THE EFFECT OF JUST IN TIME INVENTORY MANAGEMENT ON SUPPLY CHAINS EFFICIENCY: THE CASE OF INTERNATIONAL PAINT BRAND MANUFACTURING COMPANIES IN ADDIS ABABA

By:
BEMNET BEIDE GETACHEW

A Thesis submitted to the Graduate School of Addis Ababa University, School of Commerce for the Partial Fulfillment of the Requirements for the Degree of Master of Arts in Logistics and Supply Chain Management Program

Advisor:
Zelalem Bayisa (Ph.D)

June 2024
ADDIS ABABA, ETHIOPIA

DECLARATION

I, **Bemnet Beide Getachew,** declare that the thesis entitled "**The Effect of Just-In-Time Inventory Management on Supply Chains Efficiency: The Case of International Paint Brand Manufacturing Companies in Addis Ababa"** is my original work and has never been presented for a degree in any other university and all the sources of materials used for the thesis have been duly acknowledged.

Name: Bemnet Beide Getachew

Signature: _____

Date: _____

Addis Ababa University

School of Graduate Studies

This is to certify that the thesis prepared by **Bemnet Beide Getachew** entitled: *"**The Effect of Just-In-Time Inventory Management on Supply Chains Efficiency: The Case of International Paint Brand Manufacturing Companies in Addis Ababa"*** submitted in partial fulfillment of the requirements for the Degree of Master of Arts in Logistics and Supply Chain Management complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by Examining Committee

Zelalem Bayisa (Ph.D)	_____	_____
Advisor	Signature	Date
Shiferaw Mitiku (Ph.D)	_____	_____
Internal Examiner	Signature	Date
Shemelis Zewdie (Ph.D)	_____	_____
External Examiner	Signature	Date

ACKNOWLEDGEMENT

First and foremost, I would like to thank the almighty God for giving me the strength and patience to complete my graduate studies and finish this research paper and also for helping me reach this far in my academic accomplishments.

Secondly, I would like to thank my advisor Dr. Zelalem Bayisa for guiding me through my research journey and for the entire role he played towards the improvement of this thesis.

Thirdly my appreciation goes to the Supply Chain Managers and Head office employees of the paint manufacturing firms, who participated in this study by filling out questionnaires and providing further information.

And last but not least, my deepest gratitude is for my family and friends for their unwavering support and help. I cannot express my gratefulness lightly; I would not have come this far if it wasn't for you. Thank you all from the bottom of my heart.

Bemnet Beide Getachew

ABSTRACT

The general objective of the study was to examine the effect of Just-in-Time (JIT) inventory management on the supply chain efficiency of international paint brand manufacturers in Addis Ababa. The research design study employed both descriptive and explanatory research designs because it was appropriate for the achievement of the research objectives. The research also used a mixed approach, combining both quantitative and qualitative data collection methods. The target populations were international paint brand manufacturing companies in Addis Ababa. A combination of stratified and random sampling techniques was employed. The total population of the paint manufacturing companies is 167 and the sample size was 116. Both primary and secondary data were collected. Primary data were collected with questionnaire and interviews and secondary data was gathered from existing literature, the collected data was analyzed using descriptive and inferential statistics by the aid of SPSS version 23. The findings indicate that the implementation of JIT Inventory Management has significantly reduced production time, improved responsiveness, and simplified production processes, with reliable supplier deliveries. Cost reduction measures have minimized waste, maintained quality, and improved efficiency, though some concerns about employee morale persist. Strong buyer-supplier relationships have optimized production scheduling, enhanced manufacturing efficiency, and ensured high-quality raw materials, relying on open communication and collaboration. Perceptions of JIT implementation risks are mixed, with some concerns about investments in forecasting and communication systems but fewer worries about quality control. Efficiency indicators like high inventory turnover and reduced order fulfillment time are widely recognized, with strong support for JIT principles and the use of KPIs, regular reviews, and benchmarking to improve supply chain practices. The findings indicated that production time, cost reduction, and risk management positively and significantly impact supply chain efficiency. Some suggestions to improve the practice are regular reviews, employee training, rewards programs, and feedback channels to improve JIT efficiency and morale.

Key Words: Just-in-Time (JIT), inventory management, Production time, Cost Reduction, Buyer Supplier Relations, Risk, Supply Chain Efficiency

Table of Contents

Table of Tables

Table of Figures

CHAPTER ONE

INTRODUCTION

The researcher aimed to provide readers with an overview of the key elements of the study in this chapter. First, the background of the study provided a contextual overview by outlining the relevance and historical development of the research issue. The statement of the problem then briefly described the problem or knowledge gap that the research intended to fill. After that, a list of research questions were provided, which acts as guiding questions for the exploration of the study. In accordance with this, the goals and objectives of the research project were clearly defined in the objectives of the study. Additionally, significance of the study emphasized its applicability, and possible influence in the academic or societal domain. The scope of the study also defined, describing the parameters and boundaries that the research carried out within. The limitations of the study section were discussed, any shortcomings or constraints that affected how the findings were interpreted or generalized. Finally, the organization of the study provided a framework for readers' understanding in how the research report was presented and structured.

1.1 Background of the study

The Just-in-Time (JIT) philosophy of management, originating in Japan, gained prominence in the mid-1970s within various Japanese manufacturing enterprises. Taiichi Ohno, credited as the pioneer of JIT, conceived it within the Toyota manufacturing firm to fulfill consumer demands with minimal delays (Vijay & Sadikot 2016). Toyota recognized that JIT's effectiveness hinges on the comprehensive involvement and commitment of every individual within the organization, synchronized plant operations, and stringent adherence to quality and production schedules (Taylor & Francis Group 2012).

Over time, global market shifts propelled by new technologies and changing consumer trends have spurred transformations in the world economy. Consequently, established markets face escalating competition, fostering the emergence of novel concepts within the production sector. Supply Chain Management (SCM) has gathered significant attention, given its pivotal role in enhancing production processes and achieving operational excellence. The dynamic nature of the consumer market, coupled with globalization, presents SCM challenges (Hamid 2012). Rapidly evolving market demands result in shorter product life cycles, compelling businesses to innovate while maintaining cost efficiency. This necessitates a flexible supply chain capable of adapting to diverse product requirements and future endeavors. The JIT

philosophy advocates for efficient production processes, minimizing waste by reducing excess stocks and optimizing resource utilization through measures such as reducing setup time, controlling material flows, and prioritizing preventative maintenance (Aydin & Mayorga 2018).

Emphasizing quality throughout all stages of development and production processes, coupled with aligning product design with customer expectations, are catalysts for heightened product quality and subsequent business success. JIT methodologies offer shorter production time and reduced inventory costs, thereby potentially yielding favorable outcomes. However, the tangible impact of maintaining precise systems and communications to ensure timely delivery of materials and parts is crucial in comprehending the implications of this supply chain strategy. Despite its potential benefits, JIT implementation may incur unforeseen expenses, particularly when confronted with manufacturing or quality issues that disrupt the supply chain or sudden surges in demand, potentially undermining its efficacy. Fluctuations in end-user demand pose additional challenges to JIT systems, which can adversely affect company operations through fees, production disruptions, and other associated concerns (Aydin & Mayorga 2018).

JIT manufacturing comprises several interdependent elements that must harmonize to achieve its objectives. These components primarily encompass human resources, production, procurement, assembly, and organizational capabilities. Collectively, these elements form the Toyota Production System of people, plants, and systems (Taylor & Francis Group 2012). The manufacturing sector in Ethiopia is currently witnessing substantial growth, propelled by government initiatives and an expanding domestic market (World Bank 2022). Among the contributing industries, paint manufacturing plays a significant role, driven by the increasing demand for residential and commercial construction projects. However, optimizing supply chains to meet this escalating demand presents a challenge for Ethiopian manufacturers, including paint producers. They face pressure to minimize inventory holding costs while ensuring timely production to remain competitive in regional and potentially global markets (McKinsey & Company 2020).

Studies indicate that JIT can yield several benefits; including reduced production time, enhanced responsiveness to demand fluctuations, and minimized waste throughout the supply chain (Buer et al. 2020; Yang et al. 2021). These potential advantages make JIT an appealing strategy for Ethiopian paint manufacturers aiming to enhance efficiency and competitiveness.

However, effective JIT implementation in Ethiopia necessitates careful consideration of the specific context. While offering potential benefits, JIT also presents challenges. Unlike established economies with robust infrastructure and reliable logistics networks, Ethiopian manufacturers may encounter difficulties securing consistent and timely deliveries from suppliers. Disruptions stemming from infrastructure limitations or unforeseen events can significantly disrupt production if buffer stocks are unavailable (Giunipero et al. 2005). Moreover, establishing robust collaborative relationships with suppliers, a cornerstone of successful JIT implementation, may be hindered by communication barriers or limited technological adoption within the Ethiopian supply chain ecosystem (Suleiman et al. 2021).

This study aimed to address the gap regarding the effectiveness of JIT in emerging economies such as Addis Ababa, Ethiopia, focusing on the international paint brand manufacturing industry. The study investigated how JIT practices influence supply chain efficiency in this specific context, exploring their impact on key performance indicators such as production time, cost reduction, and buyer-supplier relation for international paint brand manufacturers. Furthermore, the study identified potential risks associated with Just-in-Time implementation on international paint brand manufacturers based in Addis Ababa, Ethiopia and proposes strategies to manage these risks and enhance overall supply chain resilience. The findings of this study offered valuable insights for international paint brand manufacturers in Addis Ababa considering JIT adoption and for policymakers seeking to support the growth and efficiency of the manufacturing sector.

1.2 Statement of the problem

In today's fiercely competitive global marketplace, the efficient functioning of supply chains is paramount for the success of businesses. Organizations are under immense pressure to deliver products swiftly and cost-effectively, all while minimizing wastage and upholding superior levels of customer satisfaction (Christopher, 2021). Central to achieving such efficiency is the optimization of inventory management. Traditional approaches often entail maintaining large stockpiles, thereby escalating storage expenses and the peril of inventory becoming obsolete. Enter Just-in-Time (JIT) inventory management, a favored strategy renowned for its ability to curtail inventory holding costs and streamline production processes.

The Ethiopian manufacturing sector, including paint production, is currently witnessing remarkable growth. Nevertheless, aligning supply chains with this growth presents a

formidable challenge. For the manufacturers to remain competitive in the market, it's imperative to strike a balance between minimizing inventory holding costs and ensuring punctual production. JIT inventory management emerges as a promising solution, offering the allure of waste reduction and enhanced responsiveness to customer demand (Buer et al. 2020). This applies also for international paint brand manufacturers in Addis Ababa.

JIT holds a plethora of potential benefits for Ethiopian paint manufacturers. Researchers suggest that it can lead to reduced production time, streamlined supply chains with minimized waste (Yang et al., 2021). This could be particularly advantageous in Ethiopia, where reliable infrastructure and logistics networks are still in developmental stages.

However, the precise impact of JIT on overall supply chain efficiency remains a subject of ongoing study. While the promises of JIT are enticing, the potential drawbacks cannot be overlooked. Effective JIT implementation often hinges on dependable and timely deliveries from suppliers, vulnerable to disruptions. Moreover, fostering robust collaborative ties with suppliers is pivotal for successful JIT adoption, a task fraught with complexities in intricate supply chains (Suleiman et al., 2021).

On one hand, JIT holds promise with significant advantages. Studies underscore its potential to reduce production time, enhance responsiveness to customer demands (Buer et al., 2020), and streamline supply chains by minimizing waste (Yang et al., 2021). Furthermore, implementing JIT inventory management can result in significant cost reductions by eliminating the need for large storage spaces and reducing the likelihood of inventory becoming outdated (Forbes 2023).

Yet, effective JIT implementation in Ethiopia necessitates meticulous consideration of the unique contextual factors. Unlike established economies, Ethiopian paint manufacturers may encounter hurdles in securing dependable and timely deliveries from suppliers. Disruptions stemming from infrastructure limitations or unforeseen events could severely impede production in the absence of buffer stocks (Giunipero et al. 2005). Additionally, forging strong collaborative relationships with suppliers, a cornerstone of successful JIT implementation, might encounter barriers due to communication challenges or limited technological adoption within Ethiopia's supply chain ecosystem (Suleiman et al., 2021).

Implementing Just-In-Time (JIT) in factories in Ethiopia, a developing country, presents significant challenges. Several issues hinder the successful adoption of JIT practices. Firstly,

inadequate infrastructure and logistical constraints contribute to unreliable transportation networks, leading to delays in raw material deliveries. Secondly, the volatility in local market demand and fluctuating economic conditions pose difficulties in accurate forecasting, crucial for JIT inventory management. Additionally, the high dependency on imported raw materials exposes manufacturers to currency exchange risks and supply chain disruptions, further complicating JIT implementation. Moreover, the limited availability of skilled workforce and technical expertise in JIT methodologies in the local labor market exacerbates these challenges, hindering efficient production scheduling and process optimization. These cumulative factors underscore the pressing need to address the systemic barriers to JIT implementation in Ethiopian paint factories to enhance operational efficiency and competitiveness in the global market.

Despite existing research on JIT's impact on supply chains, a comprehensive understanding of its effectiveness in emerging economies like Ethiopia remains elusive. Exploring how JIT can be tailored to address the specific challenges and opportunities within the Ethiopian paint manufacturing industry is imperative. This research endeavor seeks to bridge this gap by examining the influence of JIT inventory management on the supply chain efficiency of international paint brand manufacturers in Addis Ababa.

International brands frequently take the lead in implementing advanced inventory and logistics strategies, offering a solid foundation for examining how Just-In-Time (JIT) affects operational performance. Studying those companies in the context of Addis Ababa also highlights particular opportunities and constraints in the region's supply chain ecosystem, providing insightful information about how international best practices are tailored to local market realities. This focused strategy guarantees a thorough comprehension of JIT's effectiveness in improving supply chain efficiency in a changing and expanding market.

1.3 Research Question

To achieve the objectives, this study addressed the following research questions:

1. How does production time impact the overall supply chain efficiency of International Paint Brand Manufacturers in Addis Ababa?
2. What is the impact of cost reduction to the supply chain efficiency within the International Paint Brand Manufacturers in Addis Ababa?

3. How do the dynamics of buyer-supplier relationship affect the efficiency of supply chain in International Paint Brand Manufacturers in Addis Ababa?
4. What are the potential risks associated with JIT implementation on supply chain efficiency in the context of the International Paint Brand Manufacturing Industry in Addis Ababa?

1.4 Objectives of the study

1.4.1 General Objective of the study

To assess the effect of Just-in-Time (JIT) inventory management on the supply chain efficiency of international paint brand manufacturers in Addis Ababa.

1.4.2 Specific Objectives of the study

The specific research objectives include:

a. To analyze the effect of production time on the overall supply chain efficiency of International Paint Brand Manufacturing Industry in Addis Ababa.
b. To determine the outcome of cost reduction on supply chain efficiency within International Paint Brand Manufacturers in Addis Ababa.
c. To explore the influence of relationship between buyer-supplier on the supply chain efficiency of International Paint Brand Manufacturers in Addis Ababa.
d. To identify potential risks associated with JIT implementation on supply chain efficiency in the International Paint Brand Manufacturing Industry in Addis Ababa.

1.5 Significance of the study

The significance of the study lays in its contribution to the understanding of how Just-In-Time (JIT) inventory management impacted the efficiency of supply chains in the context of International Brand Paint manufacturers in Addis Ababa. By conducting this study, the researcher provided valuable insights into the potential benefits and challenges of implementing JIT inventory management in a specific geographic location, shedding light on its effectiveness in improving supply chain efficiency.

Furthermore, the study can also help businesses and organizations in Addis Ababa make more informed decisions about adopting JIT inventory management practices, potentially leading to cost savings, improved productivity, and better customer satisfaction. This research can also serve as a reference point for future studies on JIT inventory management and

supply chain efficiency in other regions or industries. Ultimately, the findings of this study have the potential to have a positive impact on the overall efficiency and competitiveness of management of International Paint Brand Manufacturers.

1.6 Scope of the study

The scope of this study was delimited in terms of subject (concept) and area (geography). Inventory management encompasses a vast area of managerial practice; however, it is difficult and unmanageable to conduct the study in all areas that summarizes inventory management in terms of time, finance, and research manageability. Thus, the conceptual scope of this study focused on JIT Inventory Management. In view of that, the study comprises four major components: Production time, Cost Reduction, Buyer-Supplier Relationship and Risks Associated. Regarding the geographical area coverage, the study was limited to international paint brand manufacturing companies in Addis Ababa. And the study is intended to cover the views of Employees of the international paint brand manufacturing companies in Addis Ababa. Methodologically, the study confined to mixed approach and explanatory & descriptive research design. The data for this research was primary and cross-sectional data. The data was collected through surveys or structured questionnaires distributed to international paint brand manufacturing companies in Addis Ababa.

1.7 Limitations of the study

While the study aimed to provide valuable insight into the effect of JIT inventory management on supply chain efficiency in the case of international paint brand manufacturers in Addis Ababa, it is important to acknowledge certain limitations. One of the limitations was that the researcher wasn’t able to find previously published research related to the topic of the study especially in Ethiopia.

1.8 Organization of the Paper

The study is structured into five chapters. The initial chapter encompasses the introduction, including the background of the study, problem statement, research objectives, significance of the study, and scope of the study. The second chapter inspected into an extensive literature review, comprising both theoretical and empirical research. The third chapter concentrated on the methodology employed in the study. The fourth chapter analyzed and discussed the study based on the concepts presented earlier, with the main findings being outlined. The final chapter, the fifth, consists of the conclusion and recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1. Theoretical Literature

2.1.1 Definition of JIT Inventory Management

Just-in-Time is a Japanese philosophy of management which has been put into viable use since the mid-1970s in numerous Japanese assembling firms. It was first created and idealized inside the Toyota producing firm by Taiichi Ohno as a method for accomplishing buyer requests with least deferrals. Because of this reason, Taiichi Ohno is currently alluded to as the initiator of Just-in-Time (Vijay & Sadikot 2016).

