

BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

DEPARTMENT OF ECONOMICS



**ASSESING THE FEASIBILITY OF JUST IN TIME INVENTORY MANAGEMENT
STRATEGIY ON EFFECTIVE HUMANITARIAN AID DELIVERY DURING LEAN
SEASONS IN ZIMBABWE.**

BY

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF REQUIREMENTS
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RELEASE FORM

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The undersigned certify that they have read and recommended to the Bindura University of Science Education for acceptance of a dissertation entitled “Assessing the feasibility of Just In Time inventory management strategies in achieving effective humanitarian aid delivery during lean seasons in Zimbabwe.” submitted by Brandon Philemon in partial fulfilment of the requirements for the bachelor of commerce (honours) degree in Purchasing and Supply of Bindura University of Science Education

I. To be completed by supervisor. I certify that I have supervised Brandon Philemon for this dissertation entitled “Assessing the feasibility of Just in Time inventory management strategies in achieving effective humanitarian aid delivery during lean seasons in Zimbabwe.” This dissertation is suitable for submission to the faculty. This dissertation has been checked for conformity with Faculty guidelines.

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II. To be completed by the Chair of the Department. I certify to the best of my knowledge that the required procedures have been followed and the preparation criteria have been met for this dissertation. I, therefore, recommend to the Bindura University of Science Education to accept this dissertation done by Brandon Philemon in partial fulfilment of the requirements for the Bachelor of commerce (honours) degree in Supply Chain Management.

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DECLARATION

I, Brandon Philemon declare this research project herein is my own work and has not been copied or lifted from any source without the acknowledgement of the source.

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DEDICATION

I dedicate this work to my Granddad, Saini Philemon, my grandmother the late Rosemary Philemon, my dad, the late Last Philemon.

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Firstly, I would like to give thanks to the Almighty, for enabling me to fulfill my educational strive. It seemed impossible, but through him I made it through. Secondly, I acknowledge my dad, Brian Philemon, for always supporting me financially to go through this educational journey. I am forever indebted to him. Thirdly I would like to acknowledge my granddad, Saini Philemon for giving me purpose to work extra hard to achieve greater because he believed in me in extraordinary ways. I will forever love Him. Lastly I would like to thank Dr. Chari and Mr. Ozwell Muzinda for helping with this research to make it a success. Their support has made this research a great one.

God bless you.

ABSTRACT

Humanitarian aid delivery in Zimbabwe faces mounting challenges during lean seasons, a period marked by heightened food insecurity and logistical strain. Traditional stockpiling approaches often lead to high storage costs, delayed responses, and inventory wastage. This study investigates the feasibility of adopting Just in Time inventory management strategies as an alternative for improving humanitarian logistics performance. A descriptive case study research design was employed, using a quantitative approach with structured questionnaires administered to 46 supply chain personnel across key humanitarian organizations operating in Zimbabwe. A mixed method of data analysis was used for this paper and the data gathered was analyzed through the SPSS system and several findings were obtained. It was overall quantified that JIT inventory management system strongly enhances agility and effectiveness is supported to a moderate extent while efficiency has no considerable impact to JIT inventory management system. It was also concluded that the geographical scope of the organization influences largely on logistics performance while nature of organization has a smaller effect towards logistics performance. The study contributes to the academic understanding of lean logistics in humanitarian settings and provides practical insights for policy-makers and practitioners aiming to optimize aid delivery during critical lean seasons. The study then recommends humanitarian organizations to adapt JIT inventory management system in order to achieve agility and effectiveness. It further recommends that organizations should structure in a way that strongly supports and uphold efficiency in order to achieve service excellency and successfully meet organizational goals as JIT proved to impact less to efficiency.

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CHAPTER I

INTRODUCTION

1.1Introduction

Humanitarian aid operations often face significant logistical challenges, particularly in regions affected by seasonal hardship. In Zimbabwe, lean seasons intensify the demand for timely and efficient aid delivery therefore, ensuring that essential supplies reach affected populations without delay becomes a critical concern. Traditional inventory management approaches, which typically involve stockpiling, can lead to inefficiencies such as high storage costs, wastage, and logistical delays. In contrast, the Just in Time (JIT) inventory management strategy, widely used in the commercial sector, emphasizes reducing inventory levels and delivering supplies precisely when needed. This study explores the practicality of adopting JIT within the humanitarian context of Zimbabwe, assessing whether such a model can support or hinder the timely delivery of aid during periods of acute need. By examining operational capacities, infrastructural realities, and the unpredictable nature of emergencies, this research seeks to determine the feasibility and potential benefits of implementing JIT strategies in humanitarian logistics.

1.2 Background of study

Humanitarian aid is the process of delivering various services and various humanitarian issues such as food, medication water and sanitation that aim to alleviate people from disastrous processes. The main aim is to prioritize people who have been affected or who have the potential to be affected, relief them of disaster shocks through the provision of relief goods and services. A disaster can be defined as a serious disruption of the functioning of a community or society, causing widespread human, material, economic or environmental losses that exceed the ability of affected population to cope using its own resources (UNDR, 2023). The disaster can be a sudden one that occurs promptly, such as earthquakes or floods, for example, the Tokwe-Mukosi floods which were caused by heavy rains, leading to the displacement of over twenty thousand people in

the Chivi and Masvingo districts. The disaster may also be slow occurring, such as drought, which is not fast coming but rather can be seen and anticipated well in time and migratory measures such as the identification of lean seasons can be put in place.

The lean season is defined as the period between planting and harvest when household food stocks are low, market food prices are high and access to food is limited, often leading to increased food insecurity. (FAO, 2019). Humanitarian aid delivery refers to the coordinated process of providing essential goods and services such as food, water, shelter, medical care and protection to populations affected by emergencies (OCHA, 2022). The humanitarian aid is essential during the lean season because during the season, about six million people are affected by the unavailability of food stocks and the devastating nature of the draught, therefore, having the need for lean season humanitarian aid. However, for the humanitarian aid that is provided by the Humanitarian organizations to be successful, there is need to manage inventory well.

Inventory management refers to the process of ordering, storing, tracking, and controlling inventory to ensure that the right amount of stock is available at the right time to meet demand without incurring unnecessary costs or delays. It is a critical function in supply chain management, balancing supply with demand and helping organizations improve efficiency and responsiveness (Chopra, 2021; Waters, 2020). It ensures that the right amount of stock is available at the right time to meet the demand while minimizing cost.

Just in Time (JIT) inventory management is a strategy that aims to improve efficiency by receiving goods only as they are needed in the production or distribution process, thereby reducing inventory holding costs and minimizing waste. The approach relies on accurate forecasting, reliable suppliers, and streamlined logistics to ensure that materials and products arrive exactly when required (Heizer et al., 2020; Stevenson, 2021). While JIT was originally developed in the manufacturing sector, its principles are increasingly being explored in other areas, including humanitarian logistics, where timely delivery is critical.

Globally, humanitarian inventory management is characterized by irregular demand and supply process both to the beneficiaries and field employees. These operations are done in an uncertainty situation and destabilized infrastructure (Wassenhove 2021). Examples of other disasters include

the Tsunami in 2004, the ongoing famine in regions of Yemen, Ethiopia and Madagascar. These are not only examples of disasters which severely affected the livelihoods and food security disaster area but also represents areas that are even difficult to work considering the conditions of ongoing conflicts within those areas, the nature, scope and severity of the disaster (United Nations Development Program 2022).

Inventory exists because of uncertainties between demand and supply. Inventory is a huge cost driver in the supply chain. It also has a huge impact on responsiveness. The major cost trade-offs of inventory occurs when making decisions whether to hold higher levels of inventory for responsiveness or less inventory to ensure efficiency (Chopra et al 2010). It can therefore deduced that holding much inventory has more costs associated with holding it and by so doing being less efficient. However, holding much inventory at customer's disposal makes the inventory management system more responsive.

The inventory management system has been a much difficult process as of late due to various impediments that hinders successful inventory management systems by humanitarian organizations. Economic instability, including hyperinflation and currency fluctuations, has made it difficult for the organization to maintain consistent procurement and inventory levels. (Makumbe, 2020). According to Chari and Mbiriri, 2019, noted that the lack of trained personnel in inventory and supply chain management disrupt continuity and expertise in inventory control and lead to substantial losses. Therefore, having so much research work in humanitarian inventory management strategies, very little detail has been looked at in the effectiveness of just in time inventory management to humanitarian delivery during the lean season in particular.

