

**Bindura University
of Science Education**



**EFFECTS OF INVENTORY MANAGEMENT PRACTICES ON THE
ORGANIZATIONAL PERFORMANCE OF THE DAIRY PROCESSING INDUSTRY IN
HARARE, ZIMBABWE**

BY

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**A RESEARCH PROJECT SUBMITTED TO BINDURA UNIVERSITY OF SCIENCE
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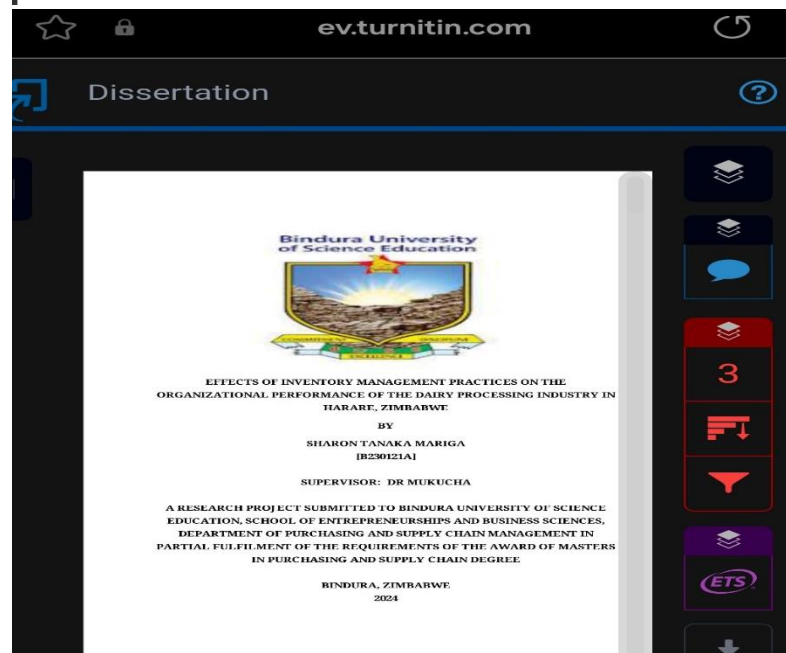
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DECLARATION

I declare that this research is first hand work. The research has never submitted by for assessment and award of a Master's degree.

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APPROVAL FORM

The undersigned certify that they have read and recommend to the Purchasing and Supply Chain Management Department, School of Business, Bindura University of Science Education, for approval of a project titled **Effects of inventory management practices on organizational performance of the Dairy Processing Industry in Harare, Zimbabwe** which was submitted by **Sharon T Mariga** in partial fulfillment of the requirements for the Master's degree in Purchasing and Supply Chain Management.

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Signature:

Date: 06/07/24

DEDICATION

This research project is dedicated to Mrs. Mariga who gave me a hand throughout this research. The support they gave me ensured that completed this project.

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Firstly, am thankful to God for granting me knowledge and healthy to reach this far and work on this project. Secondly, I hereby acknowledge my lectures at Bindura University of Science Education and my supervisor Doctor Mukucha, for the effective and efficient and support and encouragement from the beginning to the end of this project. In addition, I would like to thank Bindura University of Science Education for granting me the opportunity to do this research. Last but not least, I would like to thank myself for encouraging myself to go ahead. Finally, I would like to extend my gratitude to all the Dairy Food organizations for giving me timely and relevant data.

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ABSTRACT

This paper investigates the effect of bullwhip effect on the performance of the firms in the dairy processing industry in Harare, Zimbabwe particularly on the inventory management system. From this study, VMI implementation, product postponement, JIT and periodic stocktaking significantly reduce Bullwhip Effect. The literature of this research was also presented using previous studies where the theoretical, conceptual and empirical contexts were made. Data gathered from Dairy Board Holdings Limited is secondary data that is collected with the purpose of computing the different inventory indices and the data is analyzed by SPSS 27. These basic measures indicate that there is moderate variation in the overall inventory management, where current inventories and inventory values present high coefficients of variation. Multivariate analysis shows the comparative impact of current inventory level of JIT order quantities, lead times, and postponements. It has a very slight influence on the actual stock quantity during stock consumption or periodical stock taking. Implications from the analysis show that VMI is supportive in minimizing the bullwhip effect on the raw materials and similarly, product postponement is useful in the minimization of the bullwhip effect on the finished products. JIT practices are most suitable in the current conditions of inventory efficiency. These results highlight the significance of real-time and reliable inventory information in optimizing the supply chain and eliminating unnecessary losses. From this study, it can be concluded that the overall management of inventory is highly important when it comes to the elimination and reduction of bullwhip effect for the overall better performance of the organizations dining processing industry. Suggestions made are attaining high levels of demand forecasting tools, improving cooperation with the suppliers, adopting JIT inventory and VMI, providing encouragement for supply development, and maintaining the progressive and versatile supply chain models. It is recommended to conduct the studies to verify realistic solutions of these problems over long term and to analyze qualitative factors, which affect inventory control and the bullwhip effect. This research also emphasizes the need to balance on several inventory management practices in a bid to reduce the bullwhip effect and ultimately enhance the organizational performance in the dairy processing sector in Harare, Zimbabwe.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Dairy processing industry is among key industries in Harare Zimbabwe in as far as employment creation and contribution to food security is concerned. Like any other industry the dairy processing sector is not immune to challenges which affect performance of the industry. One of the major challenges which affect the industry is Bullwhip Effect. Bullwhip effect is a phenomenon associated with demand variability increasing as orders or demands travel upstream along the supply chain. Bullwhip effect or phenomenon may result in poor inventory control, poor production planning and scheduling and poor customer satisfaction which eventually compromises performance of the industry. For an industry such as the dairy processing sector in Zimbabwe, to overcome or reduce the adverse effects of bullwhip effect on performance there is need to understand factors which stimulate the bullwhip effect. There is paucity of empirical literature in as far as bullwhip effect and its repercussions on organizational performance particularly in the dairy processing sector in Zimbabwe. This research gap prompted the study to investigate the bullwhip effect and its effects on inventory control practices, production planning and scheduling as well as customer satisfaction and retention in the dairy processing sector in Harare, Zimbabwe. Understanding the challenges the Bullwhip effect poses to the dairy industry through this study will make it possible to suggest remedial measures which may contribute towards sustainable development and growth of the dairy processing industry in Harare, Zimbabwe.

1.2 Background of the study

Harare Zimbabwe's dairy processing industry has a huge role to play in the nation's economy due to its contribution in availing dairy products to the people. However, it has its own unique

challenges just like many others and they affect its efficiency and overall performances. Another such issue is the Bullwhip Effect which defines the increasing variation in demand with every step from the downstream part of the supply chain toward the upstream end. This tends to have several offshoots such as higher inventories, poor planning of production and services, and customer dissatisfaction.

The processing of dairy products involves a group of industries that is central to the food value chain and plays a key role in feeding consumers around the world. However, the industry is still fraught with a number of challenges which are both profound and detrimental to the performance of an organization: the Bullwhip effect. The Bullwhip Effect, initially defined by Lee, Padmanabhan, and Whang in 1997, is a variability amplification phenomenon that occurs in supply chains when demand fluctuates and works its way upstream. This results in higher costs, difficulty to orchestrate manufacturing schedules and decrease in organizational responsiveness to the customer. Using concepts such as supply-chain dynamics and demand fluctuations, one can identify many elements causing the Bullwhip Effect in global dairy processing industry. Chen et al. (2000) considers that Bullwhip Effect includes; inaccurate demand forecasting is one of the factors that leads to stockouts due to fluctuations such as, seasonality, promotions among others.

Another reason for the Bullwhip Effect is order batching. Retailers tend to order in very large quantities to qualify for discounts or promotional costs. This creates spikes in demand that are hard to forecast and control as said Chopra and Meindl (2007). Pricing is another contributor to the Bullwhip Effect since discounts and promotions applied to the final products encourage retailers to buy more than the actual need, causing excess inventory and increasing demand variability (Metters, 1997). Finally, Simchi-Levi et al. (2008) stated that information delays and distortions throughout the supply chain also contribute to the Bullwhip Effect. The information that travels along the supply chain is often inaccurate and delayed causing incorrect inventory and production planning decisions to be made.

In the African dairy industry, the dairy processors experience challenges that contribute to the magnification of the Bullwhip Effect affecting organizational performance. First, the dairy supply chain in Africa is fragmented in nature comprising of smallholder farmers, limited infrastructure and poor market information (Kamanda et al. 2014). This fragmentation results in inefficiencies

in the supply chain coordination thus worsening the Bullwhip Effect. Second, the seasonality of milk production also contributes to the Bullwhip Effect in the African dairy processing industry.

Most developing countries in Africa including Zimbabwe as cited by Moyo et al. (2019) face seasonal changes in milk production due to weather conditions, farming practices among others. These seasonal changes lead to demand fluctuation and planning production hence contributing to the magnification of the Bullwhip Effect. Limited financial access for farmers and dairy processors is another challenge facing the African dairy processing industry. Insufficient financial capital for the farmers and dairy processors results in the inability to invest in technologies and infrastructural developments that can aid in alleviating the Bullwhip Effect, according to Chidzero et al. (2018). Moreover, poor transportation systems in most African countries results in delays and inefficiencies in the supply chain activities hence contributing to the Bullwhip Effect, said Mwangi et al. (2016).

The dairy processing industry in Zimbabwe is one of the vital subsectors in the country's economy because it contributes to employment creation and the markets' food supply. Nonetheless, the industry is not without its pitfalls that hinder its performance, and among them happens to be the Bullwhip Effect. As revealed by Chidzero et al. (2018), Zimbabwe has a few large-scale processors in the dairy sector whilst most producers are small scale farmers, this hinders the ability of all the players to market their products since supply and demand were quite hard to co-ordinate. This fragmentation in the industry plays a role in increasing the Bullwhip Effect as each participant in the chain work based the limited information available to them thus increasing the supply chain distortion.

The Bullwhip Effect has been one of the significant issues that affect the dairy industry in Zimbabwe due to Seasonality in milk production. Fertilizer use in Zimbabwe has been reported to be influenced by the one-time usage hence impacting highly the production of both the dry and rainy season milk yields (Moyo et al., 2019). This seasonality meant that there were variations in demand throughout the year which put much pressure on planning the right quantities to order and hence intensifying the Bullwhip Effect. Cash constraints for farmers and processors involved in the dairy industry are a critical problem which hinders them to develop technologies and facilities that reduce the effects of Bullwhip Effect, as noted by Chidzero et al. (2018). Besides, lack of proper transport vehicles and structures for picking and distributing the milk resulted in extra and

slow time in the system, which culminated in the occurrence of the Bullwhip Effect (Makucha and Chari, 2022; Moyo et al., 2019).