Just-in-Time (JIT) inventory management is a methodology employed in supply chain and operations management aimed at reducing waste and enhancing efficiency by delivering goods or materials just when they are needed in the production process, thereby minimizing inventory holding costs while maintaining smooth operations. JIT is predicated on the principle of producing and delivering finished goods or components only as they are needed for the next stage of production, thus eliminating excess inventory and associated costs such as storage, obsolescence, and handling.

According to Christopher (2020) JIT is "a philosophy of manufacturing based on planned elimination of all waste and on continuous improvement of productivity." This definition underscores the core tenets of JIT, emphasizing waste reduction and ongoing improvement as central principles. Similarly, Jacobs & Chase (2017) define JIT as "a philosophy of manufacturing based on planned elimination of all waste and on continuous improvement of productivity." This definition highlights the strategic nature of JIT as a philosophy that extends beyond mere inventory management to encompass broader operational and organizational objectives.

2.1.2 Principles of JIT Inventory Management

1. *Waste Elimination*

At the heart of JIT inventory management lies the principle of waste elimination, which involves identifying and eliminating any activity or process that does not add value to the final product. This includes excess inventory, overproduction, waiting time, unnecessary

transportation, over processing, excess motion, and defects (Ohno 1988). By streamlining operations and focusing only on value-added activities, organizations can reduce costs and enhance efficiency. Ohno (1988) asserts that waste elimination is essential for achieving JIT objectives, stating that "The most dangerous kind of waste is the waste we do not recognize." This highlights the importance of continuously evaluating and improving processes to identify and eliminate waste, thereby optimizing resource utilization and improving overall performance.

2. *Continuous Improvement*

JIT inventory management emphasizes the importance of continuous improvement through incremental changes and innovation in processes, systems, and practices. This principle, often associated with the Japanese term "kaizen," encourages organizations to constantly seek ways to enhance efficiency, quality, and flexibility (Womack, Jones, & Roos 1990). By fostering a culture of continuous improvement, organizations can adapt to changing market conditions and customer requirements more effectively.

Womack, Jones, & Roos (1990) emphasize the significance of continuous improvement in JIT implementation, stating that "The best way to implement JIT is incrementally, with improvements made step by step." This suggests that sustained progress in JIT inventory management requires a systematic approach that prioritizes ongoing learning and adaptation.

3. *Supplier Relationship*

Effective supplier relationships are crucial for successful JIT inventory management, as they ensure timely delivery of high-quality materials or components in line with production requirements. JIT relies on close collaboration and trust between manufacturers and suppliers to maintain a steady flow of materials while minimizing inventory levels (Monczka et al. 2019). Building strong supplier partnerships enables organizations to respond quickly to changes in demand and minimize supply chain disruptions.

Monczka et al. (2019) highlight the importance of supplier relationships in JIT implementation, noting that "Long-term relationships with suppliers are crucial to the success of JIT purchasing." This underscores the strategic role of supplier partnerships in supporting JIT objectives, such as reducing production time and improving product quality.

2.1.3 Inventory Management

Inventory, according to Besley & Ghatak (2017), refers to stockpiles of raw materials, components, supplies, work in progress, and completed items that occur at different points throughout an organization's production and logistics chain. Inventory management refers to the process of ordering, storing, using, and selling a company's inventory (James 2019). This involves the management of raw materials, components, and final goods, as well as warehousing and processing of such commodities. Inventory management refers to the methods and processes used to maintain inventory holding levels, limit costs and bottlenecks and manage current and future stock requirements (Susan 2017, as cited in Mazikana 2023). It is used to maintain needed service levels for internal and external customers and inventory visibility in supply chains. As cited in Mazikana (2023) according to Pycraft (2020), inventory or stock is the stored accumulation of resources in a transformation system.

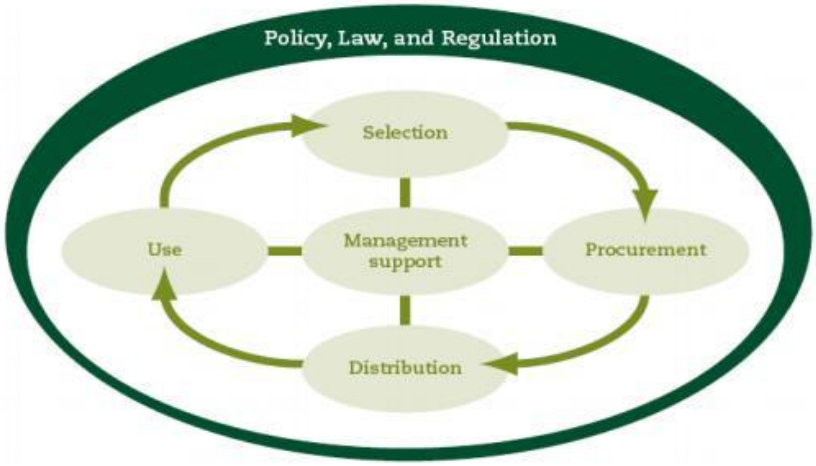
Organizations employ inventory management strategies to manage their supplies and inventories of completed items, semi-finished goods, and raw materials. According to Zer & Wei (2016), these efforts help the firm to minimize waste and expenditures while increasing sales income. Because raw materials are generally expensive, proper inventory management is crucial to ensuring cost-effective distribution. Mismanagement leads to waste and pilferage. The purpose of inventory management is to keep stocks at the lowest possible cost while ensuring continuous supply for processing processes. When determining, management must find a trade-off between several cost components such as inventory holding costs, cost of delivering cost, and expenditures incurred due to a lack of stocks (Callahan 2019 as cited in Mazikana 2023).

Inventory management is critical in any corporate organization for increasing effectiveness and efficiency (Rajeev 2018 as cited in Mazikana 2023). Inventory management has long been a topic of debate in literature, and it continues to pique people's attention since it is the primary goal of many enterprises today (Mazikana, Moyo & Mudziso 2018, as cited in Mazikana 2023). Inventory management as a customer-oriented concept is being considered by organizations today in order to establish and maintain a sustainable competitive advantage (Ospina & Perez 2017).

Inventory management has always been related to either excess or scarcity of inventory. Inventory issues have multiplied over the years as technological advancement has boosted the

organization's capacity to create things in bigger numbers, quicker, and with many design variants. There is a need for effective inventory management across the goods supply chain to avoid all sorts of waste, including shrinkage and expirations (Nakyanzi et al. 2018 as cited in Mazikana 2023).

Raw materials will not reach the customers who are the end consumers of raw materials, unless the district commits to ensuring an organized and efficient goods supply and training to carry out tasks (Clark & Barraclough 2010 as cited in Mazikana 2023). The normal ordering procedure is referred to as inventory management. Inventory management operations include ordering, receiving, storing, distributing, issuing, and re-ordering commodity inventories (Odinga 2017). The goods supply chain in organizations is shown in Figure 2.1 below.



Source: Odinga (2017)

Figure 2-1 Supply Chain

As cited in Mazikana (2023) According to Ospina & Perez (2017), inventory management is an important part of making decisions about stock handling in an organization, such as activities to be carried out, stock handling procedures to ensure that adequate quantities are kept in the warehouse at all time and having inventory management policies.

As cited in Mazikana (2023) Ester (2021) said that a good inventory management system minimizes the amount of difficulty of operations, allowing the business to be successful via distribution and shipping network execution, administration, and scheduling. Inventory management allows a company to improve the quality of its business performance

outcomes. Inventory management is an important aspect of organizational services. The availability of commodities and enough resources helps to an improvement in the quality of services provided by organizations. Because commodities serve as the ultimate connection between consumers and firm services, their availability is regarded as the most essential quality indicator of manufacturing in African contexts (Jitta et al. 2019 as cited in Mazikana 2023).

Customers' expectations are improved as a result of consistent supply (Clark & Barraclough 2020 as cited in Mazikana 2023). Many research on inventory management systems have been conducted, notably in developing nations (Chandani et al. 2016; Jitta et al. 2019; Pharasi 2017 as cited in Mazikana 2023), outlining the system's strengths and limitations. In recent years, developing nations have seen a massive expansion in product volume. To handle the huge volume of items and associated commodities, a strong inventory management system is required. Any organization may use an inventory management system to determine when and how much inventory or stock to order or issue. According to Odinga (2017), orders are submitted on time so that items are accessible as needed. Timely delivery is a vital and necessary component of catering for data on real product consumption at the firm facility level (Talafha 2019 as cited in Mazikana 2023). When an organization's quantification requirements are not related to genuine demands, it might take up a part of the produced products budget, leaving inadequate cash for other critical and fundamental goods (Clark & Barraclough 2018 as cited in Mazikana 2023).

2.1.4 Historical Development of JIT Inventory Management

Just-in-Time (JIT) inventory management has its roots in the post-World War II manufacturing practices in Japan, particularly within Toyota Motor Corporation. The development of JIT can be traced back to the 1950s and 1960s, when Toyota faced significant challenges in terms of limited resources, including raw materials and production facilities, as well as intense competition in the Japanese automotive industry (Womack, Jones, & Roos 1990). In response to these challenges, Toyota's management, led by Taiichi Ohno, devised innovative production methods that laid the foundation for JIT principles.

Ohno's pioneering work in the Toyota Production System (TPS) played a pivotal role in the historical development of JIT. TPS, often referred to as the precursor of JIT, emphasized the elimination of waste and the pursuit of continuous improvement throughout the production process (Ohno 1988). Ohno's insights into the inefficiencies of traditional batch production

systems led to the development of practices such as Just-in-Time production, Kanban systems, and Total Quality Control, which revolutionized manufacturing operations.

The 1970s witnessed the widespread adoption of JIT principles by Japanese manufacturers beyond the automotive industry. As Japanese companies gained international recognition for their superior quality and efficiency, interest in JIT practices grew among Western manufacturers seeking to emulate their success (Monden 1983). The dissemination of JIT concepts to Western countries contributed to the globalization of JIT and its evolution into a widely recognized management philosophy.

The 1980s marked a period of accelerated adoption of JIT principles by Western companies, driven by increasing competition, rising customer expectations, and the quest for operational excellence (Schonberger 1982). The success stories of companies such as Toyota, Honda, and Nissan served as compelling examples for Western firms seeking to improve their competitiveness through JIT practices. Scholars and practitioners alike began to explore and document the key principles and practices of JIT, laying the groundwork for its broader dissemination and application.

By the 1990s, JIT had become a cornerstone of modern operations management and supply chain practices, influencing a wide range of industries worldwide. Researchers continued to refine and expand the theoretical foundations of JIT, addressing issues such as supplier management, lean production, and the integration of information technology (Shingo 1989). The emergence of concepts such as Lean Manufacturing further propelled the evolution of JIT, emphasizing the importance of waste reduction, continuous improvement, and customer focus.

In the contemporary business landscape, JIT remains a dynamic and evolving methodology, adapting to the changing needs and challenges of global markets. Organizations continue to embrace JIT principles as integral components of their strategic initiatives to enhance efficiency, reduce costs, and improve customer satisfaction (Christopher 2021 as cited in Mazikana 2023). While the historical development of JIT reflects its origins in Japanese manufacturing practices, its enduring relevance underscores its universal applicability and enduring impact on modern business operations.

2.1.5 Historical Development of JIT Inventory Management in Ethiopia

Just-in-Time (JIT) inventory management has gained increasing attention in Ethiopia's manufacturing sector in recent years, reflecting a broader trend towards adopting lean production principles to improve operational efficiency and competitiveness. While the historical development of JIT in Ethiopia may not be as extensive as in other countries, there is growing recognition of its potential benefits in reducing waste, enhancing productivity, and optimizing resource utilization. The adoption of JIT inventory management practices in Ethiopia can be traced back to the late 20th century when the country began to liberalize its economy and attract foreign investment in various sectors, including manufacturing (World Bank 2019). As Ethiopian industries sought to modernize and improve their competitiveness, they started to explore alternative production and inventory management strategies, including JIT, to streamline operations and meet evolving customer demands.

According to a report by the World Bank (2019), Ethiopia's industrial development strategy emphasizes the importance of adopting lean production practices, including JIT inventory management, to enhance the efficiency and competitiveness of the manufacturing sector. The Ethiopian government has been actively promoting the adoption of lean manufacturing principles through various initiatives, such as training programs, capacity building workshops, and policy incentives, to support the implementation of JIT and other lean practices across different industries.

In recent years, Ethiopian manufacturers have increasingly recognized the potential benefits of implementing JIT inventory management in improving operational efficiency and reducing costs. As a result, there has been a growing uptake of JIT principles and practices among Ethiopian companies across various sectors, including textiles, food processing, automotive, and electronics (Shiferaw et al. 2020). This trend reflects a broader shift towards lean production and continuous improvement in the Ethiopian manufacturing landscape.

Shiferaw et al. (2020) conducted a study examining the implementation of lean manufacturing practices, including JIT inventory management, in the Ethiopian textile industry. The study found that while there were challenges related to infrastructure, skills, and supply chain coordination, many textile manufacturers in Ethiopia were actively embracing JIT principles to enhance productivity, reduce production time, and improve product quality. This research highlights the increasing relevance and adoption of JIT inventory management practices in Ethiopia's manufacturing sector.

In summary, the historical development of JIT inventory management in Ethiopia reflects a growing recognition of its potential benefits in improving operational efficiency, reducing waste, and enhancing competitiveness in the manufacturing sector. While the adoption of JIT practices in Ethiopia may be relatively recent compared to other countries, there is a clear trend towards embracing lean production principles, including JIT, as part of efforts to modernize and transform the Ethiopian industrial landscape.

2.1.6 Core Components of JIT

Just-in-Time (JIT) inventory management relies on several core components that work together to minimize waste, optimize production processes, and enhance efficiency. Three key components of JIT are Kanban systems, pull-based production, and small lot sizes.

2.1.6.1 Kanban Systems

Kanban systems are visual management tools used to control the flow of materials and information within production processes. Originating from Toyota's Production System, Kanban utilizes visual signals, such as cards or boards, to signal the need for production or replenishment of materials at each stage of the production process (Liker 2004). By linking production directly to customer demand, Kanban systems enable JIT manufacturing by ensuring that inventory is replenished only when needed, thereby reducing excess inventory and waste. Liker (2004) emphasizes the significance of Kanban systems in JIT implementation, stating that "Kanban is the key to achieving a lean process." This highlights the central role of Kanban in facilitating JIT principles such as waste reduction, continuous flow, and pull-based production. As a proven method for synchronizing production with customer demand, Kanban systems have become widely adopted in various industries as a cornerstone of JIT practices.

2.1.6.2 Pull-Based Production

Pull-based production is a fundamental principle of JIT manufacturing that contrasts with traditional push-based approaches. In a pull-based system, production is triggered by actual customer demand, rather than forecasts or production schedules (Womack, Jones, & Roos 1990). Instead of pushing products through the production process based on predetermined schedules, pull-based systems rely on downstream processes or customers to signal when additional products are needed, thereby minimizing overproduction and inventory holding costs. Womack, Jones, & Roos (1990) assert that "Pull production is the essence of JIT," highlighting its pivotal role in aligning production with customer requirements while minimizing waste. By establishing a seamless flow of materials and information across the

value stream, pull-based production enables organizations to respond quickly to changes in demand, reduce production time, and improve overall efficiency. This customer-centric approach to production has become a hallmark of JIT manufacturing practices.

2.1.6.3 Small Lot Sizes

Small lot sizes refer to the practice of producing goods or components in smaller batches, as opposed to large, bulk production runs. JIT emphasizes the economic advantages of smaller lot sizes, including reduced setup time, lower inventory levels, and increased flexibility to respond to changing customer demand (Schonberger 1982). By minimizing batch sizes, organizations can reduce the time and resources required for production changeovers, thereby enabling more frequent production runs and greater responsiveness to customer needs. Schonberger (1982) argues that "small lots are the foundation of JIT production," highlighting their role in achieving JIT objectives such as waste reduction and improved flow. By embracing smaller lot sizes, organizations can achieve smoother production flows, reduced production time, and enhanced quality control, ultimately driving greater competitiveness in the marketplace. The adoption of small lot sizes as a core component of JIT reflects a shift towards more agile and efficient production systems capable of meeting dynamic customer demands.

2.2. Theoretical Framework

2.2.1 Theory of Just-in-Time Production

Just-in-Time (JIT) production is a management philosophy and operational strategy aimed at maximizing efficiency, minimizing waste, and optimizing resource utilization throughout the production process. The theory of JIT production emphasizes several key principles and concepts that underpin its effectiveness in enhancing organizational performance and competitiveness. One central tenet of the theory of JIT production is the elimination of waste. JIT advocates for the identification and elimination of all forms of waste, including excess inventory, overproduction, waiting time, unnecessary transportation, over processing, excess motion, and defects (Ohno 1988). By eliminating waste, organizations can streamline their operations, reduce costs, and improve overall efficiency.

Ohno (1988) posits that "The most dangerous kind of waste is the waste we do not recognize," highlighting the importance of continuous improvement and waste reduction in JIT production. This recognition of waste as a fundamental impediment to efficiency

underscores the need for organizations to adopt proactive measures to identify and eliminate waste throughout their production processes.

