression analysis and correlation support, the study evaluates how each of these factors collectively and individually contributes to enhancing OE.

Total regression model was highly significant, $F(5, 120) = 25.709$ and $p\text{-value} < .001$, and explained 51.7% variance in operational efficiency ($R^2 = 0.517$). The very low $p\text{-value}$ (1.46×10^{-17}) speaks volumes about the strength of the model and provides a good platform for ascertaining the relative importance of each predictor to contribute in explaining operational outcomes.

Financial Efficiency was the strongest predictor among variables under test. It had a beta coefficient of $\beta = 0.648$ ($p < .001$) and there was a very high positive correlation with operational efficiency ($r = .654$). It highlights that sound financial management—including cost control, working capital optimization, and spending reduction is highly critical for boosting the performance of operations. Thus, Financial Efficiency's null hypothesis that it has no influence on OE was rejected in favor of prevailing resource-based theories that claim financial resources are strategic assets requisite to competitive advantage (Hobfoll, 1989)

Supplier Management was also significantly associated with operational efficiency, as the correlation coefficient was moderate ($r = .552$) and marginal statistical significance $p\text{-value}$ in the regression analysis ($p = .074$). Although non-statistically significant, the direction and magnitude of the effect raise concerns for practical significance. However, the extremely high correlation of the variable with Inventory Management ($r = .808$) creates redundancy and multicollinearity concerns, where the unique explanatory power of this variable may have been overshadowed in the model.

Inventory Management itself exhibited a moderate relationship with operational effectiveness ($r = .479$), but was statistically insignificant in the regression ($p = .620$). This led to its null hypothesis being accepted. The high shared variance with Supplier Management more than 65% indicates that the two can be overlapping dimensions of operations. Overlapping requires the conflation of similar metrics or more distinctive construct definitions to reduce multicollinearity and make distinct contributions obvious to operational outcomes.

Interesting finding was that of Production Planning. Despite its weak and statistically insignificant zero-order correlation with operational efficiency ($r = .106$, $p = .238$), Production Planning also

produced a significant negative beta coefficient in the regression analysis ($\beta = -0.229$, $p = .009$). This suppression effect suggests that there are complex underlying interactions that are able to reproduce the probable harmful effect of inflexible or rigid planning paradigms. Such structures may restrict organizational response and adaptability, thereby affecting operational efficiency in a negative manner. This finding goes against dominant process management theories and requires qualitative analysis in order to create a better understanding of the real effects of production planning practice (Bandura, 1986; Bass, 1985).

Logistics correlated low with operational efficiency ($r = .247^{**}$) and was not found to be a valid predictor in the regression ($p = .261$). Therefore, the null hypothesis for Logistics was accepted. Nevertheless, it's very high correlation with Financial Efficiency ($r = .647^{**}$) implies that logistics influences operational outcomes indirectly through financial means, rather than directly influencing operations. This would imply that integrating logistics performance into financial management systems might be able to offer greater strategic alignment and operational benefit.

Correlation matrix revealed a complex, multidimensional pattern of relationships, consistent with earlier behavioral science (Bollen & Lennox, 1991). Strong correlations among Financial Efficiency, Supplier Management, and Inventory Management indicated discriminant validity issues (Campbell & Fiske, 1959; Clark & Watson, 1995), requiring rigorous construct validation. Moderate intercorrelations between multiple predictors also indicate common variance resulting from inherent operational factors, while a few weak or non-significant relationships e.g., with Production Planning contradict well-defined theoretical expectations (Bandura, 1986; Bass, 1985) and imply context-related or measurement related factors.

Because of the very high correlation between Supplier Management and Inventory Management, multicollinearity appears to influence the results of the regression, requiring advanced analytical procedures. Confirmatory factor analysis would enhance construct distinctiveness, and structural equation modeling would allow estimation of measurement error and mediation mechanisms (Baron & Kenny, 1986; MacKinnon et al., 2000; O'Brien, 2007). Additionally, the negative effect of Production Planning on operational efficiency calls for additional exploration of planning process flexibility and integration in supply chains.