1.2 Statement of the problem

Zimbabwean communities, particularly in the rural areas, face significant food vulnerabilities during the annual lean season, typically spanning from January to March (World Food Program Zimbabwe 2020). This critical period intensify the demand for timely and efficient humanitarian aid delivery using limited and scarce resources. While traditional inventory management strategies of stockpiling have been widely adopted (Wassenhove 2006), they often lead to substantial inventory costs and considerable wastage. Despite the apparent need for agile and efficient

solutions in humanitarian logistics, there is notably little research on the feasibility of Just in Time inventory management techniques to optimize humanitarian operations. Consequently, the research intent to assess the feasibility of utilizing JIT in responding to acute food vulnerabilities during Zimbabwe's lean season.

1.3 Research objectives

This study is sort to this objective

- i. To establish the adoption of Just in Time inventory management strategies in delivering humanitarian aid during lean seasons in Zimbabwe.
- ii. To assess the impact of Just in Time inventory management strategies on efficiency of humanitarian aid delivery in Zimbabwe's lean seasons.
- iii. To analyze the impact of Just in Time inventory management strategies on the agility of humanitarian response in Zimbabwe's lean seasons.
- iv. To ascertain the impact of Just in Time inventory management strategies on the effectiveness of humanitarian response in Zimbabwe's lean seasons.

1.4 Research questions

Based on the objectives of the study, the following research questions have been formulated.

- i. To what extent have humanitarian organizations in Zimbabwe adopted Just in Time inventory management strategies for aid delivery during lean seasons?
- ii. How do Just in Time inventory management strategies impact the efficiency of humanitarian aid delivery in Zimbabwe's lean seasons?
- iii. What was the observed impact of Just in Time inventory management strategies on the agility of humanitarian response during lean seasons in Zimbabwe?
- iv. How do Just in Time inventory management strategy impact the effectiveness of humanitarian aid delivery in Zimbabwe's lean seasons?

1.5 Significant of study

This study was undertaken to satisfy personal, intellectual, and professional interests. The study's major focus is to assessing the feasibility of Just in Time inventory management strategies in achieving effective humanitarian aid delivery during lean seasons in Zimbabwe.

To the Academia

This study contributes to academic discourse by addressing a gap in the literature regarding the application of Just in Time (JIT) inventory strategies in humanitarian contexts, specifically within Sub-Saharan Africa. While JIT has been extensively studied in commercial sectors, its relevance and adaptability in unpredictable, resource-constrained environments like Zimbabwe remain underexplored (Monde et al., 2021). The study gives an elaborated insight into the principles of JIT and how they can be applied by humanitarian organizations during the lean seasons. As stated by (Baporikar, 2020) the study also supports the development of more context centric supply chain models and further academic exploration of hybrid inventory strategies that can be utilized in humanitarian operations.

To the Policy Makers

The study provides the policy makers with knowledge on the utilization of JIT inventory management systems in humanitarian organizations and how it can enhance the delivery of aid during the lean seasons in Zimbabwe's lean seasons (WFP, 2022). By assessing the feasibility of this approach in areas like Zimbabwe where resources are strained and stability conditions are always fluctuating, the study would provide educated insights on logistics planning, procurement strategies and infrastructure development (World Bank, 2023).

To the practitioners

The study provides a clear insight on the benefits that are associated by applying JIT inventory management strategy towards humanitarian aid delivery during lean seasons in Zimbabwe. It also gives an educated conclusion towards potential costs that are reduced by the adoption of JIT and feasibility of JIT adoption towards agility, effectiveness and efficiency (Kovács & Spens, 2019). The findings help practitioners develop more agile and cost-effective supply chains, ultimately enhancing the efficiency and impact of humanitarian operations (Thomas & Kopczak, 2020).

1.6 Assumptions

This study has the following assumption:

1. The study has theoretical and practical implications in the communities and people who are most affected by lean seasons across Zimbabwe.
2. The researcher assumes that the responses obtained from the study sample is a true reflection and fair view of the whole population.
3. The researcher will also assume the whole research process, data collection methods and analysis provide biasness to the research findings.

1.7 Delimitations

This study has following delimitations:

1. This study is geographically limited to Zimbabwe, focusing on regions affected by lean-season food insecurity.
2. The aim is to assess JIT inventory strategies within the specific logistical and economic challenges of this setting.
3. Subject-wise, the study is restricted to humanitarian logistics, particularly inventory management, and does not cover broader supply chain elements or commercial applications.
4. These boundaries allow for a focused analysis relevant to aid delivery in resource-constrained environments.

1.8 Limitation

This study has following limitations:

While this study provides important insights into the feasibility of Just In Time (JIT) inventory management in humanitarian aid delivery during Zimbabwe's lean seasons, several limitations should be acknowledged.

Firstly, the study relies on data from a specific geographical and economic context, meaning the findings may not be directly transferable to countries with different infrastructure, political

stability, or logistical capacity. Zimbabwe's unique socio-economic conditions and recurring aid needs shaped much of the analysis.

Secondly, access to detailed, real-time operational data from humanitarian organisations was limited due to confidentiality concerns. As a result, some conclusions were drawn from interviews and secondary reports, which may not capture the full complexity of field operations.

Thirdly, the unpredictable nature of humanitarian crises, such as sudden droughts, political disruptions, or currency fluctuations, may influence the reliability of implementing JIT systems. These external factors could not be fully controlled or anticipated within the study period.

Finally, the study primarily focuses on inventory management and does not deeply investigate related logistics components such as procurement lead times, last-mile delivery, or beneficiary targeting. This narrowed focus was necessary for depth but may overlook broader supply chain dynamics.

1.9 Definition of terms

This study has definition of terms below:

Humanitarian logistics

Humanitarian logistics refers to the process of mobilizing people, resources, planning and implementing the efficient flow of goods, information and services to help vulnerable people affected by disaster (Kovacs & Spens, 2020).

Just In Time

JIT is an inventory management strategy that aims at reducing waste by receiving goods only as they are needed to reduce inventory holding and increase efficiency (Heizer et al., 2020).

Efficiency

Efficiency in operations and logistics refers to accomplishment of a job while achieving maximum productivity with minimum expenditure of time and resources (Slack et al., 2020)

Agility

Agility is the capability of a supply chain to respond to unexpected demand or supply, with speed and flexibility.

Effectiveness

Effectiveness refers to the extent to which the intended goals or outcomes are achieved, especially in meeting customer or beneficiary needs (Slack et al., 2020).

Lean season

Lean season is a period prior to harvest where prices are generally higher and household food stocks are low typically vulnerable to hunger and food security (Maxwell et al., 2020).

1.10 Chapter summary

This introductory chapter sets the stage for the research by outlining the background of the study, which includes defining the research problem and formulating its objectives. It also introduces the specific organization serving as the case study. The chapter introduces the concept of inventory management and provides a brief overview of humanitarian aid and lean seasons. Additionally, it details the delimitations and limitations of the study, along with the research assumptions. Overall, this chapter primarily focuses on building up to, stating, and clearly establishing the research problem and its objectives. This study has the following chapters.

Chapter 2

Chapter two will follow the first chapter, serving to review existing literature and establish the study's theoretical and conceptual framework. This chapter will explore various concepts, including the humanitarian supply chain, different types of inventories, and various inventory management strategies. The chapter will conclude with a review of empirical literature and a discussion of research gaps. In essence, this chapter provides a comprehensive examination of relevant literature and studies to identify what has already been researched and what further investigation is needed in the field of humanitarian inventory management.

Chapter 3

Chapter three, titled research methodology, detailed the chosen research design and philosophy. It clearly outlined the target population, the procedures for data collection and analysis, and the ethical considerations. This chapter also introduced regression analysis and thoroughly discussed

both the dependent and independent variables. Overall, the chapter aimed to establish the specific methodology used to conduct the research.