Another core principle of JIT production is the concept of continuous improvement, often referred to as "kaizen" in Japanese. JIT encourages organizations to continuously seek opportunities for improvement in all aspects of their operations, including processes, systems, and practices (Womack, Jones, & Roos 1990). Through a commitment to continuous improvement, organizations can enhance productivity, quality, and flexibility over time.

Womack, Jones, & Roos (1990) assert that "The best way to implement JIT is incrementally, with improvements made step by step," emphasizing the incremental and iterative nature of continuous improvement in JIT production. This iterative approach enables organizations to gradually refine and optimize their processes, driving sustained performance improvements over time.

A fundamental aspect of the theory of JIT production is the emphasis on pull-based production systems. Unlike traditional push-based production systems, which rely on forecasts and production schedules to drive production, pull-based systems respond directly to customer demand (Schonberger 1982). By producing only what is needed, when it is needed, pull-based production systems minimize overproduction, reduce inventory holding costs, and improve responsiveness to customer needs.

Schonberger (1982) argues that "Pull production is the essence of JIT," highlighting its central role in aligning production with customer demand while minimizing waste. This customer-centric approach to production ensures that resources are utilized efficiently and that products are delivered to customers in a timely manner, thereby enhancing customer satisfaction and competitiveness.

The Theory of Just in Time (JIT) Production aligns well with Production Time. JIT focuses on reducing production time by receiving goods only as they are needed in the production process, which minimizes inventory costs and enhances responsiveness.

2.2.2 Theory of Constraints

The Theory of Constraints (TOC) is a management philosophy developed by Eliyahu M. Goldratt in his seminal work, "The Goal", which emphasizes the identification and management of constraints within an organization's operations to achieve its goals. TOC posits that every organization has a constraint or bottleneck that limits its ability to achieve its

objectives, and the key to improving performance lies in identifying, exploiting, and elevating these constraints (Goldratt & Cox 2014). Through a systematic approach to identifying and addressing constraints, TOC aims to optimize overall organizational performance and drive continuous improvement.

Goldratt & Cox (2014) outline the core principles of TOC in "The Goal," emphasizing the importance of focusing on the constraint to improve overall system performance. According to TOC, the constraint determines the pace at which the entire system can operate, and efforts should be directed towards maximizing the throughput of the constraint to enhance overall productivity. By identifying and leveraging the constraint, organizations can achieve significant improvements in efficiency, quality, and profitability.

A central concept of TOC is the Five Focusing Steps, a systematic process for identifying and managing constraints within an organization (Goldratt & Cox 2014). The Five Focusing Steps provide a structured approach to problem-solving and decision-making, enabling organizations to prioritize actions that will have the greatest impact on improving performance. These steps include identifying the constraint, exploiting the constraint to maximize throughput, subordinating all other activities to the constraint, elevating the constraint if necessary, and repeating the process as new constraints emerge.

Goldratt & Cox (2014) assert that the Five Focusing Steps form the foundation of TOC, guiding organizations in their quest to improve performance and achieve their goals. By systematically addressing constraints and optimizing system performance, organizations can achieve higher levels of efficiency, productivity, and profitability.

In addition to the Five Focusing Steps, TOC introduces several key concepts and tools to help organizations identify and manage constraints effectively. These include Drum-Buffer-Rope (DBR) scheduling, which focuses on synchronizing production with the constraint to maximize throughput, and Throughput Accounting, a management accounting approach that prioritizes decisions based on their impact on overall throughput (Goldratt 1990). By applying these concepts and tools, organizations can gain a deeper understanding of their constraints and develop strategies to optimize system performance.

Goldratt (1990) emphasizes the importance of adopting a holistic view of the organization and its operations when applying TOC principles. According to Goldratt (1990), TOC is not just a set of techniques or tools but a comprehensive philosophy that encompasses all aspects

of organizational management. By embracing TOC as a holistic management philosophy, organizations can achieve sustainable improvements in performance and competitiveness.

In summary, the Theory of Constraints offers a powerful framework for identifying, managing, and optimizing constraints within an organization's operations. By focusing on the constraint and applying systematic problem-solving techniques, organizations can achieve significant improvements in efficiency, productivity, and profitability, ultimately driving long-term success and competitive advantage.

The Theory of Constraints aligns with Risk Associated as it focuses on identifying and managing the most critical limiting factor (constraint) that stands in the way of achieving a goal. Managing risks effectively can be seen as addressing constraints within the supply chain to improve overall efficiency.

2.2.3 Lean Theory

Lean theory, also known as Lean manufacturing or Lean production, is a management philosophy and operational approach focused on maximizing customer value while minimizing waste. Originating from the Toyota Production System (TPS), Lean theory emphasizes the continuous improvement of processes, elimination of waste, and respect for people (Womack, Jones, & Roos 1990). By streamlining operations and optimizing resource utilization, Lean theory aims to create more value for customers with fewer resources, thereby enhancing organizational performance and competitiveness.

Womack, Jones, & Roos (1990) provide a comprehensive overview of Lean theory in their seminal work, "The Machine That Changed the World." Drawing on their study of automotive manufacturing practices, the authors highlight the core principles of Lean production, including waste reduction, continuous improvement, and respect for people. This foundational text serves as a cornerstone of Lean theory, providing insights into its origins, principles, and practical applications.

Central to Lean theory is the concept of waste reduction, which encompasses the elimination of any activity or process that does not add value to the customer. Lean theory identifies seven types of waste, including overproduction, waiting time, unnecessary transportation, over processing, excess inventory, excess motion, and defects (Womack, Jones, & Roos 1990). By identifying and eliminating waste, organizations can streamline their operations, improve efficiency, and enhance customer satisfaction.

In addition to waste reduction, Lean theory emphasizes the importance of continuous improvement, often referred to as "kaizen" in Japanese. Kaizen involves the ongoing pursuit of small, incremental improvements in processes, systems, and practices to achieve higher levels of efficiency and quality (Imai 1986). Through a culture of continuous improvement, organizations can adapt to changing market conditions, respond to customer needs more effectively, and drive sustained performance improvements.

Imai (1986) explores the concept of kaizen in his influential work, "Kaizen: The Key to Japan's Competitive Success," offering practical insights into the application of continuous improvement principles in manufacturing and service industries. By embracing kaizen as a core component of Lean theory, organizations can foster a culture of innovation, creativity, and excellence, driving continuous growth and improvement.

Another key aspect of Lean theory is the focus on value creation from the perspective of the customer. Lean theory emphasizes the importance of understanding customer needs and preferences and aligning organizational processes and activities to deliver value-added products and services (Womack & Jones 2003). By focusing on value creation, organizations can enhance customer satisfaction, build brand loyalty, and gain a competitive advantage in the marketplace.

Womack & Jones (2003) further develop the concept of Lean thinking in their book, "Lean Thinking: Banish Waste and Create Wealth in Your Corporation," offering insights into how organizations can apply Lean principles to achieve operational excellence and sustainable growth. Through a systematic approach to waste reduction, continuous improvement, and value creation, Lean theory provides a framework for organizations to optimize their operations, maximize customer value, and drive long-term success.

Lean Theory matches with Cost Reduction as it emphasizes the elimination of waste, continuous improvement, and cost efficiency. Lean principles aim to streamline processes, reduce unnecessary costs, and improve overall efficiency.

2.2.4 Contingency Theory

Contingency theory is a management perspective that posits that there is no one-size-fits-all approach to organizational management, and the most effective management practices are contingent upon the specific context or situation faced by an organization. According to contingency theory, the optimal approach to management depends on various factors, including the organization's size, industry, technology, culture, and environment (Donaldson,

2001). By acknowledging the importance of context in shaping management practices, contingency theory offers a flexible and adaptive approach to organizational management.

Donaldson (2001) provides an in-depth exploration of contingency theory in his book, "The Contingency Theory of Organizations" Drawing on empirical research and theoretical insights; Donaldson outlines the core principles of contingency theory and discusses its implications for organizational management. This seminal work serves as a comprehensive guide to understanding the key concepts and applications of contingency theory in contemporary organizations.

One of the central concepts of contingency theory is the idea of fit or congruence between an organization's structure, strategy, and environment. Contingency theorists argue that organizations must align their internal structures and strategies with the demands and challenges of their external environment to achieve optimal performance (Lawrence & Lorsch 1967). This emphasis on alignment highlights the importance of flexibility and adaptability in organizational design and decision-making.

Lawrence & Lorsch (1967) introduce the concept of organizational fit in their classic work, "Organization and Environment: Managing Differentiation and Integration." Through empirical research and case studies, the authors demonstrate how organizations can achieve effective adaptation to their environments by matching their internal structures and processes to external contingencies. This seminal work laid the foundation for contemporary research and practice in organizational design and management.

Contingency theory also emphasizes the importance of leadership in aligning organizational practices with environmental contingencies. According to contingency theorists, effective leadership involves the ability to diagnose the unique challenges and opportunities facing an organization and to implement appropriate management practices accordingly (Fiedler 1967). Leadership effectiveness is contingent upon the specific demands of the situation, and leaders must be able to adapt their styles and strategies to fit the context.

Fiedler (1967) introduces the concept of contingency leadership theory in his influential work, "A Theory of Leadership Effectiveness." Through empirical research and theoretical analysis, Fiedler explores how situational factors such as task structure, leader-member relations, and positional power influence leadership effectiveness. This seminal work has shaped contemporary understanding of leadership and highlighted the importance of contingency approaches to leadership development and practice.

In summary, contingency theory offers a valuable perspective on organizational management that emphasizes the importance of context and adaptation. By recognizing that there is no universal solution to management challenges, contingency theory encourages organizations to adopt flexible and adaptive approaches to organizational design, decision-making, and leadership. This flexibility enables organizations to navigate complex and dynamic environments effectively, driving sustainable performance and success.

Contingency Theory is suitable for Buyer-Supplier Relationships because it suggests that there is no one best way to manage relationships; instead, the optimal course of action depends on the internal and external situation. Strong buyer-supplier relationships can be seen as contingent upon factors such as trust, communication, and mutual goals.

2.2.6 Objectives and Goals of Just-in-Time (JIT) Inventory Management

Just-in-Time (JIT) inventory management is not simply about reducing stock; it's a holistic approach aimed at optimizing the entire production process. Unlike traditional methods that prioritize holding large inventories, JIT focuses on having the right materials available at the exact moment they're needed for production. This philosophy translates into a set of core objectives and goals that drive efficiency and competitiveness (Sohal & Kaur 2021).

2.2.6.1 Key Objectives of JIT Inventory Management

a. **Reduced Waste:** A primary objective of JIT is to eliminate waste ("muda" in Japanese) across various aspects of production. This includes minimizing waste associated with material storage, overproduction, unnecessary transportation, and defective products. Sohal & Kaur (2021) discuss how JIT systems can achieve this objective by promoting continuous improvement (Kaizen) and optimizing production flow through visual tools like Kanban cards.

b. **Improved Efficiency:** By reducing waste and non-value-added activities, JIT aims to streamline the production process. This translates to increased efficiency, with faster production cycles, reduced production time, and improved resource utilization. Wu et al. (2020) emphasize the efficiency gains achievable through JIT in their review of JIT research, highlighting the positive impact on responsiveness and overall production speed.

c. **Enhanced Quality:** JIT emphasizes building quality in the production process from the very beginning. This reduces the likelihood of defects and rework, leading to higher-quality products and improved customer satisfaction. A focus on preventive maintenance and supplier quality also contributes to achieving this objective.

d. **Increased Profitability:** The combined effects of reduced waste, improved efficiency, and enhanced quality lead to increased profitability. Lower inventory carrying costs, faster production cycles, and fewer defects all contribute to a company's bottom line.

2.2.6.2 Additional Goals of JIT

While the core objectives focus on immediate benefits, JIT also strives for long-term goals that enhance a company's overall competitiveness.

Increased Flexibility: By minimizing inventory and relying on smaller lot sizes, JIT allows for greater flexibility in responding to changing customer demands. This adaptability is crucial in today's dynamic market environment.

Stronger Supplier Relationships: JIT success hinges on reliable suppliers who can deliver high-quality materials consistently and on time. JIT fosters closer collaboration with suppliers, leading to stronger partnerships and mutual benefits.

Employee Engagement: A core tenet of JIT is continuous improvement, often driven by employee suggestions and participation. This fosters a culture of employee engagement and ownership within the production process.

Understanding these objectives and goals allows organizations to assess their suitability for adopting JIT principles. While JIT offers significant benefits, successful implementation requires careful planning, a focus on quality, and reliable supplier relationships.

2.2.7 Benefits of JIT Inventory Management for Supply Chains

Just-in-Time (JIT) inventory management offers several benefits for supply chains, including reduced inventory holding costs, improved efficiency, and enhanced responsiveness to customer demand. One significant benefit of JIT inventory management is the reduction in inventory holding costs. By minimizing inventory levels and adopting a lean approach to inventory management, organizations can reduce the costs associated with storing, managing, and maintaining excess inventory (Sarkis & Sundarraj 2020). This reduction in inventory holding costs frees up financial resources that can be reinvested in other areas of the business or used to improve profitability.

Sarkis and Sundarraj (2020) discuss the financial benefits of JIT inventory management in their study, "Just-in-Time Inventory Management: A Review of Literature and Directions for Future Research." Through a comprehensive review of existing literature, the authors

highlight the cost-saving potential of JIT practices, including reduced inventory carrying costs, lower obsolescence risk, and decreased warehouse space requirements. This research provides empirical evidence of the financial benefits associated with implementing JIT inventory management in supply chains.

Another benefit of JIT inventory management is improved efficiency throughout the supply chain. By synchronizing production with customer demand and minimizing production time, JIT practices enable organizations to operate more efficiently and reduce waste (Vonderembse & White 2003). This improved efficiency results in faster throughput time, reduced production costs, and increased overall productivity.

Vonderembse & White (2003) explore the operational benefits of JIT inventory management in their study, "Lean and Agile Manufacturing: A Systematic Review of Research Literature." Through a systematic review of research literature, the authors identify several key benefits of JIT practices, including improved efficiency, reduced cycle time, and increased flexibility. This research provides valuable insights into how JIT inventory management can help organizations optimize their operations and achieve competitive advantage in dynamic market environments.

In addition to cost savings and efficiency improvements, JIT inventory management enables organizations to respond more effectively to changes in customer demand. By maintaining lower inventory levels and adopting flexible production processes, organizations can adjust their operations quickly to meet shifting customer requirements (Nahmias 2015). This responsiveness to customer demand enhances customer satisfaction and loyalty, ultimately driving business growth and profitability.

Nahmias (2015) discusses the customer-centric benefits of JIT inventory management in his book, "Production and Operations Analysis." Through a comprehensive analysis of production and operations management principles, the author highlights the strategic advantages of JIT practices, including improved customer service levels, reduced stock outs, and increased market responsiveness. This research underscores the importance of JIT inventory management in building strong customer relationships and sustaining competitive advantage in today's dynamic marketplace.

Some of Benefits of JIT Inventory Management for Supply Chains are the following:

a) Cost Reduction: Inventory Holding Costs, Transportation Costs

Just-in-Time (JIT) inventory management offers significant cost reduction benefits for supply chains by minimizing inventory holding costs and transportation costs. By maintaining lower inventory levels and adopting a lean approach to inventory management, organizations can reduce the costs associated with storing, managing, and maintaining excess inventory (Sarkis & Sundarraj 2020). This reduction in inventory holding costs translates into tangible financial savings for organizations, allowing them to allocate resources more efficiently and improve their bottom line.

Transportation costs also decrease with JIT inventory management due to the reduced need for large shipments and warehousing space. JIT enables organizations to synchronize production with customer demand, minimizing the need for excess inventory storage and associated transportation expenses (Christopher 2020). By reducing the volume and frequency of shipments, organizations can optimize transportation routes, minimize transit time, and lower overall transportation costs, contributing to improved supply chain efficiency and cost savings.

b) Improved Quality and Productivity

JIT inventory management is associated with improved quality and productivity throughout the supply chain. By implementing JIT practices, organizations prioritize quality control and defect prevention, leading to fewer errors, defects, and rework (Vonderembse & White 2003). The focus on eliminating waste and streamlining processes inherent in JIT encourages continuous improvement in quality standards and enhances overall product reliability and customer satisfaction.

Moreover, JIT principles promote higher levels of productivity by optimizing production processes and minimizing downtime. JIT encourages organizations to adopt efficient production techniques, such as small lot sizes and pull-based production, which reduce setup time, increase machine utilization rates, and improve overall productivity (Womack, Jones, & Roos 1990). By eliminating inefficiencies and maximizing resource utilization, JIT contributes to higher levels of productivity and competitiveness in the marketplace.

c) Enhanced Flexibility and Responsiveness to Customer Demand

One of the key advantages of JIT inventory management is its ability to enhance flexibility and responsiveness to customer demand. By maintaining lower inventory levels and adopting flexible production processes, organizations can adjust their operations quickly to meet changing customer requirements (Nahmias 2015). JIT enables organizations to respond rapidly to fluctuations in demand, minimize stock outs, and avoid overproduction, thereby improving customer satisfaction and loyalty.

Furthermore, JIT facilitates closer collaboration and communication between supply chain partners, enabling faster response time and greater agility in addressing customer needs (Fawcett & Magnan 2002). By sharing real-time information and aligning production schedules, organizations can coordinate their activities more effectively, reduce production time, and enhance supply chain responsiveness. This collaborative approach to supply chain management enhances overall flexibility and enables organizations to meet customer demand more efficiently.

d) Increased Efficiency in Production Processes

JIT inventory management contributes to increased efficiency in production processes by minimizing waste, reducing production time, and optimizing resource utilization. By adopting JIT practices such as small lot sizes, pull-based production, and Kanban systems, organizations can streamline production flows, eliminate bottlenecks, and improve overall process efficiency (Schonberger 1982). JIT encourages organizations to identify and eliminate non-value-added activities, resulting in leaner, more efficient production processes.