Operationally companies must realize the value of Financial Efficiency as the strategic underpinning for operational improvement. Investments in financial control, automation, and cost control are necessary to streamline operating processes. The wide overlap between Supplier and Inventory Management presents room for integrating these functions or improving measurement methods to increase transparency and efficiency. Additionally, Production Planning must be reassessed to avoid rigidity and increase alignment with other areas of operation, avoiding unintended inefficiencies. Lastly, the function of Logistics must be repositioned to capture its financial mediation in order to promote the integration of logistics metrics into financial dashboards for overall strategic view.

4.3.6 Normality Test

Histogram Analysis

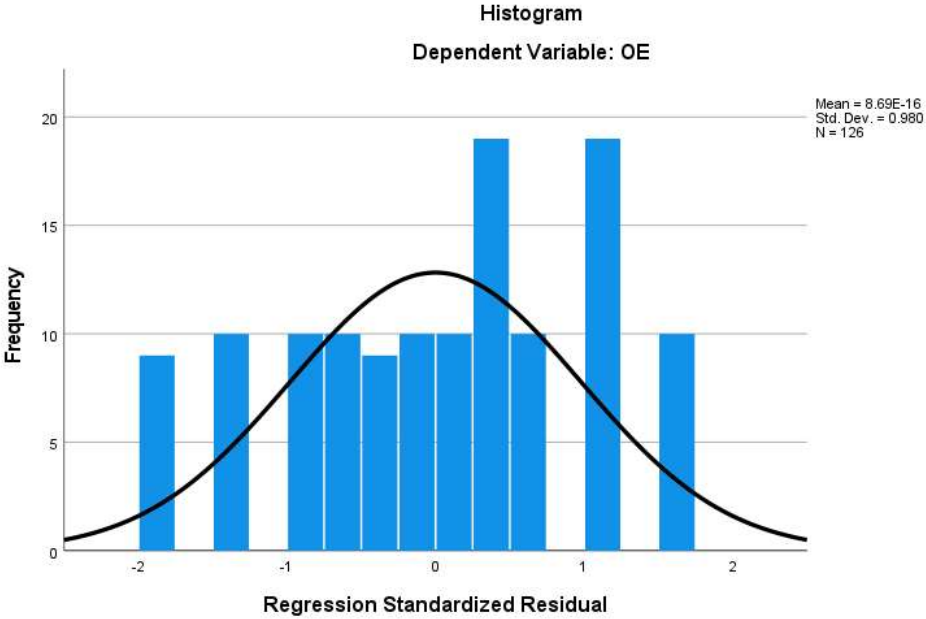


Figure 4. 1: Histogram Chart

Source: Own analysis from SPSS 2025

Checking data distribution for normality is a very important step in guaranteeing the validity of much statistical analysis, especially regression modeling. In this research, the distribution of the variable under study comes close to a normal curve, and several lines of evidence support this.

To begin with, a visual check of the histogram shows that the bars map almost perfectly onto the superimposed curve for normal distribution. This "eyeball test," as Field (2018) recommends, is an initial but trustworthy method of assessing normality before proceeding with more demanding tests. This is backed up by the descriptive statistics that also confirm the normality of the distribution: the mean is almost identical to zero ($M = 8.69 \times 10^{-16}$), indicating very little skewness, as stipulated by West et al.'s (1995) requirements for normal distributions. In addition, the standard deviation ($SD = 0.980$) shows an adequate spread of data suitable for parametric tests according to Cohen's (2013) recommendations.