Chapter 4

Chapter four will focus on the presentation, analysis, and discussion of the data. Results will be displayed using a combination of pie charts and tables. These findings will then be interpreted and discussed, connecting them back to current and empirical literature. The ultimate goal is for these results to satisfactorily answer the research questions and objectives.

Chapter 5

This final chapter of the research project will focus on drawing conclusions and providing recommendations. It will summarize the findings discussed in chapter four and present corresponding recommendations. Additionally, the chapter will offer suggestions for future research to further address existing gaps in humanitarian inventory management.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature related to the feasibility of JIT inventory management on effective humanitarian aid delivery during lean seasons. The chapter includes the definition of concepts, theoretical review, conceptual framework and research gap. The relevant research on the explanatory and exploratory factors connected to this study will be the main topic of this chapter. Resource based theory, Supply chain resilience theory and Contingency theory, will also be used in this study. This chapter will discuss the empirical reviews of past studies, how they connect to the current study, and how the conclusions in earlier chapters of this research were arrived at. The chapter will be summarized at the end of that part, which will look at the research hole that the researcher intends to address with this study.

2.2 Humanitarian Logistics

Humanitarian logistics refers to the coordination and movement of resources to aid populations in distress. Kovács and Spens (2020) describes humanitarian logistics as the mobilization of resources to assist vulnerable people during crises. Van Wassenhove (2020) expands on the definition by identifying humanitarian logistics as a system that is designed to ensure the right goods reach the right people at the right time, particularly during emergencies. Besiou and Van Wassenhove (2019) further states that humanitarian logistics must balance efficiency with equity and responsiveness, especially when addressing complex crises such as pandemics. In conclusion, all these scholars are referring to the common idea of humanitarian logistics as a process that mobilizes resources to ensure that vulnerable people are relieved during times of need.

2.3 Just in Time

The Just-In-Time concept is an inventory management system that ensures the delivery of goods as when and where they are needed. Heizer, Render, and Munson (2020) explains JIT as a strategy where goods are received only when needed, minimizing inventory holding costs and increasing responsiveness. Slack, Brandon-Jones, and Burgess (2020) define JIT as a demand-based system where production is demand-driven, therefore reducing lead times and improving workflow. Chiarini (2021) highlights that JIT also involves strong supplier coordination and process discipline, especially useful in lean manufacturing environments but requiring high supply chain stability to function effectively.

2.4 Efficiency

Efficiency refers to how well resources are used to achieve desired outputs. According to Slack et al. (2020), efficiency is about minimizing input while maximizing results as output. Christopher (2020) further defines efficiency as the ability to perform supply chain processes at the lowest possible cost while achieving desired quality and service standards. Chopra and Meindl (2019) describe supply chain efficiency as the cost-effective alignment of supply and demand through strategic process design and resource allocation.

2.5 Effectiveness

Effectiveness, unlike efficiency, measures how well an activity achieves its intended goal. Slack et al. (2020) define efficiency as achieving strategic organizational objectives, such as customer satisfaction or service delivery outcomes. Mentzer et al. (2020) argue that effectiveness in logistics is determined by the degree to which services meet beneficiaries' needs, regardless of resource use. Wisner, Tan, and Leong (2021) define supply chain effectiveness as aligning operations with overarching goals such as timeliness, accuracy, and customer responsiveness, especially in turbulent environments.

2.6 Agility

Agility refers to the ability of a supply chain in responding to changes with speed. Christopher (2020) defines it as the capability to quickly adapt to supply disruptions and demand while maintaining performance. Gligor and Holcomb (2021) also states that agility combines responsiveness, competency, flexibility, and speed which are all necessary for competitive advantage in volatile environments. Tukamuhabwa et al. (2019) emphasize agility in humanitarian supply chains as essential for dealing with unpredictable events, allowing organizations to shift resources and strategies rapidly.

2.7 Conceptual Framework

A conceptual framework represents the researcher's synthesis of literature review on how to explain a phenomenon. Conceptual framework is the researcher's understanding of how the particular variables in this study connect with each other. Therefore, it outlines the variables that are required in the investigation of the study.

INDEPENTED VARIABLE

DEPENDENT VARIABLE

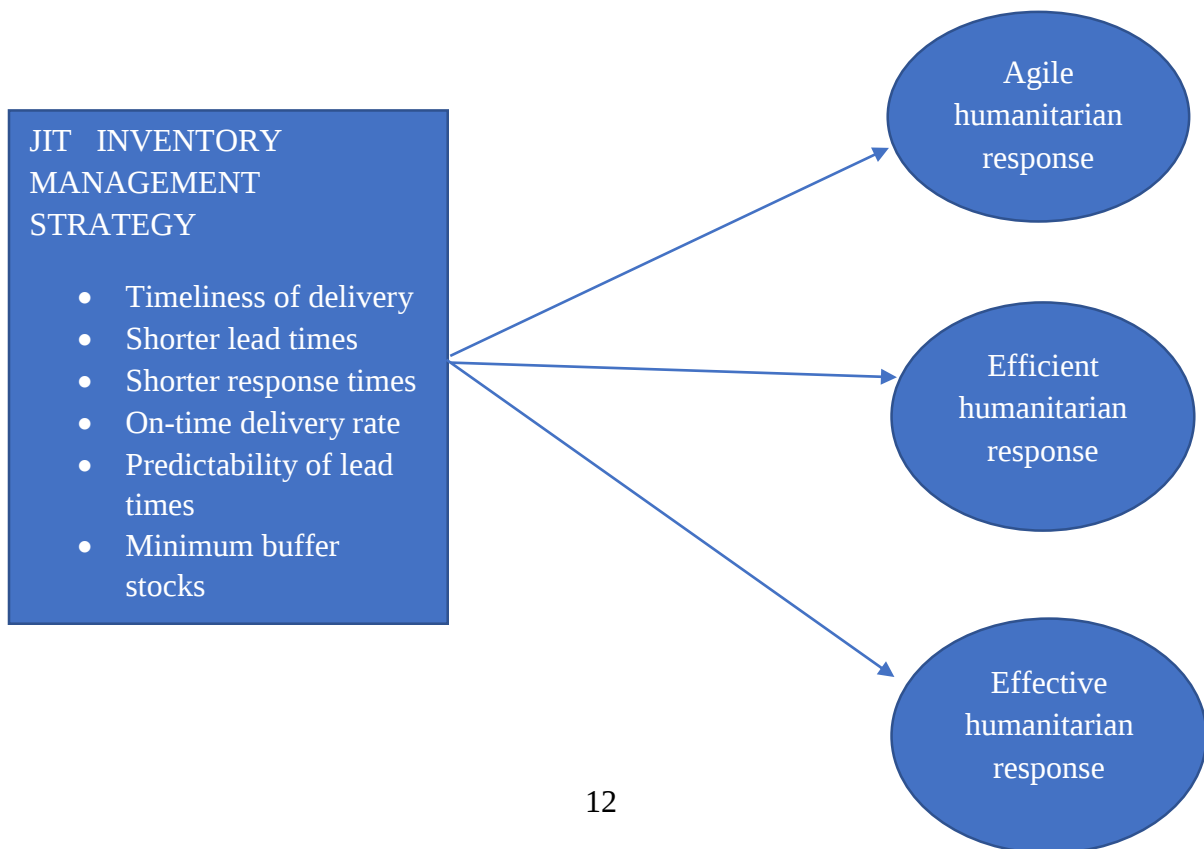


Fig 2.1: Conceptual Framework

Source: Researcher (2025)

2.8 Theoretical framework

This study guided by a theoretical framework theory as follows;

2.8.1 Supply chain resilience Theory

Supply Chain Resilience Theory (SCRT) gives a significant insight through which to assess the feasibility of JIT in humanitarian contexts during lean seasons. This theory emphasizes a supply chains ability to anticipate, respond to and recover from disruptions while maintaining continuity of supply. In lean seasons periods marked by food insecurity, drought, or seasonal shocks supply chains are highly vulnerable, making resilience a critical success factor.

JIT by design limits buffer stocks, which can be a liability in volatile settings unless supply chains are highly agile and connected. According to Wieland and Durach (2021), resilient supply chains incorporate flexibility, redundancy and visibility elements not always compatible with pure JIT. During lean seasons, communities often rely on timely external support due to depleted local food reserves or health supplies. JIT's minimal inventory philosophy could struggle in such settings unless supported by robust predictive analytics and contingency planning.