Moreover, JIT facilitates continuous improvement in production processes through its emphasis on waste reduction and problem-solving (Imai 1986). By empowering employees to identify and address inefficiencies, organizations can achieve ongoing improvements in productivity, quality, and efficiency. This focus on continuous improvement fosters a culture of innovation and excellence, driving sustainable gains in production efficiency and competitiveness.

In summary, JIT inventory management offers a wide range of benefits for supply chains, including cost reduction, improved quality and productivity, enhanced flexibility and responsiveness to customer demand, and increased efficiency in production processes. By

adopting JIT principles and practices, organizations can optimize their operations, improve supply chain performance, and gain a competitive advantage in today's dynamic marketplace.

2.2.8 Challenges and Risks of JIT Inventory Management

a) Supplier Reliability and Dependence

One of the primary challenges of JIT inventory management is the reliance on suppliers for timely delivery of materials and components. JIT systems operate on the principle of receiving materials "just in time" for production, which requires suppliers to deliver goods promptly and consistently (Cheng 2020). However, supplier reliability can be a significant concern, as disruptions in the supply chain, such as delays, quality issues, or capacity constraints, can lead to production delays and inventory shortages.

Cheng (2020) discusses the challenge of supplier reliability in JIT inventory management in their study, "Supply Chain Coordination with Manufacturer's Just-in-Time and Supplier's Production Disruption." Through a quantitative analysis of supply chain coordination models, the author highlights the importance of building strong relationships with suppliers and implementing strategies to mitigate the risks associated with supplier disruptions. This research emphasizes the need for organizations to proactively address supplier reliability issues to ensure the smooth functioning of JIT systems.

b) Production Disruptions and Downtime

Another challenge of JIT inventory management is the risk of production disruptions and downtime due to equipment failures, labor shortages, or other unforeseen events. JIT systems operate with minimal buffer inventory, leaving little room for error in production processes (Tayur et al. 2009). As a result, any disruptions or breakdowns in production can have significant consequences, leading to delays, increased costs, and customer dissatisfaction.

Tayur et al. (2009) explore the impact of production disruptions on JIT inventory management in their study, "Managing Disruptions in Supply Chains." Through a comprehensive analysis of supply chain disruptions, the authors highlight the importance of building resilience and redundancy into production processes to minimize the impact of disruptions. This research underscores the need for organizations to invest in contingency planning and risk management strategies to mitigate the risks of production downtime in JIT systems.

c) Inventory Shortages and Stock outs

JIT inventory management poses the risk of inventory shortages and stock outs if demand exceeds supply or if there are delays in production or delivery. With minimal buffer inventory, organizations may struggle to meet sudden increases in demand or unexpected fluctuations in customer orders (Towers & Young 2016). Inventory shortages and stock outs can result in lost sales, decreased customer satisfaction, and damage to the organization's reputation.

Towers & Young (2016) examine the challenges of inventory shortages in JIT systems in their study, "Just-in-Time (JIT) Supply Chain Risks: An Australian Perspective." Through a qualitative analysis of supply chain risks in Australian manufacturing firms, the authors identify inventory shortages as a significant concern for organizations implementing JIT practices. This research highlights the need for organizations to develop strategies to address inventory shortages and mitigate the risks of stock outs in JIT systems.

d) Need for Robust Demand Forecasting and Production Planning

Effective demand forecasting and production planning are essential for the success of JIT inventory management. JIT systems rely on accurate demand forecasts to determine production schedules and inventory levels (Sarkis & Sundarraj 2020). However, forecasting demand can be challenging, especially in industries with volatile demand patterns or short product life cycles.

Sarkis & Sundarraj (2020) discuss the importance of demand forecasting in JIT inventory management in their study, "Just-in-Time Inventory Management: A Review of Literature and Directions for Future Research." Through a comprehensive review of literature, the authors highlight the critical role of demand forecasting in JIT systems and identify opportunities for future research in this area. This research underscores the need for organizations to invest in robust demand forecasting techniques and develop agile production planning processes to adapt to changing market conditions effectively.

2.2.9 Impact of JIT Inventory Management on Key Supply Chain Performance Indicators

a) Inventory Turnover Ratio

Just-in-Time (JIT) inventory management has a significant impact on the inventory turnover ratio, which measures how efficiently a company manages its inventory by assessing the number of time inventory is sold and replaced over a specific period. JIT systems typically lead to higher inventory turnover ratios due to reduced inventory levels and more frequent inventory replenishment cycles (Sarkis & Sundarraj 2020). By minimizing excess inventory and optimizing inventory flow, organizations can achieve faster inventory turnover, which can result in reduced holding costs, improved cash flow, and increased profitability.

Sarkis & Sundarraj (2020) discuss the impact of JIT inventory management on inventory turnover ratios in their study, "Just-in-Time Inventory Management: A Review of Literature and Directions for Future Research." Through a comprehensive review of literature, the authors highlight the positive relationship between JIT practices and inventory turnover ratios. This research underscores the importance of JIT inventory management in enhancing supply chain efficiency and performance by improving inventory turnover metrics.

b) Order Fulfillment Cycle Time

JIT inventory management also affects order fulfillment cycle time, which measures the time it takes for customer orders to be processed, fulfilled, and delivered. JIT systems enable organizations to respond more quickly to customer orders by reducing production time and streamlining production processes (Towers & Young 2016). By synchronizing production with customer demand and minimizing setup time, organizations can achieve faster order fulfillment cycle time, resulting in improved customer satisfaction, increased sales, and enhanced competitiveness in the marketplace.

Towers & Young (2016) examine the impact of JIT inventory management on order fulfillment cycle time in their study, "Just-in-Time (JIT) Supply Chain Risks: An Australian Perspective." Through a qualitative analysis of supply chain risks in Australian manufacturing firms, the authors identify JIT practices as a key driver of improvements in order fulfillment cycle time. This research highlights the strategic importance of JIT inventory management in enhancing supply chain responsiveness and customer service levels.

c) Supplier Production Time Variability

Supplier production time variability refers to the variability or unpredictability in the time it takes for suppliers to deliver materials or components to organizations. JIT inventory management aims to minimize supplier production time variability by establishing close relationships with suppliers, implementing vendor-managed inventory systems, and optimizing supply chain processes (Cheng 2020). By reducing production time variability, organizations can enhance supply chain reliability, improve production planning, and minimize the risks of inventory shortages or stock outs.

Cheng (2020) discusses the impact of JIT inventory management on supplier production time variability in his study, "Supply Chain Coordination with Manufacturer's Just-in-Time and Supplier's Production Disruption." Through a quantitative analysis of supply chain coordination models, the author highlights the importance of managing supplier production time variability to ensure the smooth functioning of JIT systems. This research emphasizes the need for organizations to collaborate closely with suppliers and implement strategies to mitigate the risks associated with production time variability.

d) Production Time

Production time refers to the time it takes for organizations to manufacture and deliver products to customers. JIT inventory management aims to reduce production production time by eliminating non-value-added activities, minimizing setup time, and improving production efficiency (Vonderembse & White 2003). By adopting JIT practices such as small lot sizes and pull-based production, organizations can achieve faster production production time, enabling them to respond more quickly to customer demand and reduce time-to-market for new products.

Vonderembse & White (2003) explore the impact of JIT inventory management on production production time in their study, "Lean and Agile Manufacturing: A Systematic Review of Research Literature." Through a systematic review of research literature, the authors identify JIT practices as key drivers of improvements in production production time. This research highlights the strategic importance of JIT inventory management in enhancing supply chain agility and competitiveness by reducing production production time and improving responsiveness to customer demand.

2.2.10 Factors Influencing the Effectiveness of JIT Inventory Management Implementation

a) Organizational Culture and Leadership

Organizational culture and leadership play a crucial role in the successful implementation of JIT inventory management practices. A culture of continuous improvement, employee empowerment, and collaboration is essential for fostering the mindset and behaviors necessary to support JIT principles (Shah & Ward 2003). Strong leadership commitment and support are also critical for overcoming resistance to change, aligning organizational goals, and driving process improvements that enable JIT implementation to succeed.

Shah & Ward (2003) conducted a study on the impact of organizational culture and leadership on JIT implementation effectiveness in their research titled "Lean manufacturing: context, practice bundles, and performance". Through a survey of manufacturing firms, the authors found that organizations with a supportive culture and strong leadership commitment to lean principles were more successful in implementing JIT practices and achieving performance improvements. This research underscores the importance of organizational culture and leadership in facilitating JIT implementation success.

b) Supplier Relationships and Collaboration

Effective supplier relationships and collaboration are essential for the success of JIT inventory management implementation. JIT systems rely on timely and reliable delivery of materials and components from suppliers to support production schedules and minimize inventory levels (Vonderembse & White 2003). Close collaboration with suppliers, transparent communication, and mutual trust are critical for ensuring that suppliers understand and can meet the requirements of JIT systems.

Vonderembse & White (2003) explored the impact of supplier relationships and collaboration on JIT implementation effectiveness in their study, "Lean and Agile Manufacturing: A Systematic Review of Research Literature." Through a systematic review of research literature, the authors identified supplier relationships as a key factor influencing the success of JIT implementation. This research emphasizes the importance of building strong partnerships with suppliers and fostering collaborative relationships to support JIT inventory management practices.

c) Technological Readiness and Infrastructure

Technological readiness and infrastructure are essential enablers of JIT inventory management implementation. Organizations require advanced technologies and systems for demand forecasting, production planning, inventory control, and communication with supply chain partners (Nahmias 2015). Adequate technological infrastructure, including robust ERP systems, inventory management software, and communication networks, is necessary to support the real-time information sharing and decision-making processes required for JIT systems to function effectively.

Nahmias (2015) discussed the importance of technological readiness and infrastructure in JIT implementation in their book, "Production and Operations Analysis." Through a comprehensive analysis of production and operations management principles, the author highlighted the critical role of technology in enabling JIT practices and improving supply chain performance. This research underscores the importance of investing in technological capabilities and infrastructure to support JIT inventory management implementation.

d) Market Dynamics and Regulatory Environment

Market dynamics and the regulatory environment also influence the effectiveness of JIT inventory management implementation. Factors such as demand variability, market competition, and industry regulations can impact the feasibility and success of JIT practices (Sarkis & Sundarraj 2020). Organizations operating in highly volatile or regulated industries may face additional challenges in implementing JIT systems due to increased uncertainty and compliance requirements.

Sarkis & Sundarraj (2020) explored the impact of market dynamics and the regulatory environment on JIT implementation effectiveness in their study, "Just-in-Time Inventory Management: A Review of Literature and Directions for Future Research." Through a comprehensive review of literature, the authors identified market conditions and regulatory factors as important considerations for JIT implementation success. This research highlights the need for organizations to adapt JIT practices to suit the specific market dynamics and regulatory requirements of their industry.

2.3. Empirical Review

Empirical studies investigating the effects of Just-In-Time (JIT) inventory management on supply chain efficiency highlight several key findings. Firstly, research suggests that JIT implementation leads to a reduction in production time, as evidenced by Suleiman, Amini, & Zhang's (2021) study on manufacturing firms in Jordan. This reduction in production time enhances overall supply chain efficiency by allowing companies to adjust production schedules promptly in response to demand fluctuations. Additionally, JIT principles often result in a streamlined production process, as demonstrated by Gonzalez-Zapatero, Gonzalez-Benito, & Lannelongue's (2021) case study in the electronics industry, which observed improved efficiency and reduced production time following JIT implementation.

Moreover, JIT relies on close collaboration with reliable suppliers to ensure a smooth flow of materials, emphasizing the importance of supplier reliability in JIT implementation, as noted by Albadran, Benitez-Amado, & Lapiedra-Alcolea (2020) in their study on production flexibility in the Spanish automotive industry. Furthermore, JIT's emphasis on minimizing inventory levels leads to more efficient utilization of warehouse space, as indicated by Buer, Wimmer, & Bauernhansl's (2020) literature review analyzing the impact of JIT on supply chain performance.

Empirical evidence consistently demonstrates the overall positive impact of JIT on supply chain efficiency, with studies such as Negrão, Filho, & Marodin's (2017) case study in the automotive industry highlighting significant cost savings and improved operational efficiency. Additionally, Lee, Kim, & Choi's (2012) investigation in the automotive sector revealed that JIT implementation contributed to cost reduction and enhanced operational efficiency.

JIT implementation also fosters a collaborative buyer-supplier relationship, leading to improved efficiency and supply chain performance, as suggested by Wu, Blackhurst, & Chidambaram's (2016) study on electronics manufacturing companies. However, despite the benefits, JIT poses potential risks to supply chain efficiency, particularly regarding vulnerabilities to disruptions, as discussed by Kim, Park, & Park (2020) in their examination of JIT implementation challenges in the context of supply chain disruptions. These risks underscore the importance of implementing robust risk management strategies to mitigate potential disruptions and ensure the effectiveness of JIT practices in enhancing supply chain efficiency.

2.4. Conceptual Framework

The framework for studying how Just-In-Time (JIT) inventory management impacts supply chain efficiency covers several important areas. Firstly, JIT's effect on production time in the supply chain is key. By reducing inventory levels, fine-tuning production schedules, and streamlining processes, JIT aims to shorten production time, making it quicker to respond to customer needs. This aspect focuses on how JIT practices affect the time it takes to move products from raw materials to finished goods, thus assessing its overall impact on supply chain efficiency.

Secondly, the role of JIT in cutting costs and improving efficiency across supply chain operations is essential. Implementing JIT involves cutting waste, lowering inventory costs, and encouraging smarter resource use. These efforts boost productivity, refine operations, and bolster profitability, ultimately enhancing overall efficiency within the supply chain. Understanding how JIT practices influence costs and efficiency metrics provides valuable insights into its effectiveness as a supply chain management approach.

Lastly, exploring the interplay between buyers and suppliers under JIT inventory management is crucial. Strong collaboration between buyers and suppliers is vital for JIT's success, ensuring timely delivery of materials, smoother scheduling, and fewer production delays. Supplier reliability, quality, and innovation are pivotal in maintaining supply chain efficiency and competitiveness with JIT. Assessing these dynamics illuminates the significance of effective partnerships in reaching supply chain efficiency goals under JIT inventory management.

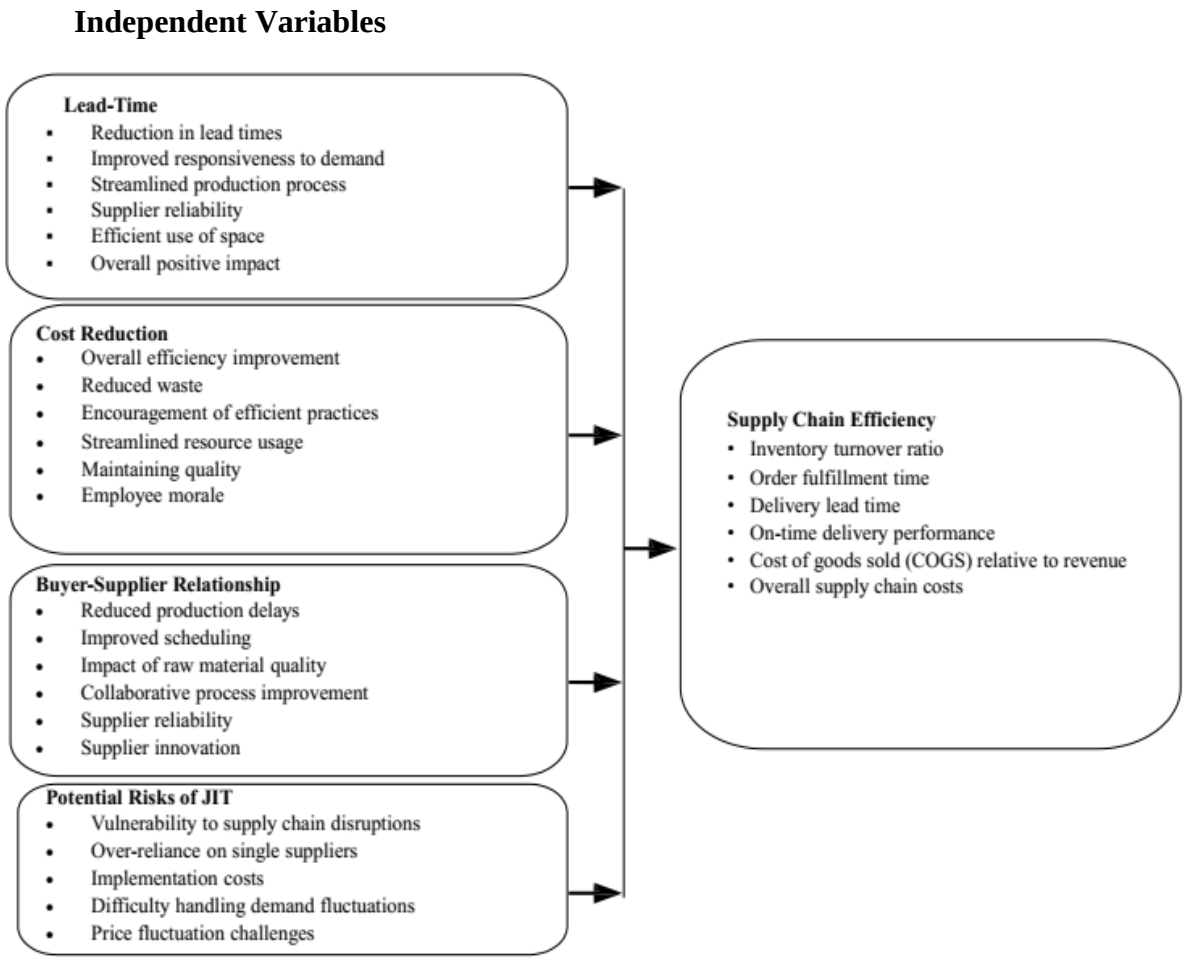


Figure 2-2 Conceptual Framework

Adapted from (Mugwe, et al., 2018) with minor modification

2.5. Research Gap

As mentioned on the empirical review part, it shows different related research conducted in Just-In-Time Inventory Management and Supply chain efficiency particular issues of the subject matter such as Production time, Cost Reduction, Relationship between buyer-supplier and potential risks in JIT in different countries and different kind of Supply chain efficiency in different countries context.