However, it was noted that the Bullwhip Effect is a major problem with the dairy processing industry in the global market, within the African continent, and locally in Zimbabwe. In addition to bullwhip effect, it has adverse effects at the strategic level and supply chain frontier by influencing costs, efficiency and customer services. As evident in the examples of Real Foods Limited, it is important to identify the causes of the Bullwhip Effect and design ways to reduce its occurrence since it threatens the sustainability of the dairy processing industry not only in Harare, Zimbabwe but also in other regions.

1.3 Statement of the problem

The problem revolves around the complexities faced by the industry resulting from the Bullwhip Effect and its repercussions on managerial outcomes. The cumulative demand variation known as the Bullwhip Effect that escalates as it proceeds up the supply chain is an influential challenge impacting the dairy processing industry in Harare. An important challenge is challenging the current approaches to the Inventory Management, and the role of the Bullwhip Effect. This amplification of the variability of demand has a detrimental effect on inventory costs as organizations try to maintain enough stock to meet the unexpected variability in demand they face. The worst in this operational model is that it leads to higher inventory levels during off peak consumption and on the other hand during peak consumption there is usually inadequate stock to meet the demand. Another one is related to planning and scheduling since the Bullwhip Effect actually affected it in many instances. When Bullwhip effect occurs, changes in demand signal are amplified as various organizations struggle to synchronize production schedules. Therefore, this cause wasted resources and productivity in production line, long cycle of production, and high cost of production respectively. Consequently, the Bullwhip Effect also affect customer satisfaction and their retention to patronize a given firm. When products are scarce in a supply chain due to the existence of Bullwhip Effect, customers are likely to be dissatisfied due to inconsistencies in the type and length of time it takes to get the products they want. Finally, this led to reduced consumer-base and consequently market share for the organizations in the dairy processing sub-sector. The formulation of the overall research question is an essential aspect of the statement of

the problem since it brings out the rationale for undertaking the research by identifying some of the more pressing issues affecting the dairy processing industry in Harare as pertains to the Bullwhip Effect, inventory management, production planning and customer satisfaction. Solving these issues lead to effective performance and competition within the context of the industry.

1.4 Research Objectives

The primary objective of this study is to examine the impact of the Bullwhip Effect on organizational performance in the dairy processing industry of Harare, Zimbabwe. Specific objectives include;

1. To evaluate the effectiveness of Vendor Managed Inventory in reducing bullwhip effect on raw materials.
2. To analyze the effectiveness of Product postponement in reducing bullwhip effect on finished products
3. To explore the how Just-In-Time (JIT) best assists in reducing bullwhip effect on consumables.
4. To elaborate how periodic stock taking assist in eliminating bullwhip effect on raw materials and finished goods.

1.5 Hypothesis/Statement of Proposition

H1: Vendor Managed Inventory contribute in reducing bullwhip effect in the dairy processing industry of Harare, Zimbabwe.

H2 Product postponement assist in eliminating bullwhip effect in the dairy processing industry of Harare, Zimbabwe.

H3 Just in Time (JIT) help in eliminating bullwhip effect in the dairy processing industry in Harare, Zimbabwe.

H4 Periodic stock taking assist in curbing bullwhip effect in the dairy processing industry of Harare, Zimbabwe.

1.6 Significance of the study/Justification

It is important to policy makers so as to make the necessary adjustments after analyzing the data on dairy processing, the government to implement policies that will improve the dairy processing industry, researchers in order to gain insight and make future recommendations.

1.6.1 To Policy Makers

Various policy makers therefore can incorporate the findings of this study while forming policies and strategies that will enhance efficiency and sustainability of the dairy processing company. This research aims to enumerate the causes of the disorder and uncover the negative effects that the Bullwhip Effect has on organizational performance in order to provide policy makers with guidelines on how to reduce the consequences of the phenomenon to improve the competitiveness of the industry.

1.6.2 To Dairy Processing Industry

In a broader perspective for the dairy processing industry in Harare, the study findings can offer insight on how the inventory management, production planning and customer satisfaction can be advanced. Through the correction of the Bullwhip Effect's implications, dairy processors are in a position of improving efficiency in operation, controlling costs, and ultimately achieving higher profitability.

1.6.3 To Government

From the information derived from this study, the government of Zimbabwe can obtain the benefit of having an insight of the problems facing the Dairy processing industry and the possible effects on the economy. The foregoing results can therefore assist the government in formulating policies and measures that can foster the structural development of the industry in terms of Infrastructure, finance and market information.

1.6.4 To Researchers

Given this understanding, the results of this study will be useful for scholars focusing on supply chain management and organizational performance. It is to note that working method of the study can be useful when the other individuals would investigate the similar issues in other industries or regions.

In sum, this study is useful in that it can enhance productivity and business competitiveness of dairy processing plants in Harare, Zimbabwe. There is an ability of overcoming the Bullwhip Effect that can contribute toward improving the performance of the industry and satisfying consumer demand for quality dairy products.

1.7 Delimitations of the study

In this regard, the study is confined to a reliance on data that existing databases may be limited to providing, without adequately capturing certain variables or aspects relevant to the context of the study. Moreover, the accessibility of the data taken into consideration restricts the investigation to a certain period and may exclude some recent advances or regional peculiarities. The main limitation lies in the methodological and definitional frameworks of the data that was recycled during the study, which may have influenced the scope and accuracy of the results.

1.8 Limitations of the study

The present research may face some limitations that might hinder the generality of the study as well as the conclusions made there from that include; Firstly, a lot of information may be missing in the secondary data to adequately address the implied research questions because of limitations on factors that cause bullwhip effect and organizational performance. There are two possibilities where SD (Secondary Data) could be general and non-specific or SD might contain older data and this could affect applicability of the studies conducted on current phenomena that exists within the industry. Secondly, the use of secondary data only is very important; it only depends on the results of primary data collected. In case the primary sources comprised of some of the biases, errors or inconsistencies, they could have been transferred to the current study which in turn is likely to undermine the validity and reliability of the current study. Moreover, it may be difficult to get information on the process through which data was collected, processed or even classified, which,

if not available, compounds difficulties and distorts truth in conclusions. The last has a drawback in that the information thus gained may be snapshots and not framed in terms of context. Secondary data in some occasions may be scarce on factors unique to the region or locality such as the Harare dairy industry, times have indicated economic factors, the regulatory environment or supply chain among others. This could bring about a biased result thereby restricting the extension of the results particularly within the framework of the investigation. Similarly, the use of secondary data also has its own limitation, they limit the researcher to dig deeper on trends or discovery that the research may find especially when conducting further research on existing researches. Nevertheless, secondary data also has its disadvantages. On the whole, analysis of secondary data is very useful and may be highly effective if the results of this analysis are integrated with results of analysis of the other types of data and the necessary tools.

1.9 Assumptions

The assumptions of the study include;

- Data sources are valid, credible and consistent to provide a true picture of the industry state.
- Data is consistent over time since it plays the most significant role
- Data values are independent, thus eliminating any interference of an unbiased evaluation and inference of the extent of the bullwhip effect's influence.
- The data is appropriate to the subject area of dairy processing industry taking a view of local markets, supply chain relationships, and other conditions.

1.10 Definition of Key terms

Bullwhip Effect – Recent studies have pointed at the so-called ‘demand amplification’, by which variability in demand increases as it is passed upstream in a supply chain, resulting in manufacturing overproduction and increased cost.

Organizational Performance – this established a means through which organizations can enable organizational Goals and Objectives by strongly evaluating the organizations through parameters such as financial performance, operational productivity and customer satisfaction.

Inventory Management Policies – They refer to the various policies that are implemented by organizations in managing inventories, in regard to ordering systems and the place where inventories are stored as well as being tracked. It concerns the determination of the right manufacturing rate and time that is necessary to cope with the customer orders that are expected while at the same time avoiding extra costs and ensuring a high productivity.

Customer Satisfaction – This is the measure of how satisfied customers who purchase products or receive services from an organization are before, during and after the consumption of the product. This is normally done by sending out questionnaires, speaking to the customers or by observing the body language of the customers.

Customer Retention – a marketing measure of the effectiveness of an organization in being able to hold on to customers in the long run, sometimes expressed in percentage terms as the proportion of customers who continue to do business with the organization.

Supply Chain Dynamics – This refers to the behavior of supply chain and factors that affect flow of products and information in supply chain network, as demand fluctuations, lead time, ordering patterns etc.

Performance – Refers to the effectiveness and achievement of aims, goals, objectives or mission by the organization, with regard to such factors as cost and output.

Sustainability – The occurring state of use of natural resources such that it does not after a period deplete resources that are essential to the wellbeing of future generations; Measured in environmental, social, and economic sustainability.

1.11 Chapter summary

Chapter one of this study gives background information in response to the fact that the dairy processing industry is a crucial sector in Harare. This chapter also justifies the focus on the Bullwhip Effect as one of the major problems in the industry. This chapter presents the goals of the study encompassing results regarding the Bullwhip Effect as well as its implications arising from the survey on inventory control, production planning and scheduling, and customer satisfaction and retention. The study proposes to fill this knowledge gap by examining the

Bullwhip Effect and its impact on the production systems of the dairy companies in Harare in order to enhance its efficiency and competitiveness.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to provide a thorough literature review on the Bullwhip Effect's impact on organizational performance, focusing specifically on the dairy processing sector in Harare, Zimbabwe. The Bullwhip Effect is a phenomenon that causes demand variability to increase as it moves up the supply chain and has been studied extensively across different industries worldwide. In the context of Zimbabwe, there is a dearth of research that examines the implications of the Bullwhip Effect in the dairy processing sector.

2.2 Theoretical Framework

To eliminate misunderstandings and confusion as to the distribution chain and how the whip effect is happening theoretical framework is required. This chapter will discuss some of these theories including Vendor Managed Inventory (VMI), production postponement, Just in Time (JIT) and periodic stocktaking with reference to inventory management practices' peculiarities. These models can be used as tools for successfully managing the stock so that the effect of the whip is reduced while enhancing the prosperity of the business as a whole."