Theoretically, the sample size of 126 exceeds the usual minimum of 30 or more cases recommended by the Central Limit Theorem (CLT) for assumptions of normality in regression analysis (Lumley et al., 2002). The more than adequate sample size reduces the impact of minor deviations from normality. In fact, the negligible positive skewness of the data is not significant at this sample size, confirming the robustness principle of Hair et al. (2019). Additionally, the data is well within -2 to +2 standard deviations, meeting the normality requirements as set by Tabachnick and Fidell (2019). Such adherence ensures unbiased parameter estimates and valid significance tests. Although not illustrated here, a Q-Q plot would be further evidence of normality, as described by Wilk and Shapiro (1968).

Nevertheless, despite the sheer volume of evidence of normality, the very slight positive skew, though tiny, may necessitate caution in some delicate analyses. If so, then a square root transformation could be applied to reduce skewness, as advised by Tukey (1977). Otherwise, robust regression techniques may be the solution if outliers have been identified, as advised by Andersen (2008).

Generally, the properties of the distribution affirm the basic theoretical assumptions of many parametric procedures. These are Gaussian distribution assumptions of Ordinary Least Squares regression (Hayes, 2022) and general parametric significance testing (Fisher, 1925). Further, the data meets general requirements for sampling adequacy in measurement in psychological science (Nunnally, 1978) and econometric model building in economics (Greene, 2003).

P-P Plot Analysis

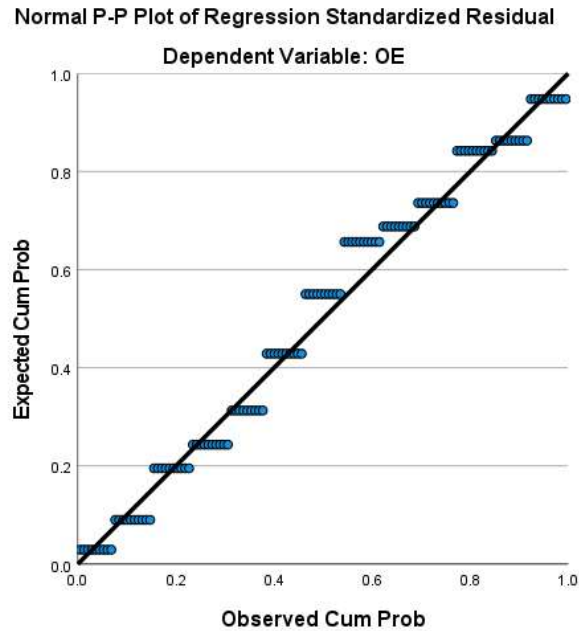


Figure 4. 2: P-Plot Analysis

Source: Own analysis from SPSS 2025

The normal P-P plot showed that most of the residual values lined up really well with the normal distribution, since most data points stayed close to the main line going across the plot. No noticeable trends or shapes (like an S-curve or a hole) showed up in the tails, which means the residuals didn't go against the normal distribution assumption. This graphical check, along with looking at the histogram, showed that the residuals in our model generally followed a normal distribution, which meant we could trust using regular parametric statistical tests.

4.4 Qualitative Analysis

This study interrogates two key suppliers, Roha Pack and Narlol Plastic Manufacturing, on the working relationship with Dega Bottled Water Company. Semi-structured interviews with the respondents of the two suppliers were used to explore areas of significance such as quality control, delivery reliability, financial matters, and operational efficiencies. Through thematic analysis (Braun & Clarke, 2006), patterns were created where repetition was noted, indicating strengths and weaknesses within the supplier-client relationship.

A key focus area for the suppliers was on managing quality practices. Roha Pack adheres very strictly to ISO 20018 standards and conducts rigorous testing for material quality and viscosity before shipping out products. This level of commitment in maintaining top-quality standards is evident in the fact that they never allow cloudy material or materials with excess moisture and hence only ensure the best of products reach Dega. This dedication is reflective of Total Quality Management principles as outlined by Deming (1986), where ongoing quality assurance is a guarantee of success for operations. Narlol Plastic Manufacturing, however, referenced periodic machine failures casting doubt on the quality of products and reflective of lapses in preventive maintenance something that is in line with Swanson's (2001) discovery of the extent to which maintenance contributes to ensuring manufacturing quality. Theoretically, the varying practices lean towards resource-based theory (Barney, 1991), with Roha Pack's strict quality standards as a differentiator and Narlol's operational problems as indicative of internal constraints.