Despite existing research on JIT's impact on supply chains, a comprehensive understanding of its effectiveness in emerging economies like Ethiopia remains elusive. Exploring how JIT can be tailored to address the specific challenges and opportunities within the Ethiopian paint manufacturing industry is imperative. This research seeks to bridge this gap by examining the influence of JIT inventory management on the supply chain efficiency of international paint brand manufacturers in Addis Ababa.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This part of the study shows the methodology that is used in the study and theoretical foundations behind the approaches and their definitions to be understood. It contains research type, research sample and methods, instrument development, instrument validity, instrument reliability, data collection tools and data analysis methods.

3.2 Description of the Study Area

The study focused on international paint brand manufacturing companies in Addis Ababa. Addis Ababa serves as the economic and industrial hub of Ethiopia, housing numerous manufacturing firms across various sectors, including paint manufacturing. The city's strategic location, infrastructure, and access to markets make it an important center for industrial activities, including paint production (Central Statistical Agency 2019).

3.3 Research Design

In the research design, the procedure for collecting, analyzing, interpreting, and reporting data in research studies is outlined (Creswell & Clark 2011). The study applied both descriptive and explanatory research designs.

Thus, the research also used a concurrent triangulation design, which is familiar to the mixed method approach. The "triangulation" method was employed to increase the validity of evaluation and research findings (Mathison 1998), helping to overcome intrinsic biases and other problems associated with a single research method (Yeasmin & Rahman 2012). Data relevant to meeting the objectives of the research was collected from the international paint brand manufacturing companies of Addis Ababa.

3.4 Research Approach

The research also employed a mixed-methods approach, combining both quantitative and qualitative data collection methods (Creswell & Creswell 2018).

The quantitative data mainly focused on describing measuring selected variables which included factors such as production time, buyer-seller relationships, cost reduction, supply chain efficiency levels, and the impact of implementing JIT strategies, and analyzing the relationship between dependent and independent variables.

Qualitative data, an inquiry process of understanding, involved collecting data from those immersed in the everyday life of the setting in which the study is framed.

Participants were selected from the Head Office employees of the international paint brand manufacturers to investigate further attitudinal and perceptional issues related to the study topic.

3.5 Sampling Design

3.5.1 Target Population

The target population that was studied in the effect of Just-in-Time (JIT) inventory management on the supply chain efficiency casing international paint brand manufacturing companies in Addis Ababa included all level managers, procurement and supplies employees, human resource employees and marketing employees.

No	Paint Manufacturing Factories	N(Population) of Companies
1	Jotun Ethiopia Paint Manufacturing PLC	**31**
2	Silkcoat Ethiopa	**26**
3	Kadisco-Asian Paints	**62**
4	Calla Paints	**29**
5	Inter-Emirates Paint	**19**
	Total	**167**

Table 3-1 Target Population

3.5.2 Sampling Technique

For qualitative data collection, a purposive sampling technique was employed. This method involves selecting participants based on specific characteristics that are relevant to the study. In this case, international paint brand manufacturing managers and employees with experience in JIT inventory management were purposefully selected.

In quantitative data collection, a combination of stratified and random sampling techniques was employed. The International paint brand manufacturing companies were stratified and then samples were randomly selected from each stratum to ensure representation.

The details of sampling are given in the schema below.

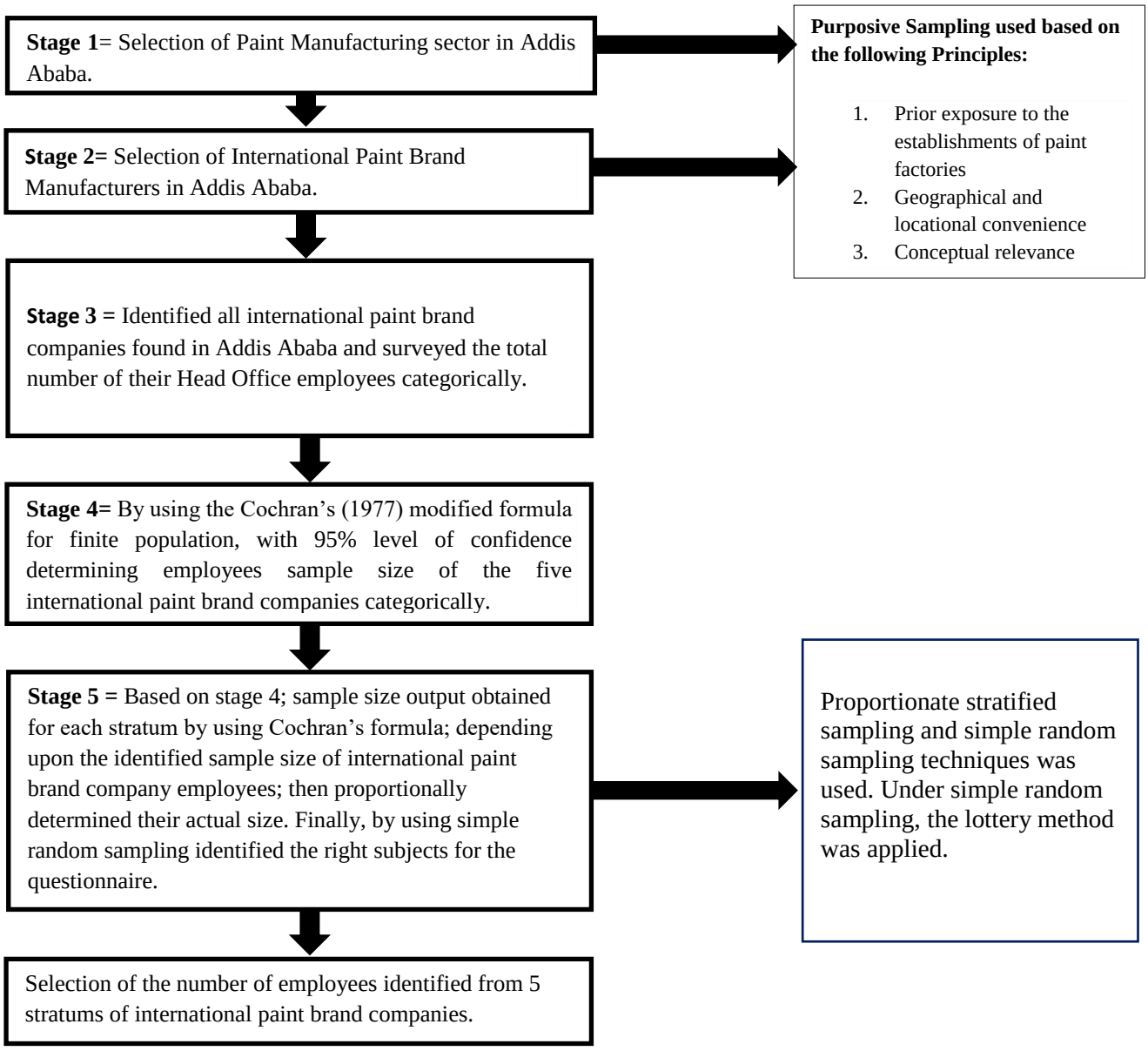


Figure 3-1 Sample Schema Designed for JIT Inventory Management Survey

3.5.3 Sample Size

The population of the study was comprised from Head Office employees of international paint brand manufacturing companies which are, Jotun Ethiopia Paint Manufacturing PLC, Silkcoat Ethiopa, Kadisco-Asian Paints, Calla Paints, and Inter-Emirates Paint. The total population of the paint manufacturing companies is **167**.

The following formula was selected for sample size determination. The sample size is calculated using Cochran's (1977) adjusted formula for a finite population, ensuring a 95% confidence level.

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

Where n_0 is calculated as,

$$n_0 = \frac{Z^2 pq}{e^2}$$

- e is the desired level of precision (i.e. the margin of error),
- p is the (estimated) proportion of the population which has the attribute in question,
- q is 1 – p.

$$\mathbf{n} = \frac{385}{1+\frac{385-1}{167}} \qquad \mathbf{n= 116}$$

The level of confidence is 95% with a precision or standard error of 0.5 percent.

No	Paint manufacturing Factories	N(Population) of Companies	Percentages	n/N*N of Companies
1	Jotun Ethiopia Paint Manufacturing PLC	**31**	**18.56%**	**22**
2	Silkcoat Ethiopa	**26**	**15.57%**	**18**
3	Kadisco-Asian Paints	**62**	**37.12%**	**43**
4	Calla Paints	**29**	**17.37%**	**20**
5	Inter-Emirates Paint	**19**	**11.38%**	**13**
	Total	**167**	**100**	**116**

Where: N= Population, n- sample size,

Table 3-2 Sample Size proprtion of target groups

3.6 Sources of data

Data was collected from both primary and secondary sources. Primary data was collected through structured questionnaires administered to employees of international paint brand manufacturing companies in Addis Ababa. Additionally, secondary data was gathered from existing literature, background information on the international paint brand manufacturing companies in Addis Ababa.

JUB Ethiopia couldn't be included in the study's sample size as it has not begun production. Would not offer relevant data or insights since the focus is on how Just in Time inventory management influences supply chain efficiency among active manufacturers, including JUB Ethiopia, which is not yet operating. For the research to evaluate the practical effects of JIT, the study must look at businesses that already hold production processes in existence.

3.7 Data Collection Instrument

To collect data that is relevant to the study, different data collecting tools were used. Adopted questionnaire with modification, containing items of measured on the 5-point Likert type and the qualitative technique will be used by interview.

3.8 Data Analysis Methods

Quantitative data collected through structured questionnaires was subjected to statistical analysis to quantify relationships, patterns, and trends relevant to the research objectives. Descriptive statistics, such as measures of central tendency (e.g., mean,) and dispersion (e.g., standard deviation, range), were computed to summarize and describe key variables related to JIT inventory management. Moreover, inferential statistical techniques, i.e., correlation & regression analysis, were employed to examine associations between variables and identify predictors of efficiency and market performance. This analysis was supported by the Statistical Package for Social Science (i.e., using SPSS version 23).

Qualitative data obtained was transcribed, coded, and organized into categories or themes representing key concepts and phenomena related to JIT inventory management, and efficiency in the international paint brand manufacturing companies. Through iterative coding and interpretation, the researcher explored relationships between themes, extracted meaningful narratives, and contextualized findings within theoretical frameworks and empirical evidence.

3.9 Validity and Reliability

The validity and reliability of instruments are crucial aspects of research methodology to ensure the accuracy and consistency of data collected. In the context of studying the effect of JIT inventory management on supply chain efficiency of international paint brand manufacturers, it is essential to have valid and reliable instruments to measure these variables accurately.

Validity refers to the extent to which an instrument measures what it is intended to measure (Eriksson & Wildershelm 1999). In this study, validity would involve ensuring that the instruments used to assess JIT inventory management in international paint brand manufacturing companies capture these constructs accurately. The research is original, and data is collected from a primary and secondary source and for all secondary source-related literature which is cited to avoid plagiarism.

To test the reliability of the data collected the researcher used Cronbach's alpha by doing so the internal consistency of the instrument was able to be observed. Reliability was checked on 29 respondent's (25% of the total sample size) answers before the questioner was disseminated in full scale.

Sub scales	N of Items	Cronbach's Alpha
Production time on the Efficiency	7	0.821
Cost Reduction on Efficiency	7	0.878
Buyer-Supplier Relationship and Efficiency	7	0.837
Risks Associated with JIT Implementation	7	0.699
Supply Chain Efficiency	6	0.909
Entire Scale	**34**	**0.817**

Source: Data Survey, 2024

Table 3-3 Reliability Test Result

As indicated on the above table Cronbach's coefficient alpha was calculated for the entire questionnaire. The values of Cronbach's Alpha showed that the results are more than acceptable, which fall in the range between 0.7 and 0.95. The resulting range is considered high as the result ensures the reliability of the questionnaire. Moreover, Cronbach's Alpha for the entire questionnaire shows the value of 0.817, which falls in an excellent range, and it indicates reliability of the entire questionnaire. Therefore, based on the test, the results for the items are reliable and acceptable.

3.10 Research Ethics

The study was carried out based on formal procedures. As the first step, a letter of request to conduct the research was submitted to the international paint brand manufacturing companies in Addis Ababa. The researcher was responsible for facilitating, managing, and controlling the activities of the enumerators. The researcher was also responsible for tolerating and showing empathy, patience, and a sense of humor to the participants to achieve the desired outcome.

CHAPTER FOUR

DATA ANALYSIS, INTERPRETATION, RESULT AND DISCUSSION

4.1 Introduction

This chapter dealt with data analysis, interpretation and discussion of the findings as set out in the research objectives and methodology, based on the data collected through questionnaire and interview. The questionnaire was designed in line with the objectives of the study; to enhance quality of data obtained; Likert type questions were included whereby respondents indicated the level of agreement to which the variables were practiced in a five-point Likert scale in questionnaire. Coded responses were entered into Statistical Package for the Social Sciences (SPSS) version 23, for data analysis. The total questionnaire distributed was 116 for the target population were head office employees of 5 international paint brand manufacturing companies in Addis Ababa out of that, all 116 were properly filled and returned representing 99.9% rate of return.

4.2 Demographic Profile of the Respondents

Gender	**f(n)**	**%**
Male	67	57.8
Female	49	42.2
Total	**116**	**100**
Age	**f(n)**	**%**
21-29 years	60	51.7
30-39 years	38	32.8
40-49 years	16	13.8
50 years & Above	2	1.7
Total	**116**	**100**
Education	**f(n)**	**%**
Certificate & Diploma	5	4.3
1st Degree (Bachelors)	73	62.9
2nd Degree (Masters)	38	32.8
Total	**116**	**100**
Working Experience	**f(n)**	**%**
2 years and less	19	16.4
2-5	38	32.8
6-10	27	23.3
Above 10	32	27.6
Total	**116**	**100**

Table 4-1 Demograpic Profile of the Respondents

4.3 Descriptive Analysis

For the analysis of the quantitative data descriptive statistics supported by SPSS software version 23 was applied, and for qualitative data interview analysis was done. Using SPSS mean and standard deviation were calculated to show the respondent agreement level in JIT inventory management on supply chain efficiency, and frequency, percentage and tables were considered to present the responses. The questionnaire was developed in five scales ranging from five to one; where 5 Strongly Agree, 4 Agree, 3 Neutral, 2 Disagree, and 1 Strongly Disagree. According to Sack (2020), mean range between 1 to 1.8, it means strongly disagree. From 1.81 to 2.60, it means disagree. From 2.61 to 3.40, it means neutral; from 3.41 to 4.20, it means agree; from 4.21 to 5. It means strongly agree.

4.3.1 Response on Effect of Production Time on Supply Chain Efficiency

No.	Statements	f(n)				Mean	Std. Dev.
		D	N	A	SA		
1	Implementing just-in-time (JIT) inventory management has significantly reduced production time for paint production in our factory.	-	6	57	53	4.405	0.5894
2	Since adopting JIT, our factory experiences fewer delays in paint production due to lack of raw materials.	2	12	68	34	4.155	0.6673
3	JIT has enabled our factory to respond more quickly to changes in customer demand for paint colors and types.	1	9	66	40	4.250	0.6307
4	Compared to traditional inventory methods, JIT has helped to simplify the paint production process in our factory.	1	7	65	43	4.293	0.6188
5	We are confident in our suppliers' ability to deliver raw materials for paint production exactly when needed under JIT.	-	35	53	28	3.940	0.7377
6	JIT has led to a more efficient use of storage space in our paint manufacturing facility.	4	8	76	28	4.103	0.6644
7	JIT inventory management has been a positive influence on reducing production time for paint production in our factory.	-	9	75	32	4.198	0.5629
				Grand Mean		**4.192**	

Table 4-2 Response on Production Time on Efficiency

Based on the results shown on table 4.2, regarding investigation of the influence of JIT inventory management on production time in the International Paint Brand Manufacturing, the average mean of production time on supply chain efficiency was 4.192. This showed the production time on efficiency is in the agreement range of most of the international paint brand companies.

The data provided revealed a consistently positive reception towards the implementation of just-in-time (JIT) inventory management in the paint factories. Across all measured aspects, including production time reduction, response to customer demand, and process simplification, respondents generally agree on the effectiveness of JIT, as evidenced by mean scores ranging from 4.103 to 4.405. Moreover, the standard deviations indicated the variability of responses is generally low, suggesting a high level of consensus among respondents. Specifically, JIT implementation has led to significant reductions in production time and fewer delays due to raw material shortages. It has also facilitated quick responses to changes in customer demand and simplified the overall production process. Confidence in suppliers' ability to deliver materials on time under JIT, while slightly less pronounced, was still reasonably high. Overall, the data suggested a widespread perception that JIT inventory management has positively impacted various aspects of paint production in the factory, garnering strong agreement and support from respondents.