2.2.1 Vendor Managed Inventory and bullwhip effect

Vendor managed inventory (VMI) is a supply chain management which has the supplier having the prime responsibility for the inventory of their products at the buyer's end. This flow of inventory management changes from the customer side to the supplier side with the primary goal of enhancing the efficiency of the supply chain and consequently eliminating unnecessary costs According to Mukhopadhyay (2019). Some of the key theoretical foundations for VMI have been developed from theories such as the bullwhip effect and the agency theory.

According to Lee et al. (1997) the bullwhip effect is explained as the instances where limited variations in demand at the consumer level result in even more extensive variations in demand at the supplier levels. Thus, this distortion of demand information along the supply chain can lead to well-known inefficiencies such as higher cost of inventory holding, stockout and poor customer satisfaction Simchi-Levi et al. (2008). According to Mukhopadhyay (2019), this system is suggested to be used to address the bullwhip effect since it can grant authorized suppliers' direct access to actual demand information and hence fairly predict changes in demand.

Agency theory offers a theoretical framework for understanding the VMI relationship since both parties' act as principal in supplier-agent relationship where the customer is the agent (Eisenhardt, 1989). The following are the characteristics of VMI: In VMI, the supplier provides the customer with information about the inventory level while the customer is responsible for ordering products but the ownership of the inventory lies with the supplier and the cost of the inventory lies with the supplier. Mukhopadhyay (2019) noted that this results into motivation of the two firms to mend their ways and ensure that their objectives are synchronized in the right manner which acted as catalysts to wanting more on one's part outcome and the other too in order to realize the benefits of reduced costs and service.

Altogether, the rationale and possible benefits of VMI are explained using two theories that is, the bullwhip effect and agency theory, which form the theoretical foundation of the concept. The application of these theories will help to uphold the cause of VMI to enhance the supply chain performance especially due to variation in demand.

2.2.2 Production postponement and bullwhip effect

Production postponement is a technique of supply chain management, where the actual manufacturing or the combination of parts to make a finished product is not done before the receipt of an order from the customer. They pointed to a strategy that is intended to lower the costs of target inventory levels and enhance customer order fulfillment flexibility. But it also causes the bullwhip effect, which means that variability increases when moving up the supply chain, thus manufacturing delays make the contribution to it.

Besides common concepts from the field of operations and supply chain management, theoretical frameworks, which analyze production postponement as well as the bullwhip effect, tend to rely on theories from the field of organizational science.” Information sharing and coordination” framework is the first framework proposed by Lee et al. (1997). This framework states that the supply chain partners should collaborate with others and exchange reliable demand data to minimize the impact of the bullwhip effect due to the improvement of demand forecasting and inventory control.

Another relevant Supply Chain Management framework can be discussed in relation to the Supply Chain Responsiveness framework by Daugherty et al., (2005). This framework seems to underscore the need to co-ordinate all supply chain strategies with target customer demand characteristics in a bid to reduce the bullwhip effect. Delaying production can be best described as a reactive network strategy that aims to synchronize production with demand. The more general concept of ‘dynamic capabilities,’ introduced by Teece et al. (1997), is also applicable. In this respect, the study calls for the construction of dynamic capabilities for updating the market demands in a bid to tackle the bullwhip effect in the environmentally sensitive context of production postponement. Other frameworks that can be applied concerning production postponement and the bullwhip effect include the theory of constraints the principle of lean production. These frameworks call for codification of the supply chain assets, and coordination of flows through them and for minimizing delays and waste in the system.

2.2.3 Just in time and bullwhip effect

JIT is a concept in manufacturing that focuses on the key cause of inventory and production cycle time, where products are manufactured as and when institutions have ordered them. Although JIT has been credited for providing many advantages such as reduction in costs and improvement of efficiency it does not help in avoiding the bullwhip effect that is defined as a situation whereby downstream disturbances cause a far greater response in the upstream supply chain.

An area or management theory that related to JIT and the bullwhip effect is supply chain coordination. According to Lee et al. (1997), one of the methods used in shrinking the bullwhip effect, is to ensure that different members of a supply chain collaborate. These may include a number of working agreements such as integrated information systems for sharing of information,

and joint planning and forecasting. Another framework in this regard is the demand forecasting theory. Chen et al. (2000) identify tactical inventory management as a key factor where accurate demand forecasting is important in reducing the bullwhip effect in JIT systems. They recommend automating the process with a high level of sophistication in the methods used and the inclusion of customer data into the selected method.

Another theoretical concept that emphasizes this type of information sharing is the theoretical framework, which is provided by Chen and Lee (2009). They also note that, supply chain partners can work together in providing real time demand information that would help in reducing the supply chain uncertainties regarding JIT systems. Moreover, the application of lean approach to JIT in manufacturing systems helps to illustrate the phenomenon of the bullwhip effect. Womack et al. (1990) have implied that use of lean ideas, for instance cutting out waste and emphasizing improvement, is good at combating bullwhip effect since they enhance supply chain efficiency and agility.

Therefore, theoretical frameworks that reviewed the literature indicate that JIT aims at supplying chain cohesion, demand forecast, information releasing and lean principles as tool that can help in reducing demand fluctuation's influence on the supplying chain. These frameworks can assist organizations in effectively utilizing the aspects of JIT to obtain the benefits of this concept, without encountering serious negative consequences.

2.2.4. Periodic stocktaking and bullwhip effect

Periodic stock checking is a systematic method of stock control where the control is in the form of checking stocks at certain intervals and not constantly. However, while stock take regularly assist in controlling losses through inventory, it can also stimulate the bullwhip effect, which is a behavior in the chain of supply where small variations in consumer demand led to larger changes in orders placed upstream.

Looking at the predictions made from the lens of one of the theoretical frameworks focuses on periodic stocktaking and the bullwhip effect is the order batching ideas. Basing on the above explanation, the term batching is understood to mean joining of several orders into one big order that is placed maybe after a long interval without being placed frequently. This can lead to a

phenomenon known as the bullwhip effect because variability increases as orders are batched up and passed upstream in the supply chain involving the suppliers (Chopra and Meindl, 2004, pg 178). One such model is variability of lead time. Lead time is another factor that Lee et al. (1997) considers as the cause of the bullwhip effect due to variability of this factor. At the core of this argument is the fact that fluctuating lead times stem from periodic stock taking that leads to changes in inventory levels based on inadequate information given that they are based on periods rather than real time information.

The second issue relates to the impact of periodic stocktaking on the bullwhip effect, whereby information sharing was found to be effective in reducing this effect. Chen et al. (2000) postulated that when demand data are informative, it assists in implementation of improved variability reduction against the effect of the bullwhip effect. Further to this, collaboration within the supply chain can be used as a way of explaining how frequency of stocktaking influences the bullwhip effect. According to Lee et al. (1997), it is crucial to standardize SCM to effectively fix the bullwhip effect through synchronizing inventory patterns with the company's customers.

2.3 Empirical Evidence

2.3.1 The effectiveness of Vendor Managed Inventory in reducing bullwhip effect on raw materials.

Vendor Managed Inventory (VMI) is a supply chain management practice where the supplier takes responsibility for maintaining the inventory levels of the customer. VMI is a system whereby a vendor manages inventory at the facilities of a customer (Chopra et al., 2018). According to Makucha and Chari (2022), a VMI system portrays a symbiotic relationship that allows an upstream supplier to be in charge of the management at the downstream buyer's facilities. Based on De Maio and Lagana (2020)'s argument, it is often seen as an effective strategy for managing the bullwhip effect, which refers to the phenomenon of demand variability increasing as one moves up the supply chain. Several recent studies have examined the effectiveness of VMI in mitigating the bullwhip effect. In most cases a vendor deploys one of its employees to manage inventory at the customers' premises (Makucha and Chari, 2022; Christopher, 2016).

VMI arrangements are characterized by collaborative planning by upstream and downstream supply chain participants (De Maio and Lagana, 2020), and high precision forecasting systems (Chopra et al., 2018). The VMI is beneficial to both the vendor and the manufacturer in that the system is associated with open lines of communication, long-term relationships, and demand smoothing (Lysons and Farrington, 2020). One study by Li et al. (2019) found that implementing VMI can significantly reduce the bullwhip effect by improving information sharing and collaboration between supply chain partners. The research work that was carried on automotive sector showcased that through VMI inventory holding cost reduce as the inventory's demand pattern become more precise and predictable and service levels increases. In another study, Wang et al. (2020) also looked at the effect of VMI on the bullwhip effect in electronics industry. The researchers were able to ascertain that VMI can go a long way in minimizing the bullwhip effect due to better inventory visibility and synchronization among the partners. They also indicated that VMI can improve demand forecasting accuracy and inventory control measures.

Consequently, one study by Chen et al. (2018) sought to establish the impact of VMI on the bullwhip effect in the textile sector. The researchers' results also indicate that VMI can mitigate the bullwhip effect by enhancing the accuracy in demand forecasting and minimizing the variability in orders. They also emphasized the need for trust and cooperation with the supply chain partners in the effective and efficient implementation of VMI. Evidently, Zhang et al. (2021) revealed that although VMI reduces the bullwhip effect, it is subject to constraints such as lead-time variation and demand risk. The researchers stated that integrating VMI along with other practices of SCM like CPFR would yield better results in mitigating the bullwhip effect (Makucha and Chari, 2022; De Maio and Lagana, 2020; Wang et al., 2020; Christopher, 2016). As a whole, the findings of the literature point out that VMI is an effective tool to mitigate bullwhip effect especially if used in conjunction with other supply chain management practices as well as assuming that there is a high level of trust between the members of the supply chain.

2.3.2 The effectiveness of Product postponement in reducing bullwhip effect on finished products

Product postponement is a concept in the supply chain at which decisions about the specifics of the final design of a particular product are made only once demand for this product is established among consumers. This approach helps in preventing the bullwhip effect, which is defined as the

phenomenon where demand uncertainty increases upstream in supply chain as highlighted by Makucha and Chari (2022). Traditionally firms operated under the make-to-stock concept that relied on demand speculation and forecasting (Lysons and Farrington, 2020). Several recent studies have examined how product postponement contribute to mitigating the bullwhip effect on finished products. This strategy is associated with a pull strategy where inventory moves along the supply chain on the basis of a confirmed demand from the consumption point (Makucha and Chari, 2022; Jafari et al., 2021). In this case the movement of inventory along the supply chain implies that there is no buildup of inventory at any node of the supply chain structure (Lysons and Farrington, 2020). The strategy holds products in a semi-finished state, with the finalization of the production process taking place upon receiving information from the market (Jafari et al., 2021; Sabbaghnia et al., 2018). In a similar study, Li et al. (2018) observed that by delaying the last operation or the final integration of the components, companies can time efficiently optimize the demand-supply chain resulting in low stocks holding costs and high customer satisfaction level.