Recent humanitarian logistics literature also emphasizes digital platforms and local partnerships to enhance resilience. By investing in real-time data systems and last-mile delivery networks, humanitarian actors may reduce lead times and maintain JIT benefits without compromising reliability (Besiou & Van Wassenhove, 2022). Thus, SCRT reveals that JIT is feasible during lean seasons only if resilience is deliberately built into the system through strategic planning and technological adaptation.

2.8.2 Resource based view theory

The Resource-Based View (RBV) of the firm, though traditionally rooted in strategic management, is increasingly applied in humanitarian logistics to evaluate organizational capacity for effective response. The theory asserts that sustainable competitive advantage interpreted here as operational effectiveness in crises derives from the organization's unique resources and capabilities. Applying RBV to JIT in humanitarian aid highlights the importance of internal assets like trained personnel, logistical technologies, data systems and pre-established supplier relationships.

In lean seasons, where demand for food, water, or health services spikes, humanitarian organisations must mobilize resources quickly. JIT is an inventory management theory that relies heavily on lean operations and accurate timing, therefore, success lies on the ability of the organization to accurately forecast and timeous procurement of materials. According to Dubey et al. (2023), humanitarian organisations with strong digital logistics capabilities such as mobile warehousing, GPS-based fleet tracking and AI forecasting, are more likely to utilize JIT effectively without affecting responsiveness.

However, RBV also reveals disparities in feasibility across organisations. Large organizations that are exposed to a larger scope to the international community are likely to adapt better to the use of JIT as compared to the local ones that are heavily reliant to local supply chains. This suggests that JIT's feasibility is not applicable to all but conditional, on the basis of strength achieved from internal capabilities as key insight provided by RBV theory.

2.8.3 Contingency Theory

Contingency Theory suggest that there is no one-size-fits-all approach to organisational strategy rather than the effectiveness of any system. As such, JIT in humanitarian aid delivery depends on the alignment between the strategy and the specific environmental conditions. This theory is particularly useful in assessing JIT's feasibility across diverse humanitarian conditions, especially during lean seasons when conditions can vary widely (e.g., droughts in the Sahel vs. post-harvest food shortages in South Asia).

JIT inventory strategies are highly dependent on factors such as transportation reliability, lead-time variability, funding stability and geopolitical access. For instance, in regions that have political instability or areas with poor infrastructure, JIT might be too risky because delays could endanger lives. Conversely, in relatively stable environments with strong logistics networks and predictable seasonal demand, JIT can have a positive impact towards costs and improve delivery speed (Chari et al., 2021).

Moreover, this theory supports hybrid inventory models combining JIT principles with buffer stocks or pre-positioned reserves in high-risk areas. According to Charles and Lauras (2022), flexible strategies tailored to local conditions outperform rigid JIT systems in humanitarian contexts. This kind of management allows organizations to benefit to some of the efficiencies that are brought about by JIT while ensuring that they are prepared for context-specific risks.

2.9 Just in Time inventory management

Just in Time (JIT) inventory management is a traditional approach widely used in manufacturing and retail sectors to reduce storage and holding costs by ordering and receiving goods only as they are required. Its core philosophy focuses on streamlining operations and reducing wastage through precision logistics and lean supply chains. In humanitarian logistics, JIT has been explored as a way to manage scarce resources effectively, especially in environments where there is limited storage and speed of response is critical (Chari et al, 2021). The idea is to deliver essentials such as food, water, medicine especially when needed and in specific quantities which significantly lower the operational footprint and reduce the risk of pilferage or misallocation of aid.

However, despite its theoretical appeal implementing JIT in humanitarian settings, this inventory management strategy may pose substantial challenges. For example. In the case of Cyclone Idai in Zimbabwe, Chari et al. (2021) found that although JIT principles were considered, the actual outcomes were hindered by limited infrastructure, poor coordination and unreliable communication among responding agencies. IT systems rely on a tightly integrated and highly predictable supply chain which is often unachievable in post disaster or conflict environments where roads are inaccessible, telecommunication are disrupted and accurate demand forecasting is nearly impossible.

Recent technological advances offer potential support for JIT implementation in humanitarian logistics. Tools such as real time tracking, cloud-based inventory systems and predictive analytics enhance responsiveness (Big Data Analytics, 2021). Furthermore, the use of autonomous delivery such as drones, as discussed by researchers in the Stochastic Dynamics Post Disaster Inventory Allocation Problem, (2023) shows promise for last mile delivery when roads are inaccessible. However, while such tools can enhance JIT effectiveness, they require substantial investment, local capacity and ethical consideration related to data use and community engagement.

2.10 Humanitarian aid delivery dimensions

Humanitarian aid delivery refers to the process of distributing life -saving assistance such as food, water, shelter and medical services to people who are affected by emergencies. The dimensions of humanitarian aid delivery are;

2.10.1 Timeliness

Timeliness in humanitarian aid delivery is important during Zimbabwe's lean seasons when delays can mean the difference between life and death. The lean season is when food stocks from harvest are depleted and many households face severe food insecurity (FEWS NET, 2024). Rapid response is essential to ensure vulnerable populations such as children under five and pregnant women, receive food and medical supplies before conditions worsen. However, the reality on the ground is that humanitarian operations often face significant logistical challenges. Poor road infrastructure, compounded by seasonal rains and flooding, slow down the transportation of aid to remote rural areas (ZimVAC, 2023). These delays can lead to critical gaps in food availability and worsen malnutrition rates.

Moreover, bureaucratic hurdles and inconsistent funding cycles further exacerbate delays. Humanitarian agencies must navigate complex coordination with government bodies and donor requirements, which can prolong approval processes and slow down aid deployment (WFP,2023). Although early warning systems like those operated by FEWS NET have improved the ability to anticipate food crises, the actual delivery of aid still lags behind due to these structural barriers. Timeliness remains a core challenge in Zimbabwe's humanitarian response system, indicating the

need for strategies that can streamline logistics and decision making to ensure aid reaches people promptly during lean seasons.

2.10.2 Coverage

Coverage is a key dimension that reflects the proportion of affected populations reached by humanitarian during lean seasons is complicated by humanitarian assistance. Achieving full coverage during lean seasons is complicated by the country's geographical and socio-political dynamics. Large rural areas remain hard to access, particularly during the rainy season when roads become impassable (UNICEF,2025). This physical inaccessibility disproportionately affects marginalised communities including those promote district like Binga where food insecurity is often most acute but humanitarian presence is limited (ZimVAC,2023). Consequently, mainly vulnerable households may be excluded from aid programmes, undermining the overall effectiveness of humanitarian efforts.

Funding constrains also restrict coverage. For example, WFP's lean season assistance programmes often have to prioritise the most venerable due to limited resources, leaving some food insecure populations without support (WFP,2023). Efforts to improve operational efficiency have led to the application of lean logistics principles, including reduced warehousing and tighter delivery schedules. These are akin to JIT systems seen in the private sector, where goods are dispatched based on immediate demand rather than pre-emptive stocking (Christopher et al, 2024). While this can streamline operations and reduce cost, it may unintentionally limit the spatial reach of aid when disruptions occur or access becomes restricted (Bacik & Tatham, 2021).

2.10.3 Effectiveness

Effectiveness in aid delivery is measured by the extent to which humanitarian interventions meet beneficiaries' actual needs and contribute to improving their conditions. In Zimbabwe, during lean seasons, this means addressing hunger, malnutrition, and underlying health vulnerabilities (UNICEF, 2025). Aid effectiveness is greatly enhanced when interventions are timely, culturally appropriate, and informed by ongoing community input. Research has shown that integrating local

knowledge into program design improves the accuracy and relevance of distributions (Maxwell & Watkins, 2003), and this principle holds across different humanitarian settings.

Globally, humanitarian logistics have increasingly adopted dynamic and demand-responsive systems to improve effectiveness, drawing inspiration from Just-In-Time models that tailor supply to real-time assessments (Kunz & Reiner, 2012). However, in unstable environments, such systems must be flexible enough to accommodate rapid changes. In contexts like the Philippines post-Typhoon Haiyan, reliance on overly lean inventories led to aid mismatches and shortages (Van Wassenhove & Pedraza Martinez, 2012). The key to improving aid effectiveness lies in balancing the speed and efficiency of lean systems with robust needs assessments and contingency planning, ensuring that aid delivery remains adaptive and relevant.