On this specific issue, the researcher made triangulation and found out the responses was consistent. The response of questionnaire respondents was cross checked with the interviewee result and the same result was found accordingly. In the interview part, Supply Chain Managers said they utilize a combination of metrics and performance indicators to measure and monitor production time performance within their operations. Key measures such as the time taken from order placement to delivery, production time variability, and on-time delivery rates. And that they regularly track these metrics using ERP systems and conduct regular performance reviews with their supply chain team and key suppliers to identify areas for improvement and ensure they are meeting the production time targets consistently.

A study by Shah and Ward (2003) on the automotive industry found that JIT practices led to reduced production time, improved quality, and enhanced productivity, echoing the efficiency gains observed in the paint manufacturing context. Similarly, research by Ferdows and De Meyer (1990) on JIT in electronics manufacturing highlighted its role in reducing inventory levels, storage space and improving production flexibility, outcomes that parallel the benefits reported in the paint industry.

The discussion above integrates findings from the study on JIT in paint manufacturing with insights from related research across different industries. It underscores the consistent benefits of JIT, including improved production time and efficiency.

4.3.2 Response on Effect of Cost Reduction on Supply Chain Efficiency

No.	Statements	f(n)				Mean	Std. Dev.
		D	N	A	SA		
1	Reducing production costs in our paint factory has led to improvements in overall production efficiency.	2	29	62	23	3.914	0.7171
2	Since implementing cost-cutting measures, our factory has been able to produce paint with less waste	1	26	65	24	3.966	0.6844
3	We have found that focusing on cost reduction has encouraged our employees to find more efficient ways to produce paint.	4	36	60	16	3.759	0.7297
4	Cost reduction efforts have led to a more streamlined use of resources in our paint manufacturing processes.	-	39	63	14	3.784	0.6434
5	While reducing costs, we have been able to maintain the same level of quality in our paint products.	2	30	62	22	3.897	0.7148
6	There have been no negative impacts on employee morale due to cost reduction initiatives in our paint factory.	3	47	61	5	3.586	0.6195
7	Reducing production costs has had a positive impact on the efficiency of our paint manufacturing operations.	3	43	59	11	3.672	0.6824
				Grand Mean		**3.796**	

Table 4-3 Response on Cost Reduction on Efficency

Based on the results shown on table 4.3, regarding determining the outcome of cost reduction on efficiency within International Paint Brand Manufacturers, the average mean of cost reduction on supply chain efficiency was 3.796, thus most of the responses fall in the agreement range. This shows the cost reduction on efficiency is in the agreement range of most of the international paint brand companies.

The survey data indicated that cost reduction measures in the paint factories were perceived positively in terms of production efficiency and waste reduction. The mean scores range from 3.586 to 3.966, reflecting general agreement on the benefits of cost-cutting initiatives. The highest mean (3.966) suggested that these measures have successfully reduced waste. Maintaining quality while reducing costs was also viewed favorably (mean 3.897), and cost reduction was seen to encourage efficiency among employees (mean 3.759). However, the impact on employee morale has a slightly lower mean (3.586), indicating some concerns. Standard deviations are relatively low (ranging from 0.6195 to 0.7297), suggesting consistency in responses. Overall, the data highlights that cost reduction efforts have positively impacted production efficiency, resource use, and waste reduction, with minimal negative effects on quality and employee morale.

On this specific issue, the researcher made triangulation and found out the responses was consistent. The response of questionnaire respondents was cross checked with the interviewee result and the same result was found accordingly. In the interview part, Supply Chain Managers said they implemented several cost reduction strategies to enhance efficiency while maintaining quality. One approach was optimizing transportation and logistics routes to minimize freight costs while ensuring timely delivery. Additionally, they've negotiated favorable terms with suppliers, consolidated orders to achieve cost advantages, and implemented lean inventory management practices to reduce carrying costs. They also mentioned continuous process improvement initiatives and cross-functional collaboration have also played a key role in identifying and implementing cost-saving opportunities without compromising product quality or customer satisfaction.

Research by Choi and Eboch (1998) in the automotive industry found that cost reduction initiatives led to improved operational efficiency and reduced waste. They highlighted that effective cost management strategies can enhance overall production performance. In another study by Flynn et al. (2010) on lean management practices emphasized the importance of balancing cost reduction with quality management. They found that while cost-cutting initiatives can improve efficiency, they must be carefully managed to avoid compromising product quality or morale.

In conclusion, the outcomes observed in the study of cost reduction measures within International Paint Brand Manufacturers are consistent with findings from diverse studies across different industries. These studies reinforce the positive impact of well-managed cost reduction efforts on production efficiency and waste reduction. They also underscore the importance of balancing cost cutting with quality management and employee satisfaction to achieve sustainable operational improvements.

4.3.3 Response on Effect of Buyer-Supplier Relationship on Supply Chain Efficiency

No.	Statements	f(n)					Mean	Std. Dev.
		SD	D	N	A	SA		
1	Our paint factory experiences fewer delays in production due to problems with supplier deliveries.	-	9	42	56	-	3.560	0.7494
2	Open and frequent communication with our suppliers helps us optimize paint production scheduling.	-	4	14	60	38	4.138	0.7564
3	The quality of raw materials we receive from our suppliers allows for a more efficient paint production process.	1	2	16	68	29	4.052	0.7324
4	Collaboration with our suppliers has helped us identify and implement process improvements in paint manufacturing.	-	3	29	56	28	3.940	0.7722
5	Our suppliers are reliable in meeting our specific requirements for raw materials needed in paint production.	-	2	18	70	26	4.034	0.6715
6	We are confident in our suppliers' ability to innovate and provide new solutions to improve paint production efficiency.	-	2	22	72	20	3.948	0.6573
7	A strong relationship with our suppliers positively impacts the efficiency of our paint manufacturing operations.	-	2	19	53	42	4.164	0.7569
				Grand Mean			**3.976**	

Table 4-4 Response on Buyer-Supplier Relationship on Efficency

Based on the results shown on table 4.4, regarding the relationship between buyer-supplier on the supply chain efficiency of International Paint Brand Manufacturers in Addis Ababa, the average mean of buyer-supplier relationship on supply chain efficiency was 3.976. This showed the buyer-supplier relationship on efficiency is in the agreement range of most of the international paint brand companies.

The survey data indicated generally positive perceptions of supplier relationships and their impact on the paint factory's operations. Most respondents agreed that open and frequent communication with suppliers optimizes production scheduling (mean 4.138), and that strong supplier relationships enhanced manufacturing efficiency (mean 4.164). The quality of raw materials was seen as high (mean 4.052), contributing to efficient production, and suppliers were considered reliable in meeting specific requirements (mean 4.034). There was confidence in suppliers' ability to innovate (mean 3.948) and collaboration with them was credited with process improvements (mean 3.940). While production delays due to supplier issues were less common (mean 3.560), the variability in responses (standard deviations

ranging from 0.6573 to 0.7722) indicated some areas for improvement. Overall, the data reflected a strong, positive relationship with suppliers, contributing to the factory's operational efficiency and respondents believed that supplier reliability, communication, and innovation positively impact paint production, though there was some variability indicating room for improvement in certain areas.

On this specific issue, the researcher made triangulation and found out the responses was consistent. The response of questionnaire respondents was cross checked with the interviewee result and the same result was found accordingly. In the interview part, Supply Chain Managers said cultivating and managing relationships with key suppliers was vital for improving supply chain efficiency. They prioritized open communication, and collaboration to build trust and alignment with suppliers. Additionally, they work together to establish clear expectations, negotiate mutually beneficial agreements, and share relevant data to drive continuous improvement. When challenges arise, they address it promptly through transparent communication, active problem-solving, and a focus on finding win-win solutions that minimize disruptions to the supply chain.

A study by Monczka et al. (2019) emphasized that strong buyer-supplier relationships, characterized by open communication and collaboration, enhance supply chain performance. They found that such relationships lead to improved delivery reliability, quality consistency, and innovation capabilities. Also research by Ellram and Tate (2004) explored the impact of supplier relationships on manufacturing performance. They found that effective communication and collaboration with suppliers lead to better production planning, reduced lead times, and improved overall operational efficiency. In another study by Fawcett et al. (2011) examined supplier relationship management practices across industries. They highlighted that reliable suppliers who innovate and collaborate effectively contribute significantly to operational performance improvements, including enhanced efficiency and product quality.

In conclusion, the outcomes observed in the study of buyer-supplier relationships within International Paint Brand Manufacturers are consistent with findings from diverse studies across different industries. These studies emphasize the importance of fostering strong relationships with suppliers through open communication, collaboration, and mutual trust to enhance supply chain efficiency.

4.3.4 Response on Risks Associated with JIT Implementation on Supply Chain Efficiency

No.	Statements	f(n)					Mean	Std. Dev.
		SD	D	N	A	SA		
1	A minor disruption in our supply chain could significantly impact our paint production under JIT inventory management.	3	15	52	37	9	3.293	0.8848
2	Relying on a single supplier for raw materials under JIT increases the risk of production delays in our paint factory.	1	8	50	48	9	3.483	0.7744
3	Implementing JIT requires a significant upfront investment in forecasting and communication systems for our paint manufacturing.	-	4	29	55	28	3.922	0.7929
4	Sudden spikes in demand for certain paint types could overwhelm our production capacity under JIT.	1	12	52	44	7	3.379	0.7875
5	JIT inventory management makes it more difficult for our paint factory to adapt to changes in raw material prices.	5	30	45	27	9	3.043	0.9903
6	There is a risk of increased quality control issues in finished paint products due to pressure to maintain low inventory levels with JIT.	12	30	45	25	4	2.819	1.0009
7	The potential benefits of JIT inventory management for our paint manufacturing are outweighed by the associated risks.	17	19	36	33	11	3.017	1.1941
				Grand Mean			**3.279**	

Table 4-5 Responses on Risks Associated with JIT Implementation

Based on the results shown on table 4.5, regarding risks associated with JIT Implementation in the International Paint Brand Manufacturers in Addis Ababa, the average mean of risks associated with JIT Implementation on supply chain efficiency was 3.279. The statement indicates that, on average, respondents perceive the risks associated with JIT implementation on supply chain efficiency to be relatively neutral. With an average mean of 3.279, falling within the neutral range, it suggests that most responses neither strongly agreed nor strongly disagreed with the notion that JIT implementation poses risks to supply chain efficiency. This implied a balanced viewpoint among respondents, with neither overwhelmingly positive nor negative sentiments towards the potential challenges or drawbacks of adopting JIT in the supply chain.

The survey data on JIT inventory management in the paint factory indicates mixed perceptions among respondents. The means range from 2.819 to 3.922, reflecting varying levels of agreement. The highest mean (3.922) is for the statement that implementing JIT

requires significant investment in forecasting and communication systems, showing strong agreement. The lowest mean (2.819) concerns the risk of increased quality control issues, indicating less concern in this area. Standard deviations range from 0.7744 to 1.1941, suggested moderate variability in responses. Overall, while there was recognition of the investment needed for JIT, there were concerns about potential risks such as supply chain disruptions, reliance on single suppliers, and adaptability to price changes.

On this specific issue, the researcher made triangulation. The response of questionnaire respondents was cross checked with the interviewee result and additional risks were raised. In the interview part, Supply Chain Managers said implementing JIT inventory management promises efficiency gains but faces significant risks due to infrastructure challenges, unreliable transportation networks, and utilities. Also, regulatory and customs complexities further threaten JIT operations by causing delays and financial risks from inaccurate demand forecasts also pose challenges furthermore foreign currency issues are major.

Research by Cheng et al. (2008) explored the challenges and requirements of JIT implementation across industries. They found that successful JIT adoption often hinges on robust forecasting capabilities and efficient communication systems to manage inventory and production schedules effectively. Another research by Christopher (2016) on supply chain risk management emphasized that JIT practices can increase vulnerability to disruptions from factors such as supplier reliability and external shocks. Also, research by Ivanov and Sokolov (2019) highlighted that infrastructure limitations and regulatory hurdles in emerging markets can pose substantial barriers to JIT effectiveness. They emphasized the importance of adapting JIT strategies to local conditions to enhance resilience and mitigate operational risks.

In conclusion, the outcomes observed in the study regarding risks associated with JIT implementation in International Paint Brand Manufacturers are consistent with findings from diverse studies across different industries. These studies underscore the complexity and potential challenges of JIT adoption, including the need for substantial investments in systems, risks related to supply chain disruptions and supplier dependencies, and navigating infrastructure and regulatory obstacles.

4.3.5 Response on Supply Chain Efficiency

No.	Statements	f(n)				Mean	Std. Dev.
		D	N	A	SA		
1	Understanding our inventory turnover ratio helps us make informed decisions about inventory management in our paint factory.	2	24	66	24	3.966	0.6970
2	A high inventory turnover ratio is a good indicator of efficient inventory management practices in our paint production.	5	30	63	18	3.810	0.7450
3	Reducing our order fulfillment cycle time for paint orders is a key priority for our business.	7	23	64	22	3.871	0.7861
4	I am confident that our paint factory can consistently meet our advertised order fulfillment cycle time.	6	16	47	47	4.164	0.8541
5	I am confident in our ability to deliver finished good for customers exactly when needed under JIT.		13	57	46	4.284	0.6568
6	JIT Inventory Management has a positive effect on Supply Chain Efficiency.		20	50	46	4.224	0.7234
				Grand Mean		**4.053**	

Table 4-6 Response on Supply Chain Efficency

Based on the results shown on table 4.6, regarding supply chain efficiency of International Paint Brand Manufacturers in Addis Ababa, the average mean of supply chain efficiency was 4.053, thus most of the responses fall in the agreement. The provided data presented responses to statements regarding inventory management practices in a paint factory, along with their mean ratings and standard deviations. Generally, respondents tended to agree with the notion that a high inventory turnover ratio signifies efficient management, as indicated by the mean rating of 3.81, though there was some variability in opinion. Similarly, there was agreement with the priority of reducing order fulfillment cycle time (mean rating: 3.871), but with diversity in responses. Confidence in meeting advertised order fulfillment cycle time collected moderate agreement (mean rating: 4.164) but exhibited a wide range of opinions. Additionally, there was general confidence in delivering finished goods under Just-In-Time (JIT) principles (mean rating: 4.284) and agreement on the positive effect of JIT on supply chain efficiency (mean rating: 4.224), although variability in responses was evident across all statements, as reflected in their respective standard deviations.

The results indicate a general acknowledgment of efficiency indicators, such as a high inventory turnover ratio, within the paint factory. There's a collective emphasis on reducing order fulfillment cycle time, reflecting a shared focus on operational efficiency and customer satisfaction. While moderate confidence exists in meeting advertised cycle time, there's

notable variability in opinions, suggesting some uncertainty. Nonetheless, there's widespread support for Just-In-Time principles, with confidence in delivering finished goods and recognition of its positive impact on supply chain efficiency. Overall, the data highlights a diverse range of perspectives within the organizations, emphasizing the need for ongoing evaluation and adaptation of inventory management strategies to align with organizational objectives.

On this specific issue, the researcher made triangulation. The response of questionnaire respondents was cross checked with the interviewee result and the same result was found accordingly. In the interview part, Supply Chain Managers mentioned to assess the effectiveness of our supply chain practices in improving efficiency and meeting business objectives, they monitor key performance indicators (KPIs) such as production time, inventory turnover rates, and order accuracy. They also conduct regular reviews and audits, utilize feedback from stakeholders, and benchmark their performance against industry standards. This data-driven approach helps them identify areas for improvement and ensures alignment with their strategic goals.

The focus on indicators like high inventory turnover ratios as a sign of efficient management is a common theme across many studies. Research often highlights that organizations recognize the importance of optimizing inventory levels to reduce costs and improve operational efficiency (Simchi-Levi et al. 2020). The consensus on reducing order fulfillment cycle time underscores a shared goal of enhancing operational efficiency and meeting customer expectations promptly. Studies by Chopra and Meindl (2021) emphasize that minimizing lead times and improving responsiveness are critical factors in achieving competitive advantage.

The widespread adoption of Just-In-Time principles and the confidence in delivering finished goods align with findings from studies advocating for lean practices in supply chain management. JIT is recognized for its potential to reduce waste, enhance responsiveness, and improve overall supply chain efficiency (Cox and Blackstone 2019).

In summary, the study's findings align with broader research in supply chain management, emphasizing the importance of efficiency indicators, the prioritization of cycle time reduction, the challenges in meeting service level commitments, these similarities underscore the universal principles and challenges faced by organizations in managing their supply chains effectively across various industries.

4.4 Model Analysis

4.4.1 Diagnosis of Regression Assumptions

The study employed multiple regression analysis to test the degree of relationship between the independent and dependent variables. And regression is a parametric approach. 'Parametric' means it makes assumptions about data for the purpose of analysis. Due to its parametric side, regression is restrictive in nature. It fails to deliver good results with data sets which don't fulfill its assumptions. Therefore, for a successful regression analysis, it's essential to validate these assumptions. Hence, the researcher checked (validated) if the data set met the following regression assumptions using the regression plots along with other statistical tests.

1. There should be a linear and additive relationship between dependent (response) variable and independent (predictor) variable(s). A linear relationship suggests that a change in response Y due to one-unit change in X^1 is constant, regardless of the value of X^1. An additive relationship suggests that the effect of X^1 on Y is independent of other variables.
2. There should be no correlation between the residual (error) terms. Absence of this phenomenon is known as autocorrelation.
3. The independent variables should not be highly correlated. Absence of this phenomenon is known as multicollinearity.
4. The error terms must have constant variance. This phenomenon is known as homoscedasticity. The presence of non-constant variance is referred to heteroscedasticity.
5. The error terms must be normally distributed.