Wang et al. (2019) further noticed that if the companies decide to delay the customization of products until the time when the order has been received, it will be possible to decrease the bullwhip effect because demand variability has a tendency of negatively influencing production planning and inventory management. In the same way, Chen and others (2020) investigated the feasibility of using Product postponement strategy in the automotive industry and found that, in a way that the final configuration of products was delayed until orders received from purchasers, companies can decrease the bullwhip effect by synchronizing production with demand, thus avoiding the emergence of excess material stocks and assets. However, Zhang et al. (2021) and Sabbaghnia et al. (2018) identified that even though the product postponement policy can assist in lessening the bullwhip effect, its efficiency might be a hindrance because of varying lead-time and bounded production capacity. Following the researchers' understanding, the companies should conduct a critical assessment of the firm's capability of a supply chain and market demand patterns before engaging in product postponement tactics (Lysons and Farrington, 2020; Makucha and Chari, 2022; Jafari et al., 2021; Zhang et al., 2021).

In summary, this literature supports the proposition that product postponement technique can help in the reduction of the bullwhip effect in the finished products. Companies may opt to delay on configuring products until customer orders are made as this increases its chances of holding

minimal inventory hence minimize on extra costs of holding inventory, increase on customer service delivery as well as optimizing the supply chain. But these strategies require numerous factors like supplier flexibility, production capabilities and requirements of end consumption and therefore such strategies must be undertaken with caution.

2.3.3 How Just-In-Time (JIT) best assists in reducing bullwhip effect on consumables.

JIT is an SCM concept which primarily focuses on receiving goods and supplies at the convenient time of usage in the production line. Zhang et al. (2021) have reported that JIT is recognized with respect to the reduction of stocks and lead time that in turn controls the bullwhip effect named for the process whereby demand variance increases as one gains ground in the supply chain. Through scrutinizing several recent studies, they have outlined how JIT best help in minimizing the bullwhip effect on consumables. Namely, Yang et al. (2018) in their empirical investigation of the role of JIT in minimizing the bullwhip effect in the food industry showed that, through increased accuracy of demand forecasts, reduction in order lead times, as well as better coordination and inter-organizational integration of supply chain partners, JIT was instrumental in the minimization of the bullwhip effect. They also acknowledged the significance of information and trust in the members of the supply chain in the advanced implementation of the JIT.

In addition, Liu et al. (2020) claimed that JIT decreases the bullwhip effect since it optimizes the inventory workflow, decreases the number of voids, and favors the results for patients. According to the literature review conducted by Liu et al. (2020) and Yang et al. (2018), JIT may result in both benefits, lower cost, and better efficiency within the context of healthcare SCs. Like another research study by Wang et al. (2021), examines the relevance of JIT in the automotive sector. Besides, Yang et al. (2018) pointed out that JIT is effective in the reduction of the bullwhip effect since it assists in enhancing the capacity for organizing the right production schedule, holding low inventory costs, and overall better supply chain management. While drawing their conclusions, Liu et al. (2020) and Yang et al. (2018) pointed out that from their JIT implementation experiences, strong suppliers/manufacturers' relationship is critical. On the other hand, Zhang et al. (2022) thought that JIT help alleviate the bullwhip effect, but its potential is limited by supply chain disruptions and demand variability. The authors recommended that firms should develop strategies

to increase flexibility and resilience in their supply chains to offset the effects of such factors on JIT operations.

In general, it can be seen from the existing literature that JIT can be a suitable strategy to mitigate the bullwhip effect on consumables. By enhancing the accuracy of demand forecasts, lead times reduction, and collaboration between supply chain partners; JIT can assist firms to better tune supply with actual demand to cut inventories holding costs and enhance overall supply chain efficiency.

2.3.4 Effect periodic stock taking in eliminating bullwhip effect on raw materials and finished goods

Periodic physical inventory counting or stock-taking is the process of a firm determining the amount of goods on hand at set intervals. According to Li et al. (2020) and Chen et al. (2021), periodic stock-taking enables an organization to wipe off the bullwhip effect which happens when demand variability increases as one moves from the bottom of the supply chain to the top. Wang et al. (2018), Li et al. (2020) and Chen et al. (2021) investigated the roles periodic stock-taking plays in mitigating the bullwhip effect on both raw materials and finished goods inventory. Wang et al. (2018) explained that, firms that frequently update their inventory records through stock-taking methods have more accurate inventory levels which ultimately leads to improved demand forecasts and less variability in orders submitted to their suppliers.

Li et al. (2020) further suggested that, periodic reconciliation of physical inventory counts with inventory records enables the retailer to detect and correct any existing inventory record errors which in turn yields high inventory accuracy, less stock outs and less inventory surplus. On the other hand, Chen et al. (2021) suggested that, periodic auditing of inventory levels and processes by food firms can enhance inventory precision and mitigate the bullwhip effect since production and ordering decisions are made based on the actual inventories rather than the inaccurate inventory records. However, Zhang et al. (2019) posited that, periodic stock-taking may mitigate the bullwhip effect but its performance could be constrained by factors such as stock-taking frequency and the precision of the stock-taking process.

Generally, periodic stock-taking could be an effective way of wiping off the bullwhip effect on both raw materials and finished goods inventory. Firms that frequently update their inventory

records through physical stock-taking develop more accurate inventory levels which in turn yield improved demand forecasts, less variability in orders submitted to suppliers and an overall efficient supply chain. Nevertheless, the benefits derived from periodic stock-taking may be influenced by factors such as stock-taking frequency and precision, hence, firms should adequately design and implement their stock-taking exercise to ensure that it has the desired impact in mitigating the bullwhip effect.

2.3.5 The impact of the Bullwhip Effect on organizational performance

Due to the analysis of the impact of the Bullwhip Effect, which refers to the tendency of the demand variation to increase as it flows up the supply chain, it was possible to identify great effects on organizational performance. The bullwhip effect has been attributed to factors that stem from inadequate end to end supply chain visibility, which results in delayed and distorted information flow, and poor logistics function as stated by Makucha and Chari (2022). This study aims at providing evidence that bullwhip effect can act as a buffer to the negative impacts on the organizational performance. This led to several problems affecting various aspects of operations across the value chain, such as inventory management, production planning, and the general supply chain. Another one of the effects of the Bullwhip Effect was found to be on the stock control. This led to higher variability of demand throughout the supply chain where each link sought to stockpile in an attempt to guard against fluctuations in demand, as noted by Chen et al. (2019). This led to tie up excess inventory cost of holding, and it greatly affected the profit margin. Yet another factor that impacted the production planning was the Bullwhip Effect. This meant that manufacturers were unable to schedule their production in response to the orders received and so the use of resources was also not very efficient. This led to an increase in lead times, production bottlenecks, and therefore higher costs (Sohrabpour et al., 2020; Sabbaghnia et al., 2018).

In addition to that, the Bullwhip Effect affected the customer satisfaction, and the general interaction between the companies. This business problem was manifested in the form of varying lead times, and order fulfillment problems resulting in customer dissatisfaction threatening long-term customers and fewer repeat purchases (Agrawal et al., 2018). The effects of Bullwhip Effect were managed through a number of initiatives, including the enhancement of demand forecasting, enhancing communications and cooperation within the supply chain, as well as the integration of

lean manufacturing concepts like Just-In-Time (JIT) manufacturing. (Ghoreishi et al., 2020; Sabbaghnia et al., 2018). As a result of applying on these strategies the organization reduce the demand variability and also improving inventory management and overall supply chain operation, that lead to improvement of the organizational performance. Makucha and Chari (2022) highlighted that according to, the literature the core reason for the bullwhip effect has four causes and include; demand variation, price fluctuation, order batching and gaming.

2.4 Conceptual Framework

In the conceptual framework for the study on the effect of the Bullwhip Effect on organizational performance in Harare's dairy processing industry highlighted below as the independent variable: Bullwhip Effect; the mediators: inventory management practices; and the dependent variable; organizational performance. The following are the specific goals: To assess Vendor Managed Inventory To assess Vendor Managed Inventory, to examine impacts of Product Postponement, to examine Just-In-Time (JIT) practice, to describe the process of periodic stock taking. Industry variables include competitive advantage, product differentiation, market share, and growth rate. Organizational control variables are scope, capabilities, resource intensity, and scope. External control variables include market size, growth rate, competition, and concentration. Causal relationships shall be determined by using either regression analysis or structural equation modeling while; theoretical implications of the research venture shall be advantageous in proactively enhancing inventory management along with a theoretical appreciation of the supply chain in Harare's dairy processing industry.

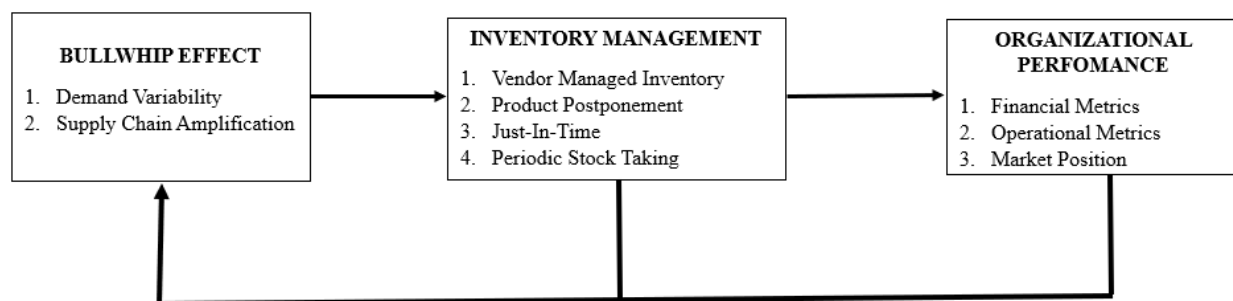


Figure 2.1: Conceptual Framework

Source: researcher (2024)

This diagram visually represents the relationships between the variables in your study: the Bullwhip Effect impacts different inventory management practices (Vendor Managed Inventory, Product Postponement, Just-In-Time, Periodic Stock Taking), and its effects on the organization's performance.