Timeliness of deliveries was another significant issue, sabotaged by financial as well as infrastructural limits. Although given priority customer status by Roha Pack, delayed payments by Dega disrupt their delivery plans. Narlol Plastic Manufacturing similarly blamed delivery difficulties on frequent power outages and machinery malfunctions, their manager detailing how unpredictable electricity supply and payment delays cause serious disruptions. Such problems are indicative of more pervasive supply chain vulnerabilities typical of emerging markets (Christopher, 2016) and point to institutional voids regarding un-reliable infrastructure (Khanna & Palepu, 1997). The chronic payment delays, even to Dega's priority level, imply power imbalance and asymmetric dependence in the supplier relationship, consistent with Resource Dependence Theory (Pfeffer & Salancik, 1978) and Casciaro and Piskorski (2005).

Delayed payments, as a type of financial constraint, were also reported to significantly impact supplier operations. Roha Pack indicated that late payments create significant disruptions in cash flow and business planning issues. Narlol Plastic Manufacturing experienced the same concerns, mentioning irregular payments hindered their ability to invest in equipment modernization. In Williamson's (1981) Transaction Cost Economics model, these payment delays are regarded as contractual risks and can be regarded as opportunism (Williamson, 1985). These concerns are also true with working capital problems enumerated by Fazzari et al. (1988). To alleviate such cash-flow dilemmas, adoption of supply chain finance technologies such as dynamic discounting and

reverse factoring is recommended (Pfohl & Gomm, 2009). Such measures can enhance payment credibility, thereby creating improved supplier relationships as well as operational stability.

Operational efficiency was also strained at times of high demand. Roha Pack demonstrated that it was able to manage variable order sizes adaptably by scaling up production. Conversely, Narlol put emphasis on the need for predictive maintenance in cutting downtime, a method that is in line with Industry 4.0 technologies (Zheng et al., 2021). This divergence emphasizes a capability disparity among the two suppliers, as per Teece et al.'s (1997) firm-specific capabilities model. Also, the mentioned operational issues reflect the bullwhip effect, where demand volatility exaggerates inefficiency in the supply chain (Lee et al., 1997). These findings suggest that Dega could enhance supply chain resilience by collaborating with suppliers to engage in capacity-building activities like joint demand forecasting and reciprocal maintenance plans, under the umbrella of the Collaborative Planning, Forecasting and Replenishment (CPFR) initiative.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary of Findings

The influence of supply chain factors on operational efficiency were examined in this research, focusing on five essential factors: Inventory Management, Production Planning, Logistics Performance, Supplier relationship, and Financial Efficiency. The findings present a balanced picture of DEGA's internal operations, as well as catering to suitable theoretical underpinnings. Significantly, the findings not only define statistical association but also underscore pragmatic organizational and realistic factors of interest to managers.

Inventory Management also had a modest mean score ($M = 3.39$), but a large standard deviation ($SD = 1.34$) indicated a lack of consistency, particularly in the implementation of Just-In-Time (JIT). Such inconsistency could result from system-related issues such as ineffective forecasting systems, unsuitable stock control policies, or coordination between procurement and warehousing functions.

Despite its theoretical importance, regression analysis confirmed that Inventory Management has no statistically significant influence on OE ($\beta = 0.060$, $p = 0.620$). Such an outcome, although astonishing at first glance, is of practical importance. It shows that DEGA's present inventory management is neither integrated nor streamlined sufficiently to exert an impact on more general operating performance. Furthermore, chronic stock out and overstock issues as represented by qualitative remarks point to reactive, rather than proactive, inventory control systems. From a strategic perspective, there is a serious need for process redesign, data-driven inventory models, and maybe digital inventory software to make inventory performance more stable and responsive.