2.10.4 Cost reduction

Cost reduction is essential in humanitarian operations, particularly in resource-constrained settings such as Zimbabwe. Humanitarian agencies often operate under tight budget ceilings, especially during protracted crises like the lean season, which places pressure on maximizing every dollar spent (WFP, 2023). Innovations like digital cash transfers and mobile payment platforms have enabled cost savings by bypassing traditional distribution methods, reducing overhead and storage costs (Aiken et al., 2023). Similar cost-reduction strategies have been applied in Kenya and Ethiopia, where local procurement has reduced dependency on international shipments (Balcik et al., 2010).

Many of these strategies are underpinned by Just-In-Time principles, which seek to eliminate excess inventory and focus on precise, demand-driven supply. These models, widely used in commercial logistics, are now being adapted for humanitarian use to cut operational waste and improve efficiency (Christopher, 2016). However, lean systems carry the risk of failure if supply chains are fragile as they often are in sub-Saharan Africa and disaster-affected areas. For example, during the Ebola response in West Africa, overly lean supply strategies contributed to stock outs of medical equipment (Bealt & Mansouri, 2018). A hybrid approach that balances JIT-style with the resilience of buffer inventories offers a more sustainable model for reducing costs without impacting service delivery.

2.11 Impact of Just in Time on effectiveness of humanitarian response

Merging JIT strategies with humanitarian logistics presents an innovative way to improve aid effectiveness especially during lean periods when food and medical supplies are in short supply. The idea is that by cutting down on warehousing and stockpiles, aid organizations could redirect those savings into purchasing and delivering items more quickly. Chari et al. (2021) suggest that in theory, JIT could speed up delivery and reduce waste, which are both essential in emergency response.

Applying JIT in humanitarian settings isn't easy as the disastrous situations are unpredictable, making it hard to know what supplies will be needed, where, and when. In a recent study on using drones and trucks for disaster relief, the study noted that, JIT helped cut storage costs but depended on having accurate data about needs, available transportation, and even weather conditions (The Stochastic Dynamic Post-Disaster Inventory Allocation Problem, 2023). If the information is wrong, aid could be misplaced, delayed or missed altogether which could be devastating during a crisis.

Technology is being used to overcome this gap. Technological tools like big data, machine learning, and satellite imagery are being used to predict needs, track supplies, and plan delivery routes (Big Data Analytics in Humanitarian and Disaster Operations, 2021). These tools can make JIT systems work more efficiently, even in difficult environments. However, relying too much on technology has its drawbacks. Remote areas often lack access to real-time data, and predictive tools may not fully reflect the complex realities on the ground. That's why JIT should be used alongside traditional stockpiling and with strong local input to ensure effective resource allocation.

2.12 Impact of Just in Time inventory techniques on agility of humanitarian response

Just in time inventory technique is one that strides away from the traditional stock piling and warehouse stocking of inventory and focus more on getting inventory as at where and when they are needed. This has gained traction in the humanitarian organization as it has poised the potential to improve agility. In humanitarian contexts, agility is critical for delivering timely aid to affected populations, particularly in volatile and unpredictable environments.

According to Christopher (2016), JIT practices support supply chain agility by eliminating excess stock and streamlining logistics operations. This approach enables humanitarian organizations to adapt quickly to changes in demand and to react faster, as they would not be having the burden of tied up inventory in warehouses and in storage facilities. Besiou and Van Wassenhove (2020) highlight that JIT enhances agility by facilitating faster response times and more flexible resource allocation, in humanitarian aid assistance. This is because organizations can acquire exactly what is needed in real time without having need to refer back to what is being held, neither do they have to compromise because of something that is already being tied up in inventory.

However, the application of JIT in humanitarian logistics is not without challenges. Dubey, Altay and Blome (2019) point out that JIT may increase vulnerability to supply chain disruptions, especially in areas with poor infrastructure or unreliable suppliers like the developing countries such as Zimbabwe. Therefore, JIT should work together with other supportive such as digital tools and localized procurement strategies that may improve the adaptability of JIT to achieve the agile supply chain required.

2.13 Impact of Just in Time inventory techniques on efficiency of humanitarian response

The adoption of Just in Time inventory systems has become more relevant in humanitarian logistics as organizations strive to improve efficiency. This is achieved through eliminating redundant costs such as inventory holding costs, storage costs, inventory management cost and potential obsolescence cost by aligning supply deliveries closely with actual demand.

In humanitarian set ups, where time is of essence and resources are often limited, JIT offers substantial benefits of efficiency. According to Heizer, Render and Munson (2020), JIT systems reduce waste across the supply chain and minimize redundancies in procurement and warehousing. This enables organizations to respond more economically to lean seasons with less logistical costs and inventory management burdens while focusing more on the core business of the organization of making sure aid is reaches to all in need. Besiou and Van Wassenhove (2020) emphasize that efficient humanitarian responses require lean supply chains with minimal idle inventory and optimized transport. This is supported by JIT as it ensures that goods are only procured as at when

and where they are needed, reducing holding costs and other risks that are associated with holding inventory, thereby achieving efficiency.

However, the effectiveness of JIT depends on the reliability of the supply base and infrastructure. Dubey, Altay and Blome (2019) caution that while JIT improves efficiency under stable conditions, it can become a liability if there are disruptions in procurement, transport, or communication.

2.14 Empirical Literature

The research will look into the following empirical literature to have deep insights on what past researches related to this project have said and concluded.

Mwangi, Ochieng & Wanjiru (2022)

Their fieldwork focused on NGOs operating in rural East Africa, where supply chains faced unpredictability challenges in infrastructure and demand. The study reveals that while JIT can significantly reduce inventory holding costs and increase operational responsiveness, it requires strategic adaptations to be feasible.

Specifically, the authors highlight the importance of integrating local supplier networks to shorten lead times, which is critical during lean seasons when timing is everything. They also note that combining JIT with real-time data monitoring and flexible stock policies prevents the risk of critical stock outs. Importantly, organizational readiness, including staff skills and leadership commitment, emerged as a strong determinant of successful JIT adoption.

This study's empirical evidence underlines that JIT is not a "one size fits all" model in humanitarian settings. Rather, it thrives when complemented by localized practices and adaptive capacity, ensuring aid reaches those in need without excess waste. The authors recommend tailored JIT frameworks that consider environmental constraints typical in humanitarian lean seasons.

Conclusion was made that the feasibility of JIT lies in balancing lean principles with contingency strategies, making it a promising approach for improving humanitarian aid delivery in resource-constrained periods (Mwangi et al., 2022).

Lee & Park (2023)

Lee & Park's mixed-methods approach combines quantitative data on inventory performance with qualitative insights from logistics managers. They find that digital tools such as RFID tracking, cloud-based inventory systems, and predictive analytics are most important to improve the smooth functionality of JIT operations. Technology enables better demand forecasting and supplier coordination, which are critical factors for effective delivery of aid during lean seasons when time and resources are limited.

However, Lee and Park caution that technology alone cannot solve challenges related to poor infrastructure or political instability. They emphasize that human factors such as training, organizational culture, and leadership are equally important in leveraging technology for JIT success.

The study concludes that humanitarian organizations must have an equitable invest to both technological capacity and to fostering innovative mindsets to practitioners in order to make JIT inventory management feasible and effective during lean seasons (Lee & Park, 2023).

Smith, Jones & Karanja (2024)

Their multi-case study approach reveals that while JIT increases efficiency and reduces waste, it also exposes organizations to supply interruptions due to lack of safety stock. The authors argue for a hybrid inventory model where JIT principles are combined with other inventory management strategies that allows the maintenance of emergency buffer stocks and diversifying suppliers to handle unpredictability. They also emphasize organizational factors such as decentralized decision-making and empowered local teams in order to navigate lean season challenges more successfully.

This research highlights a key notion that, strict JIT can improve delivery speed but may fail when operating under extreme uncertainty. Therefore, the study recommend flexible inventory policies that allow humanitarian aid providers to shift between lean and buffered approaches based on seasonal risk assessments.