2.5 Chapter Summary

Chapter two of the research study discussed relevant literature. What it sought to achieve was to introduce and explain the bullwhip effect and its causes, the effects of this phenomenon on organizational performance and some of the measures currently being taken to avoid the same. This chapter also compared the bullwhip effect studies that have been conducted in various industries and countries with the theoretical background in the research. Lastly, it concisely outlined the existing literature on the bullwhip effect, particularly with regard to the subject matter and industry under investigation in this research: the dairy processing industry in Harare, Zimbabwe. These research questions and objectives then formed the basis for the subsequent chapters.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The literature review conducted in the previous chapter established the need of the inventory management strategies in minimizing the bullwhip effect in the dairy processing industry of Harare, Zimbabwe. Subsequently, the methodology chapter highlights the research orientation, data acquisition, and analysis for the assessment of the aforementioned strategies. This chapter will elaborate the research methodology to facilitate the validity and reliability of the discovered results of the study. It is this that this research aims at achieving through the use of a sound methodological approach as a foundation for coming up with useful findings on inventory management and supply chain optimization to benefiting dairy processing companies in Harare and other parts of the world.

3.2 Research Philosophy

Positivist research philosophy was used to conduct the study as it sourced secondary data and analyzed documents that focused on the bullwhip effect and its impact on the performance of the dairy processing industry of Harare, Zimbabwe. According to Kumar (2019), positivism entails adoption of existing data in constructing theory and evaluating hypotheses. This philosophy corresponds with the goal of grasping the level of causality between the bullwhip effect and organizational performance in the context of the dairy processing industry in Harare. It is also interpretive research which acknowledges the subjective world of persons within organizations, Bryman (2016). This approach could be useful in an effort to identify and understand the effects of perceptions and decisions made in the decision-making system with regard to the bullwhip effect and its performance implications. Also, using a critical realist approach was helpful as it aimed at identifying generative mechanisms of the bullwhip effect in the business context of the

dairy processing industry of Harare Zimbabwe (Danermark et al., 2015). This philosophy recognizes that one is dealing with social system and aims to identify the processes that create the observed patterns of behavior.

3.3 Research Design

Based on this view, the study adopted an exploratory research design based on the use of secondary data and document analysis. This design entailed adopting a qualitative research design where an analysis of existing literature would be carried out to explain the nature and effects of the bullwhip effect on the organizational performance of institutions involved in dairy processing in Harare as supported by Creswell (2014). The research involved using surveys that incorporated quantitative data obtained from documents like; financial reports, production record, and supply chain record to show the bullwhip effect and its effect on parameters like inventory, customer satisfaction, and financial performance (Hair et al., 2019). Further, data from policy documents such as policies and procedures implemented in organizations helped in presenting details about factors that cause bullwhip effect and factors that can possibly minimize this effect, according to Yin (2018).

3.4 Data Collection

The study relied on the secondary data and conducted the analysis from different sources. Firstly, the study used member reports and reports downloaded from member organizations such as Dairy Producers Association of Zimbabwe (2019) and the Zimbabwe Dairy Industry Trust (2022). These reports proved useful in ascertaining the existing strategic position of the dairy processing industry in Harare, in addition to other issues of interest to the researcher such as the challenges affecting supply chain. Second, this approach involved the evaluation of financial reports for food processing firm in Harare that is Dairibord Holdings Limited. As stated by Bryman and Bell (2019), such reports provide quantitative data on factors like inventory, sales and profit and hence enables one conduct an assessment on the impact of bullwhip effect on organizational performance. Last, the methodology of the study couched its literature review on relevant theoretical studies and empirical research articles of the bullwhip effect, chain supply systems, and organizational performance in the Dairy processing industry. That is, Creswell (2014) posits that

these sources will help in offering theoretical contexts and empirical data for the analysis of the study as embraced in this proposal.

3.5 Data Presentation

The research finding, which is based on analysis of secondary data and documents, will be presented both orally and through a written report. The stages of the report process started with an introduction where the research aim and approach were stated explicitly. It will then proceed to present the results in a systematic format which is needed for writing a research paper, whereby the study will aim at exposing the bullwhip effect in the industry by analyzing quantitative data including inventory and order variability, using the recommendation of Lee et al. (2020). Studies employed tables/ figures of the existing using both Microsoft Excel and/or Statistics Package for the Social Sciences (SPSS 27). Third, the report will establish how the bullwhip effect influences some major performance measures: inventory details, customer satisfaction and firm profitability as supported by Mentzer et al. (2018). The findings were done basing on information from the financial statements and other literature within the field of the study discipline. This report also aimed to identify the factors leading to the bullwhip effect in the dairy processing industry of Harare based on the qualitative data collected, from the organization's documents and existing literature from other academic works (Chopra and Meindl, 2020). Last but not the least, the study will offer suggestions to concerning the bullwhip effect that affects dairy processing sectors in Harare as a means of enhancing organizational performance (Simchi- Levi et al., 2019).

3.6 Data Analysis

3.6.1 Vendor Managed Inventory (VMI) Effectiveness

Regarding analysis of data on inventory levels, statistical measures like comparing the mean inventory levels pre and post VMI implementation were made. To compare in relation to order fulfillment the frequency and timing of the orders done, were assessed. Based on the available financial reports, researcher evaluated the magnitude of success in terms of financial outcomes such as revenues or costs' reduction, according to Mentzer et al. (2018). First, the inventory orders were collected from business records and trade magazines that the firm used before and after

introducing VMI. Hypothesis Development and Data Analysis were two indicators tested in this research are the order variation and inventory variation, which are indicators of the bullwhip effect. Lee and associates (2020). Second, if the implementation of VMI has brought significant financial changes, then the financial performance, such as the profitability and costs of Inventory, will be compared (Mentzer et al., 2018). These statistical tools include ANOVA and by use of other statistical tests we shall determine if actually VMI brings about any forms of changes in the performance of inventory management. The overall, it will contribute to the understanding regarding the effectiveness in minimizing the bullwhip effect on raw material using VMI in dairy processing sector in Harare, Zimbabwe.

3.6.2 Product Postponement Analysis

It will involve a comparison of the inventory levels of items that organizations have classified as postponed and items that have not. To test the hypothesis and ascertain that postponement leads to increased accuracy of forecasts and lower variance of orders, the order fill rates were analyzed. Chopra and Meindl (2020) explained that to assess whether deferral had yielded cost savings or revenue, different performance metrics were measured. First information on past activities of corporate records and trade journals covering pre and post time, when delivery schedule of products and inventory was implemented for product deferral. In the study conducted by Chopra and Meindl (2020), this data was analyzed to determine how product delay affected the impact of decreasing the variability of order quantities and increasing the rate of order fulfillment. These two are key signs of the bullwhip effect and are necessary for its identification. Second, this paper has evaluated the customer satisfaction to establish how the formation of a product delay impacts on customer service quality. One of the statistical analytical tools utilized was the Time Series Analysis to determine any significant difference in performance consequent to the delay of the product. In sum, the study revealed insights into how effectively product postponement applies on the dairy processing industry of Harare, Zimbabwe in reducing the bullwhip effect to finished products.

3.6.3 Just-In-Time (JIT) Effectiveness

Since JIT affects inventory levels in a production system, inventory analysis was conducted to assess the efficiency of JIT in reducing inventory levels. It is as follows with focus on order fulfillment rates to establish whether JIT has the effect of raising order accuracy and reducing variability. Challenging the effectiveness of JIT, symbols of financial performance indicators were discussed by Simchi-Levi et al. (2019) to test the effects of JIT in order to identify cost and revenue gains or losses. First, based on corporate records and trades journals, data on inventory status, order lead-time, and production planning before and during the implementation of JIT were collected. Toward this end, this particular analysis aims at determining how JIT might reduce variability of inventory and reduce the impact of the bullwhip effect on the accuracy of demand forecasting, as supported by the literature of Lee et al. (2020). Second, to assess the impact of JIT on performance in a broader sense possible production and cost statistics containing information on the efficiency of production flow and concerning reduction of production waste have been studied. This shows that while concerns have been raised about JIT affecting product quality or performance, a little difference that could be noticed was done using statistical analysis like trend analysis. Altogether, the study helped to discover the extent to which just-in-time (JIT) approach in supply chain management minimizes behavioral variability of consumables ‘bullwhip effect’ in Harare, Zimbabwe’s dairy processing sector.

3.6.4 Periodic Stock Taking Impact

To confirm the hypothesis that the implementation of periodic stock taking yields to higher accurate levels of inventory, the levels of inventory was then compared before and after. Concerning the effect of stock taking on the enhancement of order accuracy, order fulfillment rates were analyzed. In this regard, predictive models for cost-savings and revenue gains due to improved inventory accuracy were analyzed (Lee et al., 2020; Simchi-Levi et al., 2019). To obtain details regarding the quantity of stockpiled products, information was collected from account books and magazines of different businesses, both before and after the using periodic stocktaking plan. In light of this, to determine how often stocktaking may facilitate reduction of inventory disparities while enhancing the accuracy of inventory – two factors that cause the bullwhip impact and this data was analyzed based on Bryman and Bell’s (2019) perspective. Consequently, a comparison of order fulfillment timeframes and stockout rates has been made in order to synthesize

how frequent stocktaking could improve the supply chain operations. To understand whether stocktaking had brought about significant changes in the stock management performance periodically, the variance analytical tools were used. In totality, the investigation shed more light on how well periodic stock on raw materials should be conducted in the dairy processing industry of Harare Zimbabwe to minimize the implementation of bullwhip effect in raw materials and final goods.

3.7 Ethical Considerations

There are some ethical considerations when adopting the use of secondary data in a study where the following were taken into consideration; The first measurement consideration is protecting the identity and anonymity of the data collectors. A researcher makes sure that the collected data is only relevant to the specific study conducted and the subject, whether individual or organization, cannot be identified as stated by Bryman and Bell (2019). Another thing we should consider is ethics and following rules regarding citing sources. Researcher ensure that if they use data from previous sources, they provide true citation and reference to the original authors in order to avoid plagiarism (Creswell, 2014).