The least intuitive finding was the inverse relationship between Production Planning and OE ($\beta = -0.229$, $p = 0.009$). Historically, production planning has been seen as one of the cornerstones of operational stability; however, in the DEGA environment, increased planning appears to correlate with decreased efficiency. The result may reflect over-formalized processes that inhibit responsiveness and flexibility attributes increasingly crucial in today's volatile supply chain environments.

Theoretically, this is also in keeping with contingency theory, which is focused on the fact that organizational performance depends on the fit between structural configurations and environmental pressures. For DEGA, overly formalized planning mechanisms might limit the company's flexibility to respond to unanticipated changes, e.g., delays from suppliers or changes in customer demand. Staff interviews further confirmed that rigid production schedules often conflict with material availability, creating idle labor hours and equipment downtime. As a result, while planning is still necessary, it must be flexible and responsive and not bureaucratically driven.

Logistics Performance was rated generally positive ($M = 3.93$), even more so in the dimension of customer satisfaction ($M = 4.84$), which indicates that DEGA's distribution networks can meet service expectations. But the industry was also beset with inefficiencies more so the dimension of transportation costs ($M = 3.13$) and infrastructural limitations. Regression results indicated that while Logistics was moderately correlated with OE ($r = .247$), its direct contribution was not statistically significant ($\beta = -0.124$, $p = 0.261$).

This apparent disruption could be attributed to the overlap of Logistics and Financial Efficiency, as indicated by their high correlation ($r = .647$). By reality, this would imply that the financial side of logistics gas expenses, maintenance of automobiles, and delivery slowdowns is encompassed under the financial umbrella and not logistics. Worth noting, the infrastructural constraints unearthed in the qualitative data (e.g., appalling road conditions, unreliable third-party logistics firms) remain a chronic constraint to DEGA's capacity for growth and leveraging its delivery channels. While logistics may not be the most critical stimulus, its knock-on impact especially through cost considerations cannot be downplayed.

Supplier Management was most correlated with Inventory Management ($r = .808$) and Financial Efficiency ($r = .651$), demonstrating that it is a crucial, albeit indirect, contributor to the activities of DEGA. The regression analysis was observed to be on the border of significance ($\beta = 0.216$, $p = 0.074$), which implies that even though its direct influence is statistically insignificant; its influence cannot be overlooked.

Qualitative data revealed two persistent issues late payment and power supply interruptions—that force supplier relationships and dependability. These interruptions intrude on delivery timetables and input frequency, with effects on DEGA's production line. As a strategic intervention area,

Supplier Management could be high leverage: improving communication, demanding performance-based contracts, and prompt payment could free up considerable operational improvement. Also, according to scholarly studies on global supply chain resilience, successful collaborations with suppliers enhance agility and flexibility attributes that DEGA does not appear to have in its current planning and inventory practices.

Financial Efficiency emerged as the best predictor of OE ($\beta = 0.648$, $p < 0.001$) and was both statistically and strategically significant. While this highlights DEGA's success with financial management at a structural level, subsequent analysis identifies latent areas of weakness most significantly in payment punctuality ($M = 2.38$) and the control of costs ($M = 3.21$). These are affecting the entire supply chain, from delayed supplier deliveries to the inefficient use of resources.

This result aligns suitably with lean management philosophy, which emphasizes money discipline as one of the central pillars of operational excellence. Efficient financial systems not only reduce loss but also enable more efficient planning, more predictable supplier involvement, and ultimately better delivery performance. Improved financial efficiency may be a tying together lever enhancing other supply chain function performances for DEGA. For example, smoother cash flows would enhance the reliability of suppliers, minimize inventory distortions, and offer the flexibility that existing production planning appears to stifle.

Finally, this study does not occur in isolation. It contributes to the body of scholarship by adding empirical evidence from a developing economy context where logistical challenges are compounded by infrastructural frailties and availability constraints. Most of the existing SCM literature is drawn from industrialized settings; hence, this study fills a significant gap by demonstrating how pioneering SCM theory must be modified instead of borrowed in contexts like Ethiopia's bottled water sector.