1. Autocorrelation

It is an assumption that the value of residuals to be independent from one another (or uncorrelated). To check this assumption, we need to look at the regression output of model summary box. Durbin-Watson statistic uses to test the assumption that our residuals are independent or uncorrelated. This statistic can vary from 0 to 4. For no autocorrelation assumption, Durbin-Watson statistic value needs to be close to 2. A value of two indicates no autocorrelation. A value of towards zero indicates positive autocorrelation. A value towards 4 indicates negative autocorrelation (Saunders et al., 2009).

Model Summary [b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.859[a]	.737	.728	.48139	1.867
a. Predictors: (Constant), Production time, Cost Reduction, Buyer Supplier Relationship, Risk Associated					
b. Dependent Variable: Supply Chain Efficiency					

Table 4-7 Model Summary

Thus, the model summary above showed a strong and significant relationship between Supply Chain Efficiency and the predictors: Production time, Cost Reduction, Buyer Supplier Relationship, and Risk Associated. The high R Square and Adjusted R Square values indicated that the model explains a significant portion of the variance in Supply Chain Efficiency. The Durbin-Watson statistic revealed that autocorrelation is not a concern, and the distribution of residuals being even further supports the reliability of the model.

2. Linearity

The relationship between the dependent variables and independent variables needs to be linear function to apply linear regression analysis Darlington (1968). One method of preventing nonlinearity is to use the theory of previous research to inform the current analysis to assist in choosing the appropriate variables Osborn & Waters (2002). To test the linearity of associations, scatter plot diagram with line of fit can be used to see if the distribution can be represented by linear relationship.

In this research, as indicated in Chapter Two, all the variables were selected from previous research which applied linear relationship between the variables. Furthermore, as shown in Figure 4.6 below, all the relationships between dependent and independent variables (Production time, Cost Reduction, Buyer Supplier Relationship, Risk Associated, and Supply Chain Efficiency) fit reasonably with linear pattern and it holds that linearity assumption is met.

3. Multi-collinearity

If there is a high degree of correlation between independent variables, we have a problem of what is commonly described as the problem of multi-collinearity. This is essentially the assumption that the predictors are not too highly correlated with one another.

When predictor variables are very highly correlated, we have to wonder whether they are not in fact measuring the same thing and would be better combined into one new variable, Muijs

(2010). We can also test this assumption by looking at the coefficients table. As explained by Muijs (2010), Tolerance and Variance Inflation Factors (VIF) do exactly the same thing; tolerance is the amount of variance in the individual variable not explained by the other predictor variables. It varies from 0 to 1, a value close to 1 indicates that the other predictors do not explain the variance in that variable. A value close to 0 implies almost all the variance in the variable is explained by the other variables.

This permits us to more formally check that our independent variables are not too highly correlated. To meet multiple regression assumptions, we need tolerance score of above 0.2 and VIF scores below 10. As we see from the below table, analysis of collinearity statistics showed this assumption has been met, as no relationship of predictors equals or above coefficient value of 0.8 and VIF scores shown below 10, and tolerance scores above 0.2.

4. Normality

This assumption is used to determine whether the residuals are normally distributed. This can be tested by looking at the Histogram and P-P plot for the model. To say the normality assumption of this study is met, the Histogram should be symmetric along the center 0 and the dots at the P-P Plot should be closer to the diagonal line; Normal P-P plot points should lie in reasonably straight diagonal line from bottom left to top right. In this case the Histogram (Figure 4.5) is symmetric, and in the P-P plot (Figure 4.6) the dots are drawn closer to the diagonal line, indicating that assumption of normality is met.

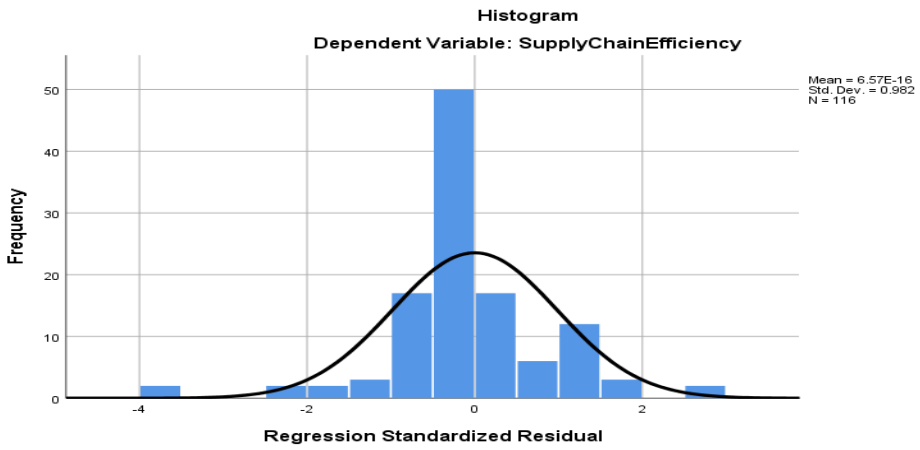


Figure 4-1 Histogram Chart

5. Homoscedasticity

This assumption requires even distribution of residual terms or homogeneity of error terms throughout the data. Homoscedasticity can be checked by visual examination of a plot of the standardized residuals by the regression standardized predicted value (Osborn & Waters,

2002). If the error terms are distributed randomly with no certain pattern, then the problem is not detrimental for analyses. As it is shown below in the figure, standardized residuals are evenly distributed. This depicted that the assumptions of the regression analysis (normality of residuals) are met. It implies that the model does not suffer from hetero-scedasticity (non-constant variance of errors) and that the residuals are likely normally distributed.

Normal P-P Plot of Regression Standardized Residual

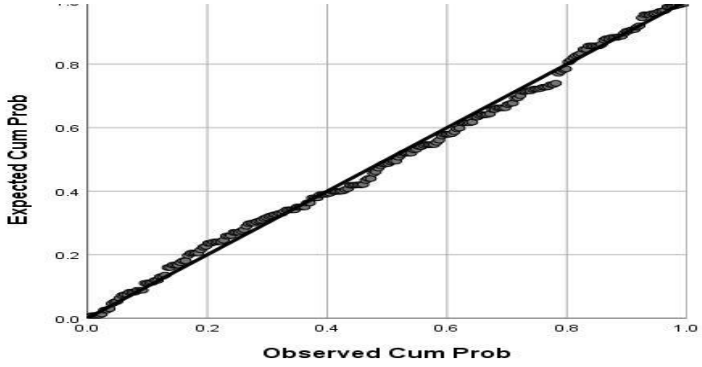


Figure 4-2 Normal P-P Plot of Regression Standardized

4.4.2 Interpretation of the Regression Model Findings

Multiple regression analysis is a statistical technique that can be used to analyze and measure a relationship between two or more variables (Saunders et al., 2009). This technique was implemented to explore the most sophisticated interrelationship among variables, for instance the technique uses to identify which JIT inventory management element is the best predictor of supplies efficiency and the amount of variance explained in dependent variable by all independent variables. Generally, this method enabled the researcher to make stronger causal inferences from observed interrelationships among variables and to predict a dependent variable based on values of a number of independent variables.

ANOVA [a]						
Model		**Sum of Squares**	***df***	**Mean Square**	**F**	**Sig.**
1	Regression	72.234	4	18.058	77.926	.000[b]
	Residual	25.723	111	.232		
	Total	97.957	115			
a. Dependent Variable: Supply Chain Efficiency						
b. Predictors: (Constant), Risk Associated, Production time, Buyer Supplier Relationship, Cost Reduction						

Table 4-8 Analysis of Variance

The ANOVA table above suggested that the regression model is significant; indicating that at least one of the independent variables (Risk Associated, Production time, Buyer Supplier Relationship, or Cost Reduction) is significantly related to Supply Chain Efficiency.

The F-statistic value of 77.926 indicates that the regression model explains a significant amount of the variation in Supply Chain Efficiency. The p-value of 0.000 is less than the typical significance level (0.05), which confirms that the relationship is statistically significant.

The Mean Square value of 18.058 represents the average squared difference between the observed values and the predicted values from the regression model. This value is significant compared to the Mean Square value of the residuals (0.232), indicated that the regression model is a better fit than a simple mean.

Overall, this analysis depicted that there is a strong relationship between the independent variables and Supply Chain Efficiency, and that a regression model can be used to predict Supply Chain Efficiency based on these variables.

Coefficients [a]								
Model		Unstandardized Coefficients		SC	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			**Tolerance**	**VIF**
1	(Constant)	1.423	.264		5.386	.000		
	Production time	.259	.072	.242	3.604	.000	.526	1.903
	Cost Reduction	.208	.055	.286	3.809	.000	.420	2.378
	Buyer Supplier Relationship	-.077	.053	-.090	-1.452	.149	.620	1.613
	Risk Associated	.332	.053	.499	6.311	.000	.378	2.646
a. Dependent Variable: Supply Chain Efficiency								
R^2 = 0.737								
**** Significant at 1% or 0.01 level and **Significant at 5% or 0.05 level***								

Table 4-9 Coefficient of Variance

Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (Supplies Chain Efficiency) that is explained by all the four independent variables. Thus, R value, also known as the multiple correlation coefficient, is 0.859. This indicated that the model explains about 73.7% of the variation in the dependent variable, Supply Chain Efficiency. Therefore, it means that other factors not studied in this multiple regression contributed 26.3% the effect of JIT inventory management. A high R

value indicated a strong relationship between the independent variables and the dependent variable.

The R Square value, also known as the coefficient of determination, is 0.737. This indicated that about 73.7% of the variation in the dependent variable is explained by the independent variables (Risk Associated, Production time, Buyer Supplier Relationship, Cost Reduction, and Constant). An adjusted R Square value that considers the number of independent variables and the sample size. A higher Adjusted R Square value indicates a better fit of the model.

a) Production Time

Production time had a positive and significant effect on the supply chain efficiency. The p-value and regression coefficient (Beta = 0.242, $p < 0.001$) revealed that the effect of production time on supply chain efficiency is statistically significant. The coefficient (0.259) indicated that for every one-unit increase in production time, supply chain efficiency increases by 0.259 units regardless of other independent variables in the model.

b) Cost Reduction

Cost reduction has also a positive and significant effect on supply chain efficiency. The p-value and regression coefficient (Beta = 0.286, $p < 0.001$) revealed that the effect of cost reduction on supply chain efficiency is statistically significant. The coefficient (0.208) depicted that for every one-unit increase in cost reduction, supply chain efficiency increases by 0.208 units regardless of other independent variables in the model.

c) Buyer Supplier Relationship

This variable is negatively related to supply chain efficiency. The p-value and regression coefficient (Beta = -0.090, $p = 0.149$) revealed that the effect of buyer supplier relationship on supply chain efficiency is statistically insignificant. The p-value is greater than 0.05. The values of regression coefficient indicate that buyer supplier relationship has been expected to decrease by -77 % regardless of other independent variables in the model. Even though it is shown in the correlation a stronger buyer-supplier relationship reduces risk, which is a critical aspect of supply chain efficiency, the beta coefficient being negative doesn't necessarily show an inverse relation in fact it shows gap or a weak link in the buyer-supplier relation in the international paint brand companies.

d) Risk Associated

Risk associated is positively related to supply chain efficiency (Beta = 0.499, $p < 0.001$). This variable has a significant positive impact on supply chain efficiency, revealed that managing risk associated with supply chain operations can lead to improved supply chain efficiency. The coefficient (0.332) indicates that for every one-unit increase in Risk Associated, Supply Chain Efficiency increases by 0.332 units regardless of other independent variables in the model.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter discussed the major findings of this particular study collected using questionnaire and interview followed by conclusions, and recommendations of the researcher.

5.2 Summary of the Findings

- The average mean of production time on supply chain efficiency was 4.192 showing the implementation of JIT Inventory Management has notably reduced production time, minimizing delays from raw material shortages, improved responsiveness to customer demand, and simplified the production process, with reasonably high confidence in suppliers' timely deliveries.
- Interviews with Supply Chain Managers reveal they use metrics like order-to-delivery time, production time variability, and on-time delivery rates, tracked via ERP systems.
- The average mean of cost reduction in supply chain efficiency was 3.796 indicating a positive view of cost reduction in the paint factories. While there were some worries regarding the effects these measures might have on staff morale, they effectively reduced waste, maintained quality, and enhanced efficiency.
- The survey findings were supported by interviews with supply chain managers, who highlighted strategies like lean inventory management, supplier negotiations, and logistics optimization to reduce costs without sacrificing quality or customer satisfaction.
- The average mean of buyer-supplier relationship on supply chain efficiency was 3.976 indicating positive perceptions of buyer-supplier relationships, highlighting their role in optimizing production scheduling, enhancing manufacturing efficiency, and ensuring high-quality raw materials. While there is some variability in responses, overall confidence in supplier reliability, communication, and innovation is strong.
- Interviews with Supply Chain Managers confirm these findings, emphasizing the importance of open communication, collaboration, and proactive problem-solving with suppliers to improve supply chain efficiency and address challenges promptly.

However, the model analysis showed it is negatively related to supply chain efficiency.

- The average mean of risks associated with JIT Implementation on supply chain efficiency was 3.279 implying views on risks associated with JIT implementation in the paint factory ranges from neutral to mixed. While respondents acknowledge the significant investment needed in forecasting and communication systems, they expressed less concern about increased quality control issues.
- Interviews with Supply Chain Managers support these findings and draw attention to other issues like challenging infrastructures, complex regulations, and unpredictability in finances.
- There was strong support for Just-In-Time principles and their positive impact on supply chain efficiency. The results indicated a general recognition of efficiency indicators like high inventory turnover and reduced order fulfillment time in the paint factory, though there is some uncertainty about meeting cycle time.
- Interview with Supply Chain Managers emphasizing the use of KPIs, regular reviews, stakeholder feedback, and benchmarking to evaluate and enhance supply chain procedures, ensuring alignment with business objectives.
- The findings indicated that shorter production time led to cost reduction, cost reduction is positively correlated with supply chain efficiency, a stronger buyer-supplier relationship reduces risk, and lower risk is associated with higher supply chain efficiency.
- The findings indicated that production time, cost reduction, and risk management positively and significantly impact supply chain efficiency, with regression coefficients of 0.259, 0.208, and 0.332, respectively ($p < 0.001$ for all). Specifically, an increase in production time and cost reduction each result in corresponding increases in supply chain efficiency, while effective risk management yields the highest increase. Conversely, the buyer-supplier relationship is negatively related to supply chain efficiency, with a regression coefficient of -0.090, but this effect is statistically insignificant ($p = 0.149$). These results highlight the critical role of timely processes, cost-effective strategies, and risk management in enhancing supply chain performance, whereas the buyer-supplier relationship does not significantly influence it.

5.3 Conclusion

The analysis reveals several key conclusions about supply chain efficiency in the international paint brand manufacturers. The implementation of Just-In-Time (JIT) Inventory Management has significantly reduced production time while improving responsiveness, and simplifying production processes. Also there is high confidence in timely supplier deliveries, showing that production time has a positive and significant effect on supply chain efficiency. While Cost reduction measures have effectively minimized waste, maintained quality, and improved efficiency, with survey results showing a positive and significant effect on supply chain efficiency. However, there are some concerns about their impact on employee morale. The dynamics of a strong buyer-supplier relationship affect the efficiency of supply chain by optimizing production scheduling, enhance manufacturing efficiency, and ensure high-quality raw materials. However, according to the model, this variable is negatively related to supply chain efficiency, indicating that companies should focus on improving this aspect to enhance overall efficiency specifically in these organizations. The perceptions of JIT implementation risks are neutral to mixed, with concerns about investment in forecasting and communication systems, but less worry about quality control issues. This variable has a significant positive impact on supply chain efficiency, revealing that managing risks associated with supply chain operations can lead to improved efficiency. Therefore, despite mixed perceptions, effectively addressing and managing buyer-supplier relationship risks are crucial for enhancing the overall efficiency of the supply chain. There is a general recognition of efficiency indicators such as high inventory turnover and reduced order fulfillment time, with strong support for JIT principles. Key performance indicators (KPIs), regular reviews, and benchmarking are used to assess and improve supply chain practices. This highlights that JIT Inventory Management positively affects the efficiency of the supply chain by promoting high inventory turnover and reducing order fulfillment time, thereby streamlining supply chain operations and enhancing overall performance.

5.4 Recommendations for Further Research

- The researcher recommends companies should do regular review to ensure consistent production time performance and identify improvement areas other than using only metrics.
- Companies should establish rewards programs to recognize and recognize efforts that reduce costs and increase efficiency.
- Companies should provide regular channels for employee feedback to address issues and promote involvement to increase the efficiency of the supply chain.
- Companies should balance efficiency goals with realistic workloads to prevent burnout and maintain job satisfaction, ensuring cost reduction efforts are sustainable and improve both efficiency and morale.
- Companies should use strategies like supplier diversification, resilience investments, improved teamwork, and technology utilization for better inventory visibility and flexibility to mitigate risks associated with Implementing JIT.
- Companies should conduct supply chain audits and process mapping to identify inefficiencies and bottlenecks to effectively assess the efficiency of supply chain practices.
- Companies should invest in employee training and development to ensure the workforce can sustain improvements.
- Companies should analyze customer feedback and demand patterns for better alignment with market needs
- Companies should conduct risk management assessments to identify vulnerabilities and develop strategies to ensure supply chain resilience and continuity.
- Companies should organize regular meetings and share relevant market and demand information.
- Companies should align clear goals and expectations, assess supplier performance regularly, and collaboratively address issues.
- To enhance supply chain efficiency, it is recommended that companies align their strategies with specific management theories tailored to key variables. For Production Time, the Theory of Just in Time (JIT) Production should be utilized to reduce production time and improve responsiveness. Lean Theory principles should be implemented for Cost Reduction, focusing on eliminating waste and enhancing cost efficiency. Buyer-Supplier Relationships should be optimized using Contingency

Theory, allowing companies to adapt and manage these relationships based on situational factors. Lastly, the Theory of Constraints should be applied to manage risks associated with supply chain operations, identifying and addressing key constraints that limit performance. By integrating these theories, companies can effectively address critical areas and improve overall supply chain efficiency.