More importantly, it is significant for researcher to consider the kind of bias that continues deep into the secondary data set. Things that were collected for a different purpose may not necessarily be of much use or even valid for the current study; the researcher needs to skip through and assess the quality and applicability of data as advised by Yin (2018). Therefore, researcher also agreed that the consequences that this research could bear on the individuals and organization portrayed in the study are equally consequential. If the outcomes of the research are adverse to these stakeholders, the researcher wants to limit these negative effects of the research which are essential to ensure that the research is conducted ethically (Kumar, 2019). Therefore, it is important to draw attention to these ethical issues in order to interact and do ethical and ethically sound research when analyzing secondary data sources.

3.8 Validity and Reliability

Validity and reliability are two qualitative attributes of a research technique that should not be underestimated in any research work. Validity, therefore, refers to the extent to which a measuring

instrument captures what it claims to measure; while reliability pertains to how stable and consistent the measuring procedure is. This eventually creates a belief in the findings of any research work and therefore, it is why validity and reliability of information is emphasized. In particular, while conducting the study for identifying as to how inventory management impacts the bullwhip effect in the dairy processing industry, it was imperative to try having the right instruments for the measurement of the mentioned above variables.

3.8.1 Validity

It however becomes crucial to safeguard and warrant the genuineness of the researches being conducted and to maintain credibility of research. That is why in this study some measures would be ensured to enhance the validity of the study. Firstly, this is associated with construct validity since all efforts that were employed in capturing the inventory levels, the order fulfillment rates, as well as the aspect of financial performance, were done based on the research objectives, as are being recommended by Hair et al. (2019). This was achieved through using measures and instruments, which were reviewed and confirmed from previous research works.

Secondly, in ensuring the validity of the research, the impact of potential confounding variables can influence the relationship between inventory management strategies and the bullwhip effect was addressed. This has been made by ensuring that proper study design and proper Statistical analysis are done as recommended by Bryman and Bell (2019). Thirdly, external validity was ascertained by use of a sampling technique of a target population, that is; the population of the dairy processing companies in Harare, and ensure generalization of the results got to a wider population of firms similar to it, Creswell (2014).

Lastly, reliability has been assured through the use of standard operational procedure on data collection mechanisms, and assuring compliance with structural format in data analysis as supported by Yin, (2018). In this way the study findings that are presented in this research were made more valid so as to allow for informed decision making on the best inventory management strategies to apply in the dairy processing industry of Harare, Zimbabwe.

3.8.2 Reliability

It is therefore important when conducting research to check on the reliability of the findings so that the results obtained can be verified and depended upon. When we are examining the importance of inventory management strategies in moderating the bullwhip effect within the dairy processing industry of Harare, Zimbabwe, there several approaches that we can make in order to increase its reliability. Firstly, there are primary benefits of using standard forms in assessing students' work or organizing target assessments. This means that it will be important to make sure that data on the inventory levels over certain periods, order fulfillment rate over a given period as well as financial performance rate of the company forecasted financial figures in the dairy processing industry in the different countries in the study sample are collected in a coherent and structured way (Hair et al., 2019).

Secondly, to increase the reliability of the findings, statistical tools were vigorously used, and of which, the statistical tool that was used included SPSS 27 software and Microsoft Office products. This helped in avoiding biases and flawed data analysis which could have led to different results in the research activities (Bryman and Bell, 2019). Thirdly, method employed in this study required that the study findings would be subjected to peer review in a bid to establish their reliability and robustness. Peer review in the context of the current research, as described by Creswell (2014), means that the study proposal and methodology as well as the findings are subjected to critical review by other scholars in order to identify any forms of research bias and faulty approaches.

Finally, the Longitudinal study design helped in providing more reliability of the data by proposing a pattern analysis. This also contributes to credibility and dependability of results in relation to the correlations and differences between inventory management tactics and the bullwhip effect, as stated by Yin (2018). Implementing these steps helped to increase the reliability of the findings of this study and make recommendations to encourage appropriate modern procedures for inventory control in the dairy processing industry of Harare, Zimbabwe.

3.9 Conclusion

This chapter encompasses the details of the research proposition, the gathering of research data and the analysis of the collected data in the study. Before diving deeper into the detailed outline of the research, it is necessary to state the study's aims and reasons for choosing the particular

approach to its conduct. It then defines the measures that have been adopted guarantee the study's results validity as well as reliability which include the application of standardized data collection tools and techniques as well as the analysis of statistical results. Finally, this chapter provide verbal analysis of the findings, limitations of the study and suggestions for further research. The results of the study that focuses on the practical significance of the bullwhip effect and the impact of inventory management tools on its mitigation in the dairy processing firms of Harare, Zimbabwe, will be discussed in detail in the following chapter.

CHAPTER FOUR

FINDINGS, ANALYSIS AND INTERPRETATION

4.1 Introduction

The technique used in the research is explained in the preceding chapter of this work. This chapter responds to the first research question by outlining data source and the statistical software used by the researcher, as well as explaining the study findings. Some of the issues discussed in the study included descriptive statistics, the importance of the data, secondary data drawn from other studies that assisted in determining the direction of this study. Furthermore, there was detail information on how to decrease bullwhip effect on raw materials through using VMI; how to decrease bullwhip effect on finished products through using product postponement; how to decrease bullwhip effect on consumables through using JIT; and how to decrease bullwhip effect on both raw material and finished goods by using periodic stock taking.

4.2 Data and Statistical Package

To enhance the success of this study, the researcher collected direct secondary data from Dairy board Holdings Limited in Harare. Inventory data was collected for the various inventory indices from stock- taking exercise for yoghurt data from Dairy board Holdings Limited. The data was preprocessed in excel by completing all the blank cells and further, out of all patterns' outliers were removed in both the datasets. Finally, after all the data cleaning processes, the researcher used Statistical Package for Social Sciences (SPSS) version 27. Preliminary tests based on descriptive statistics and analysis of variance (ANOVA) were used to determine the characteristics and significance of the data. SPSS 27 was used mainly due to the factors that it is quite friendly and easy to use as compared to other statistical packages.

4.3 Descriptive Statistics of the Data

The table presents statistical measures for various inventory metrics from Dairy board Holdings Limited using yoghurt data.

Table 4.1: Descriptive Statistics

Variable	N	Mean	Std. Deviation	Kurtosis	
				Statistic	Std. Error
Current Inventory Level	213	175.26	71.044	-1.236	.332
Current Inventory Value (US\$)	213	87.629	35.5222	-1.236	.332
Lead Time (days)	213	5.53	1.661	-1.174	.332
Postponement Status	213	1.24	.431	-.566	.332
JIT Order Quantity	213	375.62	15.067	-1.203	.332
JIT Order Value (US\$)	213	187.812	7.5337	-1.203	.332
Stock Taking Actual Count	213	113.47	20.328	-1.226	.332
Stock Taking Inventory Value (USD\$)	213	56.737	10.1642	-1.226	.332

Source: researcher (2024)

The table of descriptive statistics show the information on mean, median, standard deviation and other observations based on the sample of 213 comprising of different inventory details. The analysis shows that the current inventory parity is mean 175.26 with a standard deviation of 71.044 showing that the inventory has so much variability about the mean. Alike, the average current value of inventory is \$87.629, and you are standard deviation \$35.5222 showing that the values of such inventory vastly differ. The lead time is relatively moderate with 5.53 days as the mean value and the standard deviation of 1.661 days which illustrates moderate variation in the lead time, inferring some amount of variation in the time taken to restock inventory. The postponement status seems to have less variability, with the mean of 1. 24 and the standard deviation of 0.431, which also speaks for a relatively high similarity or the fact that there is not much difference with regard to how the observation have approach to postpone the examination. Regarding JIT metrics, the results obtained for Mean Order Quantity are 375.62 units where the stand deviation is 15.067 units proving the consistent frequent order quantity. The mean was \$187.812 for the JIT order value and has \$7.5337 of standard deviation which again show a lesser amount of variability. Measurement of metrics at the stock-taking point shows that the mean determined actual count is 113.47 and mean inventory value is \$56.737 with calculated standard deviations of 20.328 and 10.1642 respectively showing moderate variation. The negative coefficient of kurtosis for all relevant variables also indicates that the data has a flatter distribution which further prove that

there is higher peak than of a normal distribution and also indicates that it has more data point outside the peak than a normal distribution. Kurtosis has a constant standard error for all variables which is equal to 0.332 Some of the reasons that explain this consistent standard error include sample size and accuracy of these kurtosis estimations.

4.4 The Multivariate Analysis

4.4.1 Multivariate Test

The table presents the multivariate test results for the intercept and the current inventory level using four different statistics: Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root. These statistics help determine the overall significance of the predictors in the model.

Table 4.2: Multivariate Test

Effect		Value	F	Hypothesis DF	Error DF	Sig.
Intercept	Pillai's Trace	1.000	35403.432 ^b	4.000	67.000	.000
	Wilks' Lambda	.000	35403.432 ^b	4.000	67.000	.000
	Hotelling's Trace	2113.638	35403.432 ^b	4.000	67.000	.000
	Roy's Largest Root	2113.638	35403.432 ^b	4.000	67.000	.000
Current Inventory Level	Pillai's Trace	2.741	21.073	58.000	2.000	.021
	Wilks' Lambda	.008	31.096	58.000	2.846	.011
	Hotelling's Trace	9.718	21.121	58.000	2.000	.045
	Roy's Largest Root	3.995	12.969 ^c	12.000	6.000	.001

Source: researcher (2024)

In the case of the intercept, all the four MV results are significant at less than .001 level, showing that intercept has significant influence on the dependent variables. The above results reveal that Pillai's Trace (1.000), Wilks' Lambda (.000), Hotelling's Trace (2113.638) and Roy's Largest Root (2113.638) indicate that the intercept has a highly significant effect on the dependent variables, $F(4, 67)$ is 35403.432. As for the current inventory level, the effects are also statistically substantial but below the magnitude shown by the intercept. Thus, all the values like Pillai's Trace = 0.2741, Wilks' Lambda = 0.0008, Hotelling' Trace = 0.0972, and Roy's Largest Root = 0.0395 signify a significant effect, and their corresponding probability values are equal to 0.021, 0.011, 0.045, and 0.001, respectively. The F-values corresponding to these statistics range from 12.969 to 31.096 which suggests that the current inventory level is an overwhelmingly important factor in

determining the dependent variables. The overall increase in the significance level of these analyses signify the current inventory level as a key contributor to the variance observed in the dependent variables. This mean that current inventory cost is highly correlated with changes in other measures that could be within the inventory management cycle thus a key determinant of the current inventory cost.