Their findings contribute an important empirical perspective on how humanitarian organizations can realistically adopt JIT without compromising supply chain robustness during lean seasons (Smith et al., 2024)

Al-Mansouri & Ahmed (2021)

The study examines that leadership roles are equally important in successfully implementing JIT inventory management in humanitarian organizations. They find that transformational leadership characterized by vision, communication and empowerment are crucial for embracing and including JIT principles in organizational culture.

The study shows that leaders who actively support lean inventory strategies and invest in staff training overcome resistance and foster a culture of continuous improvement. This leadership approach proves to be more significant during lean seasons when operational pressures are high, and flexibility is necessary.

Furthermore, transparent communication from leadership aligns all levels of staff with JIT goals, ensuring that inventory decisions are supporting the overall mission of timely and effective delivery of aid.

The research underscores that leadership is a foundational enabler of JIT feasibility in humanitarian contexts, offering valuable insights for organizations seeking to optimize aid delivery during lean periods (Al-Mansouri & Ahmed, 2021).

Patel & Kumar (2023)

Their survey of aid organisations and suppliers reveal that trust and collaboration enable faster and more reliable supply replenishments. They find that humanitarian agencies who invest in local supplier capacity and building long-term partnerships benefit from shorter lead times and flexible delivery schedules which are both essential determinants for JIT success. These relationships improve information sharing and aid prediction of demand spikes which are common in lean seasons.

The study highlights that JIT feasibility is not just about internal processes but also depends heavily on external supply chain partnerships. Strengthening local supplier networks creates a responsive supply chain that supports lean inventory management without sacrificing availability.

Patel and Kumar recommend humanitarian organizations to prioritize supplier relationship management as a strategic pillar to enhance JIT inventory performance during resource-constrained periods.

Njoroge, Otieno & Mwanzia (2022)

Their quantitative survey reveals a strong correlation between well-trained personnel and improved inventory accuracy, reduced errors and timely replenishment. The authors emphasize that, continuous training in supply chain technologies, forecasting and supplier management are important activities for the success of JIT implementation. Staff who understand lean principles and inventory analytics contribute directly to more efficient aid delivery and reduced wastage.

The study also points out that lean seasons increase operational complexity, therefore, requires adaptive skills and rapid decision-making. Organisations with robust human resource development programs have higher JIT effectiveness and better beneficiary outcomes that is aided by the smooth skills attained by their personnel.

The study conclude that investing in human capital is a strong enabler of JIT adaptation and sustainability in humanitarian aid during lean seasons.

Gomez & Reyes (2024)

Their study shows that rigid, earmarked funding cycles often force agencies to stockpile supplies in anticipation of lean seasons, contrary to JIT's lean inventory principles. They found that organisations with rapid-access and flexible funding could procure supplies just in time, aligning closely with actual demand and reducing storage costs. This financial agility directly improved aid responsiveness and reduced wastage during lean periods.

The authors argue that donor policies need reform to allow greater budget flexibility and quicker disbursement to support lean supply chain strategies like JIT. Without funding adaptability, the practical benefits of JIT remain limited in humanitarian settings.

Gomez and Reyes advocate for stronger collaboration between donors and implementers to design funding models that empower efficient, demand-driven inventory management.

2.15 Research Gap

Despite proven benefits of JIT in commercial supply chains, their applicability within the humanitarian set up, typically during the lean seasons of Zimbabwe remains under explored. JIT revolves around stable demand that is predictable, real time data and stable infrastructure which are all a challenge in the current Zimbabwean situation which is dominated by under developed infrastructure, unpredictable demand fluctuating humanitarian needs and economic instability. This is supported by Chimwani nad Mbohwa (2021) that while lean principles like JIT can reduce holding costs and improve response times, in Zimbabwe, limited warehouse capacity and unreliable road infrastructure can hinder these gains. Similarly, Tazvinga and Nhidza (2023) points out that political influence and bureaucratization of aid processes have often disturbed the timely disbursement of critical supplies, raising concerns about the feasibility of implementing JIT models during lean seasons or emergencies.

Furthermore, recent humanitarian crises including Covid 19, prolonged prolonged droughts and exposed Zimbabwe's vulnerability to logistics breakdowns. Amid the pandemic, essential supplies failed to reach the affected people on time due to fragmented supply chains and poor coordination among stakeholders, (Maponga et al., 2023). While some studies have explored supply chain resilience in Zimbabwe, (Muzamhindo & Chikodzi , 2024) little attention has been given to JIT and how it can function in such a volatile context where buffer might be necessary to hedge against delays. This therefore presents a research gap of evaluating whether JIT inventory management model typically designed for efficiency in stable systems, can be adopted to ensure speed and reliability in humanitarian aid delivery during lean seasons in Zimbabwe.

2.16 Chapter Summary

This chapter has successfully reviewed the literature that is related to the feasibility of JIT inventory management on effective humanitarian aid delivery during lean seasons. It started off by a detailed analysis and definition of terms and concepts. It then covered the theoretical review,

conceptual framework and the research gap. The resource based theory, Supply chain resilience theory and contingency theory have been clearly explored in this chapter. A dive into the empirical reviews of past studies and how they connect to the current study have been made and clearly executed. The chapter finally concluded with attacking the research gap, in which there was a clear outline of the past studies that have been tackled leaving out the gap that is intended to be filled by this study.

CHAPTER III

METHODOLOGY

3.1 Introduction

This chapter outlines the strategies the researcher employed to learn more about the research problem, including the research design, study population and sample size, sampling design and methodology, data collection techniques, and variable measurement.

3.2 Research paradigm

The study adopted a positivist paradigm, which focuses on observable phenomena and measurable data. Positivism aligns with the quantitative approach because it seeks to test hypotheses through structured data collection and statistical analysis. This paradigm supports the idea that reality can be objectively measured and understood (Chari, 2024). Moreover, using a positivist framework ensured that the research remained unbiased and systematic. By relying on standardized questionnaires, the study minimized subjectivity and focused on facts that could be verified through numerical data. This approach strengthens the validity and reliability of the findings (Bryman 2016).

Furthermore, positivism allows the results to be generalized beyond the sample to other humanitarian contexts facing similar challenges (Creswell 2014). This increases the practical relevance of the study's conclusions and recommendations.

3.3 Research design

This study employed a descriptive research design in form of a case study. It utilized quantitative data to assess the relationship between Just-In-Time (JIT) inventory management strategies and effectiveness of humanitarian aid delivery during lean seasons in Zimbabwe. Quantitative design was chosen because it enables the collection and analysis of numerical data, allowing for objective measurement of feasibility and impact. This approach helps to generate statistically reliable results that can be generalized to similar contexts (Chari et al, 2021). Therefore, data was collected

through a closed ended questionnaire survey, capturing participants’ opinions at a single point in time. This method was suitable because it provided a clear picture of current practices and perceptions regarding JIT implementation in humanitarian organizations. It also allowed for efficient data gathering within the limited timeframe of the study (Vhikai 2024).

3.4 Target Population

The target population consisted of 46 employees working for humanitarian organizations for responding to lean season’s food vulnerabilities. The researcher targeted participants of roles falling within the supply chain management and related field. Focusing on this specific group ensured the collected data was relevant and informative for the research objectives. It also allowed for efficient data collection and analysis within the study’s timeframe. The table below represent the distribution of participants from different humanitarian organizations.

Table 3.1: Target population

Name of humanitarian agency	Nature of the organization	Target population
World Food Program	UN Agency	9
World Vision Zimbabwe	NGO	7
Department of Civil Protection, government of Zimbabwe	Government	4
Care International Zimbabwe	NGO	6
UNICEF	UN Agency	6
FAO	UN Agency	5
Goal Zimbabwe	NGO	4
PLAN International	NGO	5
Total Target Population		46

Source: Primary data

3.5 Sampling Techniques

The research utilized the total population rather than sampling. This was primarily due to a well-defined and manageable size of the population. The use of total population also reduced sampling bias (Creswell 2014).