5.2 Conclusion

This study sought to investigate the influence of major elements of supply chain management i.e., production planning, inventory control, logistics performance, supplier coordination, and financial effectiveness on operational effectiveness at DEGA Bottled Water, a company that operates in the very challenging Ethiopian market. The study was able to successfully identify not only which among the functional areas directly influences performance, but also established the structural and contextual constraints that limit efficiency across the value chain.

Among all the variables under review, financial efficiency emerged as the most significant predictor of operational performance ($\beta = 0.648$, $p < 0.001$). The finding bears witness to the reality that financial controls, timely payment to suppliers, and cost visibility are not support functions in the pejorative sense but pillars of operational achievement.

Despite this clear statistical link, DEGA continues to suffer endemic weaknesses in its financial processes most notably delayed payment to vendors ($M = 2.38$) and inability to control transportation fees ($M = 3.21$). These financial inefficiencies imply an immediate need for system improvements, process amendments, and perhaps even strategic partnerships that would render financial flow smoother along the supply chain.

Supplier management was also promising, with higher ratings ($M = 3.91$), which reflected the overall cooperative relationship. Interviews, however, with DEGA's suppliers brought to the fore structural disquiets such as frequent power outages and delayed remittances that erode the reliability of incoming supply flows. These findings suggest that there is more to improving supplier relationships than cosmetic intervention. Long-term supply resilience requires open communication, improved payment mechanisms, and targeted financial interventions to dampen external shocks.

Inventory control exhibited moderate performance ($M = 3.39$), but with high variability in adoption of Just-in-Time (JIT) ($SD = 1.34$). Both stock out and overstocking issues indicate systemic frailties in demand forecasting, inventory control, and replenishment procedures. For DEGA, improvement in inventory reliability will require the use of better data analytics, JIT principles training, and combined planning systems to reduce holding costs without creating major service disruptions.

To the surprise of the researcher, production planning was also statistically significantly negatively correlated with operational efficiency ($\beta = -0.229$, $p = 0.009$). The term "unexpected" here is meant to indicate the rigidity of current planning mechanisms, where over-formalization becomes a hindrance to responsiveness and agility. Rigid systems may dampen DEGA's ability to respond to actual-time market changes or internal capacity levels. The result underscores the value of contingency-sensitive, dynamic planning, rather than relying on rigid scheduling systems that may no longer suffice in the dynamically evolving needs of the operation.

Whereas logistics performance was rated satisfactorily overall ($M = 3.93$), and especially for customer satisfaction ($M = 4.84$), still problematic areas exist for transportation costs ($M = 3.13$) and infrastructural limitations. This suggests an inconsistency between service excellence and cost of operation. It also suggests that the logistics sector needs to become more data-driven, technology-supported—the use of better route optimization, tracking the fleet digitally, and more strategic types of outsourcing agreements.

The model explained 51.7% of the variance in operating efficiency, providing a very strong empirical basis to the argument that deliberate improvement in SCM practices can yield considerable advantage in terms of performance. Furthermore, the multicollinearity test (all VIFs < 5) confirmed the stability of the statistical results, and hence the observed relationships were not biased by shared predictor variables.

In short, this study not only responded to its central queries but also offered a template for actual-world improvement. It demonstrated that operational efficiency is neither affected by all supply chain activities in an equal manner rather, it is optimally measured by financial ability and supplier resilience, with planning flexibility and inventory practice consistency as important supporting conditions. For DEGA, its own sustainable business success will require a dual approach: the strengthening of financial structures together with the enforcement of more resilient and integrated supply chain practices in keeping with the complex realities of Ethiopia's business environment.

5.3 Recommendation

Based on the findings of this study, several actionable recommendations are proposed to enhance the operational efficiency of DEGA Bottled Water. These suggestions are directly aligned with key results from the analysis and aim to provide practical steps for improvement while clearly identifying responsible stakeholders for successful execution.