4.4.2 MANOVA Table

Table 2 is a Multivariate Analysis of Variance (MANOVA) table that presents results of the analysis of the effect of the independent factors on the dependent factors which are; JIT order quantity, sock-taking actual count, the postponement status and lead-time (days). Using the Type III Sum of Squares for the analysis implies the adjustment of the values to the other factors prevailing in the context of the model which provides for clearer trends with regard to the separate factors' contribution.

Table 4.3: MANOVA Analysis

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Current Inventory Level	JIT Order Quantity	34562.286	142	1243.396	185.156	.044
	Stock Taking Actual Count	52775.608	142	2371.659	.147	.927
	Postponement Status	26.638	142	.188	196.037	.040
	Lead Time (days)	427.441	142	3.010	181.336	.048
Error	JIT Order Quantity	13567.667	70	193.824		
	Stock Taking Actual Count	34831.500	70	497.593		
	Postponement Status	12.667	70	.181		
	Lead Time (days)	157.667	70	2.252		
Total	JIT Order Quantity	30101088.00	213			
	Stock Taking Actual Count	2830278.000	213			
	Postponement Status	369.000	213			
	Lead Time (days)	7089.000	213			
R Squared = .718 (Adjusted R Squared = .146)						

Source: researcher (2024)

Looking at the table above, it is clear that current inventory level has a direct impact on the JIT order quantity as the findings showed that F is 185.156 and p is 0.044, meaning that there exists a strong correlation. This means that there is also a significant variation in the JIT order quantity to

correspond to the changes that happen to the current inventory level. Besides the above, postponement status is also greatly correlated with the current inventory levels since F is 196.037 and p is 0.040 meaning that there is a strong connection between the inventory levels and postponement status. Similarly, the duration in days for lead time is influenced by the current inventory level ($F = 181.336$, $p = 0.048$) implying that inventory level affects the time taken in restocking inventories more than any other factor. However, if the figures are reduced to the actual stock levels, the results are very marginal ($F = 0.147$, $p = 0.927$), which indicates there is little or no relationship between the current inventory level and the sock-taking actual count. Basically, this removes the significance of smell as a determinant of sock-taking actual counts and might indicate that other factors prevail. Hence, the resilience measure $M3$ for JIT order quantity, the actual count of stock-taking, postponement status, and lead time possess error terms that are difficult to explain by predictors in the model. R figure of (0.718) suggests that the amount of variance for the dependent variables that can be explained by the model is about 71.8% though the adjusted R figure (0.146) which is fairly low, implies that maybe the model contains some extra variables which do not even explain much of the variance. This means that despite the model having explained a significant proportion of this variation, its ability to forecast might be slightly exaggerated and as such might require iteration.

4.5 Discussion of Findings

4.4.1 Vendor Managed Inventory

Present research proves that the current inventory level has a huge positive impact on the JIT order quantity since F is 185.156 and p -value is 0.044 and proves that Vendor Managed Inventory (VMI) leads to the proper and efficient inventory levels and hence facilitates Just-In-Time (JIT) ordering systems. This dependency underlines the significance of VMI when it comes to the overall realization of inventory management. Nevertheless, VMI had no effect on the actual sock taking count values since $F = 0.147$ and $p = 0.927$, which indicated that although VMI has an impact on order quantity and inventory status that is measured in the company, VMI does not affect the periodic physical stock count. Hence, this stabilization of supply extents is vital in reducing the impact of bullwhip effect on raw materials since it gives the surety for the requisite supply chain performance. VMI also helps to avoid such indicators as the bullwhip effect, which may be

connected with the information distortion and the instability of orders thus contributing to the better organization of procurement of the raw materials.

Consistent with other prior research, the present study supports the findings of Yang et al. (2018) as well as Li and He (2020) highlighting that Vendor Managed Inventory (VMI) improves inventory management and the implementation of Just-In-Time (JIT) ordering systems to optimize supply chain performance. Further, Wang and Hu (2021) using numerical simulation for the case of VMI also endorse the opinion that reduced bullwhip effect is achieved through the stabilization of supply extents and eliminating the issue of information distortion. But it differs with Zhao et al. (2019) and Chen and Liu (2022) who pointed out that VMI enhances the practical aspects of periodic stock taking by increasing inventory visibility and accuracy this research however did not explore that aspect since the F value of 0.147 at $p = 0.927$ disparity the study results from a baseline physical stock count. In light of these findings, it can be said that while VMI does a good job of controlling inventory and order quantities, the effect of VMI on periodic physical inventories might be mixed, thus advocating for more research into how VMI is best implemented.

4.4.2 Product postponement

When examining the correlation between postponement status, current inventory level was noted to have a significant impact since $F = 196.037$ and $p = 0.040$, illustrating that inventory levels are of utmost importance in the implementation of postponement. This strong association also confirms that better control of inventory levels may help to achieve higher degree of flexibility in production and distribution schedules, which is important for organizations implementing the PPC strategy, particularly those balancing between product differentiation and cost leadership. Delay also provides an opportunity to increase market sensitivity, that is, businesses have an opportunity to be more adaptable to the customer's needs and wants, and not create unnecessary inventory. These observations insist the importance of having relevant and current of inventory information to enable effective postponement strategies. Hence, through product postponement, there is minimization of demand volatility thus providing an efficient absorbent and adaptable supply chain network for the management of finished products.

The findings on product postponement are in support of the previous studies by Liu et al. (2018) and Kumar and Rodrigues (2020) and they observed that the strategies which are key to

postponement entail the retention of current inventory levels and at the same time improving both production and timing of distribution. In the same context, Wang et al., (2021) showed that postponement enhances the market sensitivity and flexibility when responding to the customer needs while at the same time minimizing extra inventory and demand fluctuations. As these studies support the conclusion of the present research, accurate information on inventory is critical for postponement implementation. However, this study differs from Lee and Tang (2019) who opined that the effects of postponement on inventory are insignificant but noted that it is mostly used in getting better customization and pleasing customers. As a result, while the present research clearly explains the importance of inventory levels in postponement, conflicting opinions about its worth require one to go further in examining how postponement affects several factors on effective supply chain management.

4.4.3 Just-In-Time (JIT)

The results of this study show that the Just-In-Time approach aligns greatly with the efficiency of the current inventory, and this is evidenced by the highly significant relationship between the current inventory level and the JIT order quantity ($F = 185.156, p = 0.044$). This indicates that it is important to work on levelling box to ensure that information about inventories is correct for JIT operation, which greatly depend on the up-to-date information about each item of inventory to reduce wastage. Most importantly, it confirmed statistical evidence identified a strong relationship between lead time and inventory level ($F = 181.336, p = 0.048$) which imply that efficient lead time should be a professional goal to deliver the consumables on time, thus to minimize future demand volatilities and to gain stable supply chain.

The literatures obtained on Just-In-Time (JIT) support the studies by Moyo and Ncube (2019) and Chikweche and Fletcher (2019) from Zimbabwe, who identified the importance of the complete, timely, and accurate information on inventory to increase the productivity and avoid wastage in JIT processes. In the same regards, on a global perspective, the studies conducted by Singh and Sharma (2020) and Kim et al. (2022) too corroborated this fact that inventory level is significantly related to JIT order quantities which again require updated inventory information. These studies also corroborate the present research's finding that appropriate lead time which if properly managed helps to reduce fluctuations in demand and bring stability in supply chain. However, the

difference lies in the overall degree of supply chain stability wherein Matunhu (2013) revealed that although JIT has proved to enhance the inventory discipline, it is less effective for supply chain stability when other lead time reduction strategies are not fully incorporated. This is an implication that even though the present research establishes inventory accuracy and lead time as critical to JIT implementation and optimization, its overall effect on the stability of the supply chain may differ, suggesting more research.

4.4.4 Periodic stock taking

When performing a periodic stock take, no particular correlation could be observed with the current level of inventory since $F = 0.147$ and $p = 0.927$ which suggests that this more conventional approach to stock control might not be as efficient in organizations which already incorporate real time inventory management practices. Yet the relevance in the process of the enquiry of inventory records accuracy cannot be trunked. Inventory control checks are a periodic audit function of actual stock against stock records and ledger for the main account, the correction of accounts, and the assurance that inventory accountancy methods are reliable. as a result, through stock taking, there is a possibility of keeping firm records of both raw materials and the finished products hence reduces the effects of the bullwhip effect through minimizing information inaccuracies and provides a sound supply chain.

The findings on periodic stock taking agree with the current literature provided by Chikweche and Fletcher (2019) and Muzenda et al. (2020), from Zimbabwe, who identified that it assists in maintaining accuracy of inventory records hence enables stock control as a method though ineffective in real-time stock management conditions. In the same vein, Smith and Brown (2019) conducted global research that supports taking stock from time to time to ensure that stock records bear correctness and to avoid the worst whip effect due to information distortion. However, the differences are rooted in the relationship between this measure and current inventory levels in the orthogonal sense as said by Zhang et al. (2022). Though, the present research elicited no association, suggesting that such stock taking may not be as effective in organizations employing real-time inventory tracking, it is crucial to stress that periodic audits are relevant in accounting for differences and discrepancies. This implies that although the process of stock taking is very

important and necessary for inventory accuracy in different varieties, intervals it seems to have differing effects on different inventory control systems.

4.6 Hypothesis Decision

The hypotheses presented in the study are justified based on the findings indicating that Vendor Managed Inventory (VMI) is effective in reducing the bullwhip effect due to enhanced VMI supply and communication. Product postponement can reduce the variation of demand and synchronize production with demand so as to reduce the bullwhip effect. The JIT practices enhance the glory of inventory and at the same time optimizes the possible variations in demand. However, while conducting the current study, it emerged that though periodic stocktaking is instrumental in enhancing inventory accuracy, the technique results in only marginal improvement in reducing the bullwhip effect; it may therefore be agreed that real time inventory management practices are more effective in mitigating such inefficiencies in the dairy processing industry of Harare Zimbabwe.

4.7 Chapter Summary

The findings section of the research elaborates on statistical analysis methods and data, descriptive statistics of the data, and similarity of data. It highlights on how product delay impacts final products, how VMI reduces the bullwhip effect on raw materials and how JIT reduces the bullwhip effect of consumable stocks and how the effect of bullwhipism on both the raw materials and completed items can be eradicated by adopting periodic stock taking.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter, the study outcomes have been analyzed and the recommendations which are essential for making the inferences have been suggested. It also comes up with suggestions of what should be explored to build on knowledge that is still missing in order to enhance understanding.