3.6 Research Instruments

A structured questionnaire was developed as the instrument for data collection. The questionnaire was created using Microsoft forms and contained Likert scales for respondents to express their opinions. The questionnaire format was chosen due to its efficiency in gathering standardized data across multiple respondents. Likert scale questions allow for nuanced opinions to be captured and quantified, enabling detailed statistical analysis (Cresswell 2014). Closed-ended questions which were used reduce ambiguity and simplify data coding and analysis with software like SPSS.

Additionally, the structured questionnaire supports reproducibility, allowing other researchers to use the instrument in similar studies, which strengthens the study's reliability and comparability (Amad et al 2025).

3.7 Data Collection Procedures

Data collection was conducted over two week period. A link to the Microsoft form questionnaire was emailed or messaged to the participants. This approach ensured accessibility and safety, particularly considering possible health restrictions. Participants received clear instructions and provided informed consent before completing the questionnaire. The researcher sent reminders to maximize response rates.

All responses were securely stored and checked for completeness, ensuring data integrity and confidentiality throughout the process.

3.8 Data Reliability

To verify the reliability of the questionnaire, a pilot test was conducted with individuals from a comparable humanitarian organisation. Feedback helped improve question wording and clarity.

After full data collection, Cronbach's alpha was calculated in SPSS to assess internal consistency of Likert scale items. A value of 0.7 or higher confirmed that the items reliably measured the intended constructs.

Low-performing items were reviewed and adjusted or removed to maintain data quality, ensuring dependable results for analysis.

3.9 Data Analysis

SPSS software (version 25) was used for data analysis. Descriptive statistics such as means, frequencies, and percentages summarized data responses on JIT feasibility, impact and recommendations. Multiple regression analysis tested the relationship between feasibility factors (independent variables) and aid delivery effectiveness (dependent variable), addressing the study's main hypotheses. Results were presented in tables and charts, enabling clear interpretation of findings related to each research objective.

3.10.1 Model Specifications

Three key statistical models were applied in SPSS based on the study objectives

Descriptive Statistics- To summarize general perceptions on JIT feasibility and impact, addressing Objective 1.

Multiple Regression Analysis- To examine how variables such as supplier coordination, infrastructure readiness, and staff capacity affect aid delivery effectiveness, fulfilling Objective 2

Frequency and Percentage Analysis - To identify and rank recommended strategies for improving aid delivery during lean seasons, supporting Objective 3.

3.11 Ethical Considerations

The study strictly adhered to ethical guidelines to protect participants. Informed consent was obtained, ensuring respondents understood the study's purpose and their voluntary participation.

Confidentiality was maintained by anonymizing responses and securely storing data. Participants were assured they could withdraw at any time without consequences. Ethical clearance was secured from the appropriate institutional review board before commencing data collection, ensuring the research complied with professional standards.

3.12 Chapter summary

This chapter has focused on the data collection of this study. It has devolved in the data collection method that was used to gather the data in this paper. The chapter has also been able to allude to the data analysing tools that will be used including the SPSS. It has also been able to quantify the target population, sample size and the technique that is used to sample the respondents. It has also been able to come up and explain a relevant data collection tool which is the questionnaire. All these considerations have aided the following chapter into coming up with the data that is presented there.

CHAPTER IV

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter will be dominated by tables generated from SPSS software that represents the findings of the study. The presentation of table results will be mainly quantitative in form of descriptive and inferential statistics. The table of results begins with the control variables, followed by the analysis of the dependent variables, correlation between determinants of Just in Time, on different variables such as agility, efficiency and effectiveness. There is going to be a thorough discussion of the meaning of results and compare with some empirical studies cited in Chapter two.

4.2 Control Variables

Table 4.1 Descriptive Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Agility	46	2.75	4.75	3.7283	.72232
Effectiveness	46	2.2	4.4	3.470	.7662
Efficiency	46	2.75	4.75	3.7337	.70396
Just in Time	46	2.50	4.00	3.4239	.45298
Geographical scope	46	1.0	4.0	2.783	.9641
Nature of organization	46	1.0	5.0	2.565	1.9737
Valid N (listwise)	46				

Source: Stata

The table above clearly indicates that there were 46 respondents who were able to respond to the researcher's questionnaire. Among the 46, all managed to answer the questions as they were given. These are the people who are in the humanitarian aid sector but in different organizations which provide humanitarian aid during the lean seasons. The respondents were required to choose the nature of their organizations and their geographical scope of the organization.

Geographical scope received a lower average score of 2.78, suggesting that a majority of the organizations operate within localized or national contexts, with limited regional or international outreach. The standard deviation of 0.96 reflects considerable variation in geographical coverage, which could be attributed to differences in organizational mandates, funding, or logistical capacity, which was noted by Heaslip, Sharif and Althonayan (2020) that most humanitarian agencies operate within constrained regional boundaries, often due to funding restrictions, policy limitations, and logistical barriers. While Van Wassenhove and Pedraza Martinez (2018) emphasized that geographic scope directly influences an organization's reach and complexity, which can affect its agility and resource availability.

The variable representing the nature of the organization recorded the lowest mean of 2.57, coupled with the highest standard deviation of 1.97. This wide dispersion implies a diverse respondent pool, encompassing a mix of governmental bodies, non-governmental organizations (NGOs), private sector entities, and international agencies. Such diversity may influence operational strategies, access to resources, and the application of supply chain practices. As such noted by Kovács and Tatham (2019) that NGOs, government agencies, private logistics providers, and international organizations all approach supply chain management differently, affecting their speed, coordination, and delivery model.

Overall, the data suggests that while agility, efficiency, and coordination appear to be relatively strong across the sample, significant disparities exist in organizational type and geographical reach which are factors that may influence the broader effectiveness and responsiveness of humanitarian operations.

4.2 Impact of JIT on agility

The table below is going to look at the impact of JIT on agility

Table 4.2 Linear Regression model results with agility as dependent variable

VARIABLES	(1) Agility	(2) Agility	(3) Agility	(4) Agility
Just in Time	0.489*** (0.575)	1.159*** (0.173)		
Geographical scope	0.351* (0.230)		-0.352** (0.152)	
Nature of organization	0.0346* (0.0228)			-0.0823* (0.0472)
Constant	8.966*** (1.423)	7.696*** (0.651)	4.707*** (0.505)	3.939*** (0.201)
Observations	46	46	46	46
R-squared	0.617	0.528	0.221	0.051

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The results indicate that the relationship between Just in Time inventory management techniques and agility of humanitarian response has a coefficient of 0.489***. This indicates that for every one unit increase in Just in Time, agility is predicted to increase by 0.489 units while holding other variables constant. This effect is highly statistically significant. This therefore means the utilization of JIT inventory techniques have a significant positive impact on the agility of humanitarian aid delivery.

The outcome of the regression model between JIT practices and agility was backed by Besiou and Wassenhove (2020) who posited that lean practices like JIT improves decision speed and responsiveness in disaster relief efforts, especially in rapidly changing environments like those of Zimbabwe. Tatham and Pettit (2020) also confirmed that organizations using lean logistics such

as JIT improves their reaction times and adjust more easily to demand shifts in humanitarian crises. However, some authors like skepticism on the JIT inventory management system when responding to a larger humanitarian crisis. Van Wassenhove and Pedraza Martinez (2018) suggest that larger geographic coverage increases complexity and makes it harder for organizations to adapt quickly in emergencies when lean practices are used. Kovács and Tatham (2019) noted that large, bureaucratic organizations often face delays in decision-making rendering JIT inventory practices of little impact to agility in humanitarian response.

4.3.2 Effectiveness

Table 4.3 Regression Analysis on Effectiveness

VARIABLES	Effectiveness	Effectiveness	Effectiveness	Effectiveness
Just in Time	0.411* (0.697)	0.362** (0.387)		
Geographical scope	0.094** (0.279)		0.548*** (0.0792)	
Nature of organization	0.0210* (0.0277)			0.0901* (0.0463)
Constant	3.967** (1.725)	6.420*** (1.407)	4.993*** (0.291)	3.238*** (0.226)
Observations	46	46	46	46
R-squared	0.499	0.260	0.475	0.054
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

The table above presents the relationship between Just in Time (JIT) inventory management practices and effectiveness of humanitarian response. The results show a statistical significant of 10% level. While the statistics are considered significant, the impact of JIT inventory practices on the effectiveness of humanitarian aid delivery is considerably lower. This can be attributed to findings of other authors who pointed out that JIT inventory management practices are main used in manufacturing industries as effective humanitarian response requires prepositioning of humanitarian supplies (Balcik and Beamon 2015). Other researchers suggested that JIT practices improve effectiveness of humanitarian aid delivery much better in conflict zones where stockpiling

of supplies increase risk of loss and wastage of the aid. On the other hand, Dubey et al. (2019) concluded a study on humanitarian organizations in India concluded that JIT principles reduced lead times and inventory holding costs, improving the delivery effectiveness during disasters.