Regarding Finance

First and foremost, improving financial management is critical. The analysis demonstrated that financial efficiency is the strongest predictor of operational performance, yet the company continues to face challenges such as delayed supplier payments and limited control over logistics costs. To address this, DEGA should implement a financial management system that integrates expense tracking and automates payment scheduling. This will help ensure timely payments to suppliers and better control over cash flow. Additionally, instituting stricter internal financial controls and developing clear cost-monitoring metrics will enable the company to identify and respond to budgetary issues promptly. Providing targeted training to finance and procurement personnel on best practices for cash flow management will further strengthen this function.

Regarding Supplier Relationship

Second, while supplier relationships are generally positive, supplier interviews revealed persistent issues such as power outages and payment delays, which disrupt supply continuity. Strengthening supplier collaboration is therefore essential. DEGA should develop a supplier engagement program that fosters transparent communication, guarantees timely payments, and incorporates joint contingency planning for operational risks like infrastructure failures. Financial incentives or early payment options could be explored to encourage supplier reliability. Furthermore, diversifying the supplier base would mitigate risks associated with reliance on a few key suppliers.

Regarding Inventory Managements

Inventory management, although moderately effective, revealed significant variability in the adoption of Just-in-Time (JIT) practices and ongoing issues with stock outs and excess inventory. To improve this area, DEGA should invest in demand forecasting tools that utilize historical sales data and market trends to better predict inventory needs. Training supply chain staff on JIT

principles and inventory control will help reduce both overstocking and stock shortages. Cross-functional collaboration between sales, production, and inventory teams is also crucial to improve demand visibility and responsiveness, aligning inventory levels with actual market needs.

Regarding Production Planning

Production planning showed a negative association with operational efficiency, suggesting that overly rigid and formalized planning processes might hinder flexibility. DEGA should therefore transition towards more adaptive and contingency-based planning approaches. Incorporating scenario analysis and “what-if” planning will prepare the company to respond more effectively to unexpected changes or disruptions. Encouraging continuous feedback loops among production, inventory, and logistics teams will foster greater alignment and agility across operations.

Regarding Logistics

Logistics emerged as a relative strength, particularly in customer satisfaction, yet challenges remain in controlling transportation costs and addressing infrastructure limitations. Optimizing logistics through the adoption of route planning software and fleet management systems can reduce costs and enhance delivery efficiency. Engaging with local authorities and industry partners to advocate for infrastructure improvements and more reliable utilities is also vital.

In conclusion, the successful realization of these recommendations depends on coordinated cross-departmental collaboration, continuous monitoring, and committed leadership. Clear performance indicators and regular progress reviews will ensure these improvements translate into measurable gains in DEGA’s operational efficiency. By focusing on financial management, supplier resilience, inventory accuracy, adaptive planning, and logistics optimization, DEGA Bottled Water can strengthen its competitive position and better navigate the challenges of a resource-constrained market.

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Appendix A

Addis Ababa University
College of Business and Economics
School of Commerce

Department of Logistics and Supply Chain Management

Questionnaire on the influence of Supply Chain Factors on Operational Efficiency: The Case of Dega Bottled Water Company.

Dear Respondent,

I am Tariku Mekonnen, from the Department of Logistics and Supply Chain Management at Addis Ababa University. I am conducting this research to explore the impact of supply chain factors on operational efficiency, specifically focusing on Dega Bottled Water Company. The insights gained from this study will contribute to a deeper understanding of supply chain dynamics and operational improvements. I kindly request you to complete this questionnaire. Your cooperation is highly appreciated, and I assure you that all responses will be treated with strict confidentiality.