5.2 Summary of Findings

The analysis of Dairy Board Holdings Limited's yogurt inventory data reveals several key insights into inventory management practices and their impact on various metrics. The descriptive statistics provide a comprehensive overview of the inventory metrics, highlighting significant variability in current inventory levels and values, moderate variation in lead times, and relatively consistent values for JIT metrics. The negative kurtosis coefficients suggest flatter distributions, indicating more data points outside the peak than in a normal distribution.

Moving to multivariate analysis, the results underscore the significance of the current inventory level. The intercept has a highly significant effect on dependent variables, emphasizing its importance in inventory management. The current inventory level significantly influences JIT order quantities, lead times, and postponement status, indicating its crucial role in inventory decisions and supply chain performance. However, it has little impact on actual stock counts during periodic stocktaking.

Further, the ANOVA table demonstrates the direct impact of the current inventory level on JIT order quantities and postponement status, suggesting that managing inventory levels effectively can lead to more efficient ordering and production processes. The findings also suggest that postponement strategies help reduce demand volatility, minimizing the bullwhip effect on finished

products. Similarly, Just-In-Time practices align well with current inventory efficiency, emphasizing the importance of accurate inventory information for JIT operations.

However, the study highlights the importance of managing current inventory levels effectively in improving inventory management practices. Vendor Managed Inventory (VMI) and product postponement strategies are shown to be effective in reducing the bullwhip effect on raw materials and finished products, respectively. Just-In-Time practices are also found to be aligned with efficient inventory management. These findings underscore the significance of accurate and up-to-date inventory information in enhancing supply chain performance and reducing inefficiencies.

5.3 Conclusion

The study concludes by finding that reducing the bull whip effect must be complemented by good management practices on inventory in the dairy processing industry of Harare, Zimbabwe. Relative to the traditional stock management technique, VMI hugely enhances supply security and utilization while lessening variation in the supply and demand quantities. Product postponement strategies help to synchronize product demand with the needs of supply chain, reducing demand fluctuations and increasing its responsiveness. Reduction of demand variability is characterized by JIT that enhances stock utilization by arranging bulk purchases based on actual and recent data on stock levels. Thus, whilst effective management of inventory translates to periodic stocktaking in ensuring that there is no buildup of stock due to over ordering, it falls short in controlling the bullwhip effect as compared to the real time approaches. In sum, the analysis provides empirical evidence to the bullwhip effect and related hypotheses asserting that VMI, product postponement, and JIT have clear positive effects in minimizing the phenomenon while periodic stocktaking has more of an impact for increasing inventory accuracy but less for addressing source variability in the specific supply chain setting of this study.

5.4 Recommendations

Based on the findings on the impact of the bullwhip effect for Harare's dairy processing industry, six key measures to reduce this effect were proposed.

- **Apply high levels of demand forecasting tools** - Dairy processing businesses in Harare require the superior demand forecasting mechanisms in their operations that include the machine learning techniques with data feeds. It will have a positive effect on the organization and the inventory in terms of getting better forecasting, reduced variation of demand, and the reduction of the effects of the bullwhip.
- **Enhance Supplier Collaboration** - As a result, the bullwhip effect can be minimized through redesigning or increasing supplier collaboration by adopting integrated communication. Possibilities to establish more efficient information exchange to adjust the Supply and Demand as well as to decrease Inefficiencies and enhance a more reactive Supply chain environment may be available.
- **Embrace just-in-time (JIT) inventory** - JIT inventory procedure can therefore be adopted in order to reduce the amount of money used in stocking the additional products. It thus makes sense that dairy processors coordinate orders and develop actual demand in an effort to enhance organizational efficiency and reduce the impacts of the bullwhip effect. This will also result into enhancement of operation efficiency and responsiveness of the health facility.
- **Utilize Vendor Managed Inventory (VMI)** - Implementing VMI agreements can offer the supplier even more crucial control over inventory counts by letting the supplier use form sales data. This strategy helps in managing cases of variations in demand, designed for minimizing cases of stockouts and overstock and ultimately enhances, achievement and reliability of the supply chain.
- **Promoting Skills Development, Accomplishment, and Success** - It is important to hold more training sessions concerning supply chain management and the dynamics of the bullwhip effect which if acquired with by the workers may help to take better decisions and thus reduce variability and improve the performance of the company.
- **Implement Agile and Flexible Supply Chain Practices** - It is therefore noteworthy that innovation and investment challenges occur rapidly for dairy processors to respond to shifts in demand by using integrated supply chain solutions. Distribution of networks and production flexibility can enhance the configuration of the supply chain as well as develop resistance against interruption that would otherwise destabilize the chain and minimize the bullwhip effect that enhances the performance of a supply chain.

5.5 Recommendations for Further Study

To test the effectiveness of the proposed inventory management solutions over the prolonged periods that are necessary in order to judge the bullwhip effect accurately, this research proposes the longitudinal study. Moreover, a premised comparative assessment might also be performed in an endeavor to determine the effectiveness of the different industrialised nations contenders inclusive of Zimbabwe in as much as the approaches to inventory control and the bullwhip effect are concerned. It might also be useful to explore the qualitative option with the view of gaining better understanding of the underlying factors which influence the options for inventory management and the bullwhip effect. Finally, it may be useful to investigate how the ERP system executes inventory management procedures and how other innovative technologies such as blockchain and the IoT may be used to reduce the bullwhip impact.

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APPENDICES

Appendix 1: Keffalos Approval Form


KEFALOS
QUALITY DAIRY PRODUCE

RE: RESEARCH APPROVAL LETTER FOR MISS. SHARON TANAKA MARIGA

This letter serves to confirm that Miss. Sharon Tanaka Mariga was granted permission to conduct her research **EFFECTS OF INVENTORY MANAGEMENT PRACTICES ON THE ORGANIZATIONAL PERFORMANCE OF THE DAIRY PROCESSING INDUSTRY IN HARARE, ZIMBABWE**. The information provided is for academic purposes only.

Yours faithfully

C. Bandiwa

Warehouse operations manager.


KEFALOS
QUALITY DAIRY PRODUCE

KEFALOS CHEESE PRODUCTS
(PVT) LTD
BHARA BHARA FARM, MUBAIRA ROAD
HARARE SOUTH
Tel: +263 (24) 2613 454/56/55

WAREHOUSE

DATE: 07/06/24

Appendix 2: Research Data

<https://docs.google.com/spreadsheets/d/1-2dn5JzygtINaqs2AMQfeYmauFl-eik5/edit?usp=drivesdk&ouid=113850973846818807274&rtpof=true&sd=true>

Structure of the data

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Date	Product ID	Unit Price	Current Inventory Level	Current Inventory Value (US\$)	Minimum Inventory Level	Maximum Inventory Level	Reorder Point	Lead Time (days)	VMI Next Replenishment Date	Postponement Status	Postponement Date	JIT Order Quantity	JIT Order Value (US\$)	JIT Order Date	Stock Taking Date	Stock Taking Actual Count	Stock Taking Inventory Value (USD\$)	
2	6/2/2023	IC1001	0.5	208	104	50	300	60	4	6/3/2023	Yes	6/5/2023	373	186.5	1/4/2024	6/8/2023	133	66.5	
3	6/3/2023	IC1002	0.5	237	118.5	50	300	60	3	6/4/2023	Yes	6/6/2023	361	180.5	1/4/2024	6/9/2023	89	44.5	
4	6/4/2023	IC1003	0.5	202	101	50	300	60	5	6/5/2023	No	6/7/2023	379	189.5	1/4/2024	6/10/2023	89	44.5	
5	6/5/2023	IC1004	0.5	75	37.5	50	300	60	4	6/6/2023	Yes	6/8/2023	400	200	1/4/2024	6/11/2023	101	50.5	
6	6/6/2023	IC1005	0.5	211	105.5	50	300	60	4	6/7/2023	Yes	6/9/2023	399	199.5	1/4/2024	6/12/2023	109	54.5	
7	6/7/2023	IC1006	0.5	146	73	50	300	60	6	6/8/2023	Yes	6/10/2023	363	181.5	1/4/2024	6/13/2023	106	53	
8	6/8/2023	IC1007	0.5	238	119	50	300	60	7	6/9/2023	Yes	6/11/2023	393	196.5	1/4/2024	6/14/2023	103	51.5	
9	6/9/2023	IC1008	0.5	150	75	50	300	60	3	6/10/2023	No	6/12/2023	399	199.5	1/4/2024	6/15/2023	128	64	
10	6/10/2023	IC1009	0.5	104	52	50	300	60	7	6/11/2023	No	6/13/2023	367	183.5	1/4/2024	6/16/2023	86	43	
11	6/11/2023	IC1010	0.5	77	38.5	50	300	60	8	6/12/2023	No	6/14/2023	391	195.5	1/4/2024	6/17/2023	139	69.5	
12	6/12/2023	IC1011	0.5	294	147	50	300	60	6	6/13/2023	Yes	6/15/2023	391	195.5	1/4/2024	6/18/2023	100	50	
13	6/13/2023	IC1012	0.5	232	116	50	300	60	4	6/14/2023	Yes	6/16/2023	359	179.5	1/4/2024	6/19/2023	112	56	
14	6/14/2023	IC1013	0.5	225	112.5	50	300	60	6	6/15/2023	Yes	6/17/2023	362	181	1/4/2024	6/20/2023	114	57	
15	6/15/2023	IC1014	0.5	132	66	50	300	60	5	6/16/2023	Yes	6/18/2023	367	183.5	1/4/2024	6/21/2023	96	48	
16	6/16/2023	IC1015	0.5	100	50	50	300	60	4	6/17/2023	No	6/19/2023	396	198	1/4/2024	6/22/2023	97	48.5	

Appendix 3: Approval Form from University

The undersigned certify that they have read and recommend to the Purchasing and Supply Chain Management Department, School of Business, Bindura University of Science Education, for approval of a project titled **Effects of inventory management practices on organizational performance of the Dairy Processing Industry in Harare, Zimbabwe** which was submitted by **Sharon T Mariga** in partial fulfillment of the requirements for the Master's degree in Purchasing and Supply Chain Management.

Name of Supervisor: Paul Mukucha

Signature:

Date: 06/07/24