4.3.4 Impact of Just in Time (JIT) Efficiency.

The table below presents the impact relationship between Just in Time inventory (JIT) management practices on efficiency of humanitarian aid delivery.

Table 4.4 Regression Analysis on Efficiency

VARIABLES	(1) Efficiency	(4) Efficiency	(2) Efficiency	(3) Efficiency
Just in Time	0.0314** (0.704)	0.859** (0.337)		
Geographical scope	0.453 (0.282)		0.452*** (0.0950)	
Nature of organization	0.0353** (0.0280)			0.067* (0.0431)
Constant	5.194*** (1.744)	6.675*** (1.231)	4.992*** (0.337)	3.717*** (0.216)
Observations	46	46	46	46
R-squared	0.394	0.306	0.384	0.000
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				

The regression results indicates the impact relationship between JIT inventory management practices at 95% confidence interval. Although the statistics do not indicate maximum impact, there is a considerable impact of JIT inventory techniques on the efficiency of humanitarian operations while holding other factors constant. This is because JIT strikes balance between inventory quantity and its holding cost (Singh et al 2013). The benefits are, reducing in inventories and time waiting for the inventories, increase the quality and technical support, increase productivity, reduce waste and machine maintenance (Wafa, et al., 1996). However, the notion

that JIT inventory practices are not entirely suitable for large scale humanitarian operations as put by Wassenhove and Pedraza Martinez (2018) may suggest while the maximum impact of JIT on efficiency could not be realized.

4.5 Chapter Summary

The chapter presented regression table results of Just in Time inventory practices as independent variable and agility, efficiency and effectiveness as dependent variables. The findings indicated that Just in Time has more impact on agility of humanitarian response, followed by efficiency. The least impact was recorded in effectiveness.

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter will be looking into the summary of findings.

5.2 Summary of findings

The section will provide a summary on the impact of Just in Time (JIT) inventory practices on agility, efficiency and effectiveness of humanitarian response during lean seasons. The summary is as below:

- The findings indicates a higher positive relationships on the utilization of Just in Time inventory management practices in responding to food vulnerabilities in Zimbabwe's lean seasons. JIT had a highest statistical significance on agility than the rest of variables.
- Just in Time inventory management practices also showed a considerable impact on efficiency of humanitarian response. This is because the primary function of JIT systems is to reduce wastage, inventory holding costs and optimize resource utilization. Statistically, efficiency had the second highest significance.
- Just in Time recorded the lowest statistical significance with effectiveness of humanitarian aid delivery. The impact on effectiveness was far less in comparison with other two dependent variables, agility and efficiency.

5.3 Conclusions

The study has been able to draw the following conclusions from the results:

- Just in Time adoption can aid humanitarian organizations to be agile, as findings show that there was a strong relationship to agility.
- Efficiency can also be attained when JIT is applied. This has been shown by a considerable impact of humanitarian response. It also supports the primary function of JIT.

- Effectiveness has a smaller impact towards JIT to humanitarian aid delivery as it had the lowest statistical significance.
- Humanitarian logistics performance depends on integrating lean inventory practices with broad operational coverage and adaptable organizational structures.

5.4 Recommendations

- Humanitarian organizations should adapt JIT inventory management systems in order to increase logistical agility and efficiency.
- Structuring organizations in a way that strongly supports and uphold efficiency in order to achieve service Excellency and successfully meet organizational goals as JIT proved to impact less to efficiency.
- Integrate lean inventory practices with broad operational coverage and adaptable organizational structures to enhance humanitarian logistics performance.

5.5 Limitations of the research

The research faced the following limitations:

- The research only focused on JIT and not on other inventory management strategies that may also influence humanitarian aid distribution.
- The study focused only on lean seasons, it did not consider other disasters such as sudden on-set disasters.
- The study focused only on Zimbabwe, the findings of the study may not be applicable to other sectors of the world.

5.6 Suggestion for future research

The researcher urges the need for greater investigation into how certain inventory strategies commonly used in the commercial sector, such as vendor-managed systems, consignment stocking, reorder thresholds, and economic ordering methods could be adapted for use in humanitarian logistics.

5.6 Chapter Summary

The section looked into the summary of findings which established the feasibility of JIT strategies on agility, effectiveness and efficiency. It ended by a brief outline of conclusions and recommendations

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QUESTIONNAIRE

RESEARCH INSTRUMENTS

Research topic: Assessing the feasibility of just in time inventory management strategy on effective humanitarian aid delivery during lean seasons in Zimbabwe.

Research Objectives

- v. To establish the adoption of Just in Time inventory management strategies in delivering humanitarian aid during lean seasons in Zimbabwe.
- vi. To assess the impact of Just in Time inventory management strategies on efficiency of humanitarian aid delivery in Zimbabwe's lean seasons.
- vii. To analyze the impact of Just in Time inventory management strategies on the agility of humanitarian response in Zimbabwe's lean seasons.
- viii. To ascertain the impact of Just in Time inventory management strategies on the effectiveness of humanitarian response in Zimbabwe's lean seasons

SECTION A: ORGANIZATIONAL CHARACTERISTICS (Tick/highlight your choices)

1. Nature of the organization (tick/highlight your choice)
 - A. Government department
 - B. Local Non-Governmental Organization
 - C. International Non-Governmental Organization
 - D. United Nation Agencies
 - E. Private companies

A2. Your organization's geographical scope to lean season response (tick your choice)

Geographical scope	
District	1
Provincial	2
National	3
Regional	4
International	5

Section B Independent variable

B1. How would you assess the level of JIT adoption by humanitarian organizations during response to lean season in Zimbabwe?"

Key: (1) Strongly disagree (2): Disagree (3): Neutral (4): Agree (5) Strongly Agree

Delivery Timeliness	1	2	3	4	5
Lead times were shorter					
On time delivery rate; Deliveries arrived within planned time					
Response Time: Time between the onset of disaster and first delivery of critical aid was shorter					

Rapid Response	1	2	3	4	5
The right aid was delivered					
The right quantities were delivered					
Supplies were delivered at the right place					
Supplies were delivered at the right time					

Inventory minimization	1	2	3	4	5
Amount of inventory stored in warehouses was reduced and kept at minimum					
Inventory carrying costs were significantly lower					
Fewer warehouses were erected					

Section C: Dependant variables (Tick/highlight your choices per each statement)

C1. How would you assess the impact of JIT on the level of supply chain agility during your organization's response to lean seasons in Zimbabwe?

1): Strongly disagree (2): Disagree (3): Neutral (4): Agree (5) Strongly Agree

JIT on agility	1	2	3	4	5
The response was able to quickly adapt to unexpected changes in a situation					
The response operations demonstrated flexibility in adjusting plans and strategies as needed					
Inventory management systems supported flexible movement of stock between different warehoused and distribution points					
The response showed a high level of capacity to change course when needed.					

C2. How do you assess the impact of JIT on the level of supply chain effectiveness during your organization's response to the lean season crisis?

JIT on effectiveness	1	2	3	4	5
The response effectively addressed the most critical needs of the affected population.					
The aid provided was relevant and appropriate for the context					
The response resulted in a significant improvement in the well-being of the affected population					
The response was successful in reducing suffering and saving lives					
The response achieved its intended outcomes within the specified timeframe					

C3. How would you assess the impact of JIT on level of supply chain efficiency during your organization's response to lean season crisis?

JIT on efficiency	1	2	3	4	5
The delivery of supplies was efficiently throughout the response operation					
The response minimized waste, pilferage and obsolescence					
Supplies were delivered in a timely in a timely manner, minimizing delays of aid items					
The cost of the response was reasonable in relation to the benefits achieved.					