For any inquiries, please feel free to contact me directly at

Tel.- [+251-911 433 606](tel:+251-911-433-606)

Section 1: General Information				
Gender				
Male <input type="checkbox"/>		Female <input type="checkbox"/>		
Age				
18-25 <input type="checkbox"/>	26-30 <input type="checkbox"/>	31-40 <input type="checkbox"/>	40 and above <input type="checkbox"/>	
Education Level				
High School <input type="checkbox"/>	Diploma <input type="checkbox"/>	BA/BSc Degree <input type="checkbox"/>	MA/MSc <input type="checkbox"/>	PhD <input type="checkbox"/>
Work Experience				
≤ 2 years <input type="checkbox"/>	3-5 years <input type="checkbox"/>	6-10 years <input type="checkbox"/>	10 and above <input type="checkbox"/>	
Current Position in the Organization				
Managerial <input type="checkbox"/>		Non-Managerial <input type="checkbox"/>		

Please tick (√) in the box that best reflects your level of agreement

S.No	Category	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Section 2: Inventory Management						
IM1	The company inventory management system is efficient.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IM2	The company successfully avoids stock out issues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IM3	The company successfully avoids overstocking issues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IM4	Just-in-Time (JIT) practices are well implemented in our organization.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Section 3: Production Planning						
PP1	Demand forecasting is accurate for production planning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PP2	Production delays due to planning or scheduling issues occur frequently.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PP3	The company effectively uses applicable technology for production planning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PP4	Planning and scheduling issues rarely affect production.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PP5	The production efficiency supports overall business success.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Section 4: Logistics						
L1	The transportation system is well-organized, ensuring timely deliveries and smooth coordination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L2	The company ensures timely deliveries.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L3	The cost of transportation is effectively managed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L4	Product damages during transportation are minimal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L5	Logistics plays a significant role in customer satisfaction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Section 5: Supplier Relationships						

S1	The company maintains strong relationships with suppliers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S2	The companies engage in collaborative partnerships with suppliers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S3	Supplier reliability positively impacts companies operations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S4	The company effectively manages supplier related risks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S5	Supplier complaints are handled effectively	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Section 6: Finance						
F1	The company manages supply chain costs effectively.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F2	Inventory costs are kept under control.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F3	The companies optimize logistics expenses effectively.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F4	Production planning contributes to cost efficiency.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F5	Supplier payments are settled on time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Section 7: Impact on Operational Efficiency						
OE1	The companies' supply chain is highly efficient.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OE2	Effective supply chain management improves overall business performance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OE3	Inventory management significantly impacts operational efficiency.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OE4	Supplier relationships directly influence efficiency.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OE5	Logistics and distribution play a crucial role in operational success.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Suggestions for Improvement

What improvements would you suggest for enhancing the efficiency of the supply chain in your organization?

Any additional comments or suggestions regarding your company's supply chain management?

Appendix B

Addis Ababa University
College of Business and Economics
School of Commerce

Department of Logistics and Supply Chain Management

Semi-Structured Interview for Suppliers

Interviewer: Tariku Mekonnen

Thank you for taking the time to participate in this interview. I am conducting research on the influence of supply chain factors on operational efficiency, with a particular focus on Dega Bottled Water Company. The insights you provide will be crucial to understanding supplier relationships and their effect on operational efficiency. This interview will be semi-structured, so I will ask some general questions, but I welcome your detailed responses and any additional insights you may have.

- 1) Please describe your role and the products your company provides to Dega Bottled Water Company.
- 2) How reliable is your company in meeting the agreed delivery schedules for Dega Bottled Water Company?
- 3) Have you experienced any challenges in meeting the delivery deadlines? If so, what are the main causes?
- 4) Have there been any instances where product quality did not meet the required standards? If so, what were the reasons, and how was it addressed?
- 5) How would you rate the communication between your company and Dega Bottled Water Company?
- 6) How would you rate the timeliness of payments from Dega Bottled Water Company?
- 7) How flexible is your company in accommodating changes in order volume or delivery schedules, particularly during peak demand periods?
- 8) What suggestions do you have for improving the efficiency and effectiveness of the supply chain between your company and Dega Bottled Water Company?