5.5 Suggestion for Further Study

The study was conducted only on Just-in-Time Inventory Management on Supply Chain Efficiency casing only International Paint Brand Manufacturers in Addis Ababa to limit its scope. Future researchers may examine those factors on local paint manufacturers at regional or country level.

REFERENCES

Aydin M. Torkabadi and R. V. Mayorga, 2018. Implementation of Just-In-Time Policies in Supply chain Management: International journal of Economics and Management Systems.

Battilana, J., & Dorado, S., 2010. Building Sustainable Hybrid Organizations: The Case of Commercial Microfinance Organizations. Academy of Management Journal, 53(6), pp. 1419–1440.

Besley, T., & Ghatak, M., 2017. Profit with purpose? A theory of social enterprise. American Economic Journal: Economic Policy, 9(3), pp. 19-58.

Buer, M. S., Miranda, F. J. C., & De Sousa, J. A. P., 2020. A review of the effects of just-in-time (JIT) practices on supply chain performance. International Journal of Production Economics.

Cheng, T. C. E., Lai, K. H., & Gunasekaran, A., 2008. Responsive supply chain: A competitive strategy in a networked economy. Omega, 36(4), pp. 549-564.

Cheng, Y., 2020. Supply Chain Coordination with Manufacturer's Just-in-Time and Supplier's Production Disruption. International Journal of Production Research, 58(11), pp. 3407–3429.

Choi, T. Y., & Eboch, K., 1998. The TQM paradox: Relations among TQM practices, plant performance, and customer satisfaction. Journal of Operations Management, 17(5), pp. 59-75.

Chopra, S., & Meindl, P., 2021. Supply Chain Management: Strategy, Planning, and Operation (8th ed.). Pearson.

Christopher, M., 2020. Logistics & Supply Chain Management (6th ed.). Pearson Education Limited.

Cochran, W. G., 1977. Sampling techniques (3rd ed.). New York: John Wiley & Sons.

Cox, J. F., & Blackstone, J. H., 2019. APICS Dictionary (16th ed.). APICS.

Creswell, J. W., & Creswell, J. D., 2018. Research design: Qualitative, quantitative, and mixed methods approach (5th ed.). SAGE Publications.

Creswell, J. W., & Plano Clark, V. L., 2011. Designing and conducting mixed methods research (2nd ed.). SAGE Publications.

DiMaggio, P. J., & Powell, W. W., 1983. The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. American Sociological Review, 48(2), pp. 147–160.

Donaldson, L., 2001. The Contingency Theory of Organizations. SAGE Publications.

Ellram, L. M., & Tate, W. L., 2004. The use of formal and informal controls for managing business-to-business relationships. Journal of Business Logistics, 25(1), pp. 1-28.

Eriksson, P., & Kovalainen, A., 1999. Qualitative methods in business research. SAGE Publications.

Evans, R. H., 1996. An Analysis of Criterion Variable Reliability in Conjoint Analysis. Perceptual and Motor Skills, 84, pp. 988-990.

Fawcett, S. E., & Magnan, G. M., 2002. The Rhetoric and Reality of Supply Chain Integration. International Journal of Physical Distribution & Logistics Management, 32(5), pp. 339–361.

Fawcett, S. E., Magnan, G. M., & McCarter, M. W., 2011. Benefits, barriers, and bridges to effective supply chain management. Supply Chain Management Review, 15(1), pp. 26-33.

Fiedler, F. E., 1967. A Theory of Leadership Effectiveness. McGraw-Hill.

Flynn, B. B., Huo, B., & Zhao, X., 2010. The impact of supply chain integration on performance: A contingency and configuration approach. Journal of Operations Management, 28(1), pp. 58-71.

Giunipero, L., Parikka, S., & Persson, F., 2005. Impact of just-in-time (JIT) on supply chain disruption risk. International Journal of Production Economics, 96(1), pp. 109-121.

Goldratt, E. M., & Cox, J., 2014. The Goal: A Process of Ongoing Improvement (3rd Revised ed.). North River Press.

Goldratt, E. M., 1990. The Haystack Syndrome: Sifting Information Out of the Data Ocean. North River Press.

González-Zapatero, C., Gonzalez-Benito, J., Lannelongue, G., & Ferreira, L. M., 2021. Using fit perspectives to explain supply chain risk management efficacy. International Journal of Production Research, 59(17), pp. 5272-5283.

Hamid Pourasiabi, 2012. Just in Time (JIT) Production in Supply Chain Management. Conference paper published on 2nd of April 2012.

Imai, M., 1986. Kaizen: The Key to Japan's Competitive Success. McGraw-Hill Education.

Ivanov, D., & Sokolov, B., 2019. Adaptive supply chain management: Synchronization and digitalization. Springer.

Jacobs, F. R., & Chase, R. B., 2017. Operations and Supply Chain Management (15th ed.). McGraw-Hill Education.

Kothari, C., 2004. Research Methodology Methods & Techniques. New Delhi: New Age International Publisher.

Lawrence, P. R., & Lorsch, J. W., 1967. Organization and Environment: Managing Differentiation and Integration. Harvard University Press.

Lee, S., Tae-Kim, S., & Choi, D., 2012. Green supply chain management and organizational performance. Industrial Management & Data Systems, 112(8), pp. 1148-1180. http://dx.doi.org/10.1108/02635571211264609

Liker, J. K., 2004. The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. McGraw-Hill Education.

Lu, S., Wang, J., Chitsaz, F., Derbyshire, M. K., Geer, R. C., Gonzales, N. R., & Marchler-Bauer, A., 2020. CDD/SPARCLE: the conserved domain database in 2020. Nucleic acids research, 48(D1), pp. D265-D268.

Mazikana, A. T., 2023. The Impact of Inventory Management on the Overall Performance of the Organization. A Case of Halsted Builders Express. A Case of Halsted Builders Express (March 16, 2023).

Monczka, R. M., Handfield, R. B., Giunipero, L. C., & Patterson, J. L., 2019. Purchasing and Supply Chain Management (7th ed.). Cengage Learning.

Monden, Y., 1983. Toyota Production System: Practical Approach to Production Management. Institute of Industrial Engineers.

Mugwe, E. W., & Moronge, M., 2018. Influence of just-in-time inventory strategy on performance of vehicle manufacturing firms in Kenya. Strategic Journal of Business & Change Management, 5(3), pp. 1195-1207.

Muijs, D., 2010. Doing quantitative research in education with SPSS. Sage Publications.

Nahmias, S., 2015. Production and Operations Analysis (7th ed.). McGraw-Hill Education.

Negrão, L. L. L., Godinho Filho, M., & Marodin, G., 2017. Lean practices and their effect on performance: a literature review. Production Planning & Control, 28(1), pp. 33-56.

Odinga, E., 2017. Supply chain integration and performance of public universities in Kenya. Doctoral dissertation, University of Nairobi.

Ohno, T., 1988. Toyota Production System: Beyond Large-Scale Production. Productivity Press.

Sarkis, J., & Sundarraj, R. P., 2020. Just-in-Time Inventory Management: A Review of Literature and Directions for Future Research. International Journal of Production Research, 58(11), pp. 3454–3472.

Schonberger, R. J., 1982. Japanese Manufacturing Techniques: Nine Hidden Lessons in Simplicity. Free Press.

Scott, W. R., 2014. Institutions and Organizations: Ideas, Interests, and Identities (4th ed.). SAGE Publications.

Shah, R., & Ward, P. T., 2003. Lean manufacturing: context, practice bundles, and performance. Journal of Operations Management, 21(2), pp. 129–149.

Shiferaw, A. T., et al., 2020. Implementation of Lean Manufacturing Practices in Ethiopian Textile Industry: A Case Study. Journal of Textile Science & Engineering, 10(3), pp. 1-7.

Shingo, S., 1989. A Study of the Toyota Production System: From an Industrial Engineering Viewpoint. Productivity Press.

Simchi-Levi, D., Kaminsky, P., & Simchi-Levi, E., 2020. Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies (4th ed.). McGraw-Hill Education.

Sohal, A. S., & Kaur, N., 2021. A review of kanban systems: Implementation and applications. International Journal of Production Research, 59(13), pp. 3969-3992.

Taylor & Francis Group, 2012. The Complete Guide to Just-in-Time Manufacturing Second Edition.

Tayur, S., Ganeshan, R., & Magazine, M., 2009. Managing Disruptions in Supply Chains. Production and Operations Management, 18(1), pp. 1–8.

Towers, N., & Young, S., 2016. Just-in-Time (JIT) Supply Chain Risks: An Australian Perspective. International Journal of Production Economics, 171(Pt A), pp. 8–17.

Vijay S., & Sadikot A., 2016. Implementation of Just-in-Time for Inventory Management at Kazi Industries, Pune. Journal for Contemporary Research in Management, pp. 56-60.

Vonderembse, M. A., & White, G. P., 2003. Lean and Agile Manufacturing: A Systematic Review of Research Literature. International Journal of Operations & Production Management, 23(7), pp. 794–818.

Womack, J. P., & Jones, D. T., 2003. Lean Thinking: Banish Waste and Create Wealth in Your Corporation. Free Press.

Womack, J. P., Jones, D. T., & Roos, D., 1990. The Machine That Changed the World: The Story of Lean Production. Harper Collins.

World Bank, 2019. Ethiopia Industrialization Roadmap 2019-2025. World Bank Group.

World Bank, 2022. Ethiopia overview. Available at: https://www.worldbank.org/en/country/ethiopia/overview [Accessed 30 June 2024].

Wu, D., Ding, H., & Xu, L., 2020. A review of JIT production research and its future directions. Sustainability, 12(14), pp. 5528.

Yang, J., Xie, H., Yu, G., & Liu, M., 2021. Achieving a just–in–time supply chain: The role of supply chain intelligence. International Journal of Production Economics, 231, p. 107878.

Yeasmin, S., & Rahman, K. F., 2012. Paulo Freire and 'critical literacy': relevance for Bangladesh. Bangladesh Education Journal, 11(2), pp. 7-14.

Zer, O. & Wei, W., 2006. Strategic commitment for optimal capacity decision under asymmetric forecast information. Management Science, 52(8), pp. 1239-1258.

ANNEX: I QUESTIONNAIRE

Addis Ababa University

School of Commerce

Department of Logistics and Supply Chain Management

(Questionnaire to be filled by Paint Manufacturing Employees)

Dear Respondents,

I'm currently conducting research on "The Effect of Just-In-Time (JIT) Inventory Management on the Supply Chains Efficiency of International Paint Band Manufacturing Companies in Addis Ababa." in the partial fulfillment of acquiring Master of Art Degree in Logistics and Supply Chain Management at the Addis Ababa University, School of Commerce.

I kindly request you to spend some minutes of your time in filling the questionnaire. Your genuine response is highly appreciated for the outcome of the project. Please be assured that the information acquired shall be used purely for research purposes only and will be kept strictly confidential. Your identity will be treated anonymously.

Note: Please indicate your level of agreement or disagreement by using "√" mark on the appropriate box given corresponding to each statement, and no need of writing your name.

Part I. Demography

1. Sex Male ( ) Female ( )

2. Age 21-29 ( ) 30-40 ( )

40-50 ( ) Above ( )

3. Educational Level Certificate ( ) Diploma ( )

1st Degree ( ) 2nd Degree ( )

Others _____

4. Work Experience 2 years and less ( ) 2-5 years ( )

5-10 years ( ) above 10 years ( )

5. Which department do you work in?

_____

ANNEX: I QUESTIONNAIRE

Part II. Major Question

Under this section the researchers used symbols in the table; based on that tick your choice. Thus, where;

SA - Strongly Agree, **A** - Agree, **N** - Neutral, **D** – Disagree, , **SD** - Strongly Disagree.

1. Production time on the Supply Chain Efficiency of Paint Manufacturers						
	Statement	SA	A	N	D	SD
1.	Implementing just-in-time (JIT) inventory management has significantly reduced production time for paint production in our factory.					
2.	Since adopting JIT, our factory experiences fewer delays in paint production due to lack of raw materials.					
3.	JIT has enabled our factory to respond more quickly to changes in customer demand for paint colors and types.					
4.	Compared to traditional inventory methods, JIT has helped to simplify the paint production process in our factory.					
5.	We are confident in our suppliers' ability to deliver raw materials for paint production exactly when needed under JIT.					
6.	JIT has led to a more efficient use of storage space in our paint manufacturing facility.					
7.	JIT inventory management has been a positive influence on reducing production time for paint production in our factory.					

Others (please specify)

_____

_____

_____

_____

ANNEX: I QUESTIONNAIRE

2. Cost Reduction on Supply Chain Efficiency of Paint Manufacturers						
	Statement	SA	A	N	D	SD
1.	Reducing production costs in our paint factory has led to improvements in overall production efficiency.					
2.	Since implementing cost-cutting measures, our factory has been able to produce paint with less waste.					
3.	We have found that focusing on cost reduction has encouraged our employees to find more efficient ways to produce paint.					
4.	Cost reduction efforts have led to a more streamlined use of resources in our paint manufacturing processes.					
5.	While reducing costs, we have been able to maintain the same level of quality in our paint products.					
6.	There have been no negative impacts on employee morale due to cost reduction initiatives in our paint factory.					
7.	Reducing production costs has had a positive impact on the efficiency of our paint manufacturing operations.					

Others (please specify)

_____

_____

_____

_____

3. Buyer-Supplier Relationship Supply Chain Efficiency of Paint Manufacturers						
	Statement	SA	A	N	D	SD
1.	Our paint factory experiences fewer delays in production due to problems with supplier deliveries.					
2.	Open and frequent communication with our suppliers helps us optimize paint production scheduling.					

ANNEX: I QUESTIONNAIRE

3.	The quality of raw materials we receive from our suppliers allows for a more efficient paint production process.					
4.	Collaboration with our suppliers has helped us identify and implement process improvements in paint manufacturing.					
5.	Our suppliers are reliable in meeting our specific requirements for raw materials needed in paint production.					
6.	We are confident in our suppliers' ability to innovate and provide new solutions to improve paint production efficiency.					
7.	A strong relationship with our suppliers positively impacts the efficiency of our paint manufacturing operations.					

Others (please specify)

_____
_____
_____
_____

4. Risks Associated with JIT Implementation Supply Chain Efficiency of Paint Manufacturers						
	Statement	SA	A	N	D	SD
1.	A minor disruption in our supply chain could significantly impact our paint production under JIT inventory management.					
2.	Relying on a single supplier for raw materials under JIT increases the risk of production delays in our paint factory.					
3.	Implementing JIT requires a significant upfront investment in forecasting and communication systems for our paint manufacturing.					
4.	Sudden spikes in demand for certain paint types could overwhelm our production capacity under JIT.					
5.	JIT inventory management makes it more difficult for our paint factory to adapt to changes in raw material prices.					

ANNEX: I QUESTIONNAIRE

6.	There is a risk of increased quality control issues in finished paint products due to pressure to maintain low inventory levels with JIT.					
7.	The potential benefits of JIT inventory management for our paint manufacturing are outweighed by the associated risks.					

Others (please specify)

_____
_____
_____
_____

5. Supply Chain Efficiency of Paint Manufacturers						
	Statement	SA	A	N	D	SD
1.	Understanding our inventory turnover ratio helps us make informed decisions about inventory management in our paint factory.					
2.	A high inventory turnover ratio is a good indicator of efficient inventory management practices in our paint production.					
3.	Reducing our order fulfillment cycle time for paint orders is a key priority for our business.					
4.	I am confident that our paint factory can consistently meet our advertised order fulfillment cycle time.					
5	I am confident in our ability to deliver finished good for customers exactly when needed under JIT.					
6	Just-in-Time Inventory Management has a positive effect on supply chain efficiency					

Others (please specify)

_____
_____
_____
_____

ANNEX: II Interview Question

Addis Ababa University

School of Commerce

Department of Logistics and Supply Chain Management

(Interview Question to be answered by Supply Chain Managers)

Dear Respondents,

I'm currently conducting research on "The Effect of Just-In-Time (JIT) Inventory Management on the Supply Chains Efficiency of International Paint Band Manufacturing Companies in Addis Ababa." in the partial fulfillment of acquiring Master of Art Degree in Logistics and Supply Chain Management at the Addis Ababa University, School of Commerce.

I kindly request you to spend some minutes of your time in answering the following questions. Your genuine response is highly appreciated for the outcome of the project. Please be assured that the information acquired shall be used purely for research purposes only and will be kept strictly confidential. Your identity will be treated anonymously.

1. How do you measure and monitor production time performance within your supply chain operations?
2. What cost reduction strategies have you implemented in your supply chain operations to enhance efficiency while maintaining quality?
3. How do you cultivate and manage relationships with key suppliers to improve supply chain efficiency? And how do you handle challenges or conflicts in buyer-supplier relationships that may impact supply chain efficiency?
4. What risks do you perceive in implementing Just-in-Time (JIT) inventory management?
5. How do you assess the effectiveness of your supply chain practices in improving efficiency and meeting business objectives?