THE MODERATING EFFECT OF GOVERNMENT REGULATIONS IN THE RELATIONSHIP BETWEEN LEAN PRODUCTION PRACTICES AND SUPPLY CHAIN PERFORMANCE OF SUGAR MANUFACTURING FIRMS IN WESTERN KENYA

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DECLARATION

This thesis is my original work prepared with no other than the indicated sources and support and has not been presented elsewhere for a degree or any other award.

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance of Masinde Muliro University of Science and Technology a thesis entitled: "***the moderating effect of government regulations in the relationship between lean production practices and supply chain performance of sugar manufacturing firms in western kenya".***

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DEDICATION

I would like to express my heartfelt dedication of this work to my wife, whose unwavering support and tireless sacrifices have been invaluable throughout my entire master's degree program.

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Gratitude to the highest God for the divine power and blessings of life and for bestowing upon me the abilities, determination, perseverance, and desire to successfully finish this thesis. Throughout the project, I depended on His divine guidance, strength, safeguarding, and provisions

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ABSTRACT

Lean concept implementation in supply chain performance such as Just in Time (JIT), Total Quality Management (TQM), and Total Prevention Maintenance (TPM). Organizations have gone through major changes to improve efficiency and to streamline operations. The study sought to determine the influence of just-in-time on supply chain performance, establish the impact of total prevention maintenance on supply chain performance, examine the effect of total quality management on supply chain performance, and to assess the moderating effect of government regulations on supply chain performance of manufacturing firms in western Kenya. The study was guided by lean,transaction cost and resource-based view theories. Descriptive cross-sectional research design was adopted in the study. The target population was 95 employees comprising procurement officers, finance officers, production officers, quality assurance officers, operations officers, director of audit services, logistics, and firm engineers from 11 sugar manufacturing firms in western Kenya. The survey utilized a census approach, specifically targeting all 95 employees. The research employed primary data sources, with primary data gathered by administering closed-ended questionnaires. Descriptive statistics was employed to present the data, displayed as tables, pie charts, and bar graphs. In this study, inferential statistics was used to test hypotheses and to evaluate data. Concisely, the researcher utilized Pearson correlation and linear regression models to show the association between lean production techniques and the supply chain performance of sugar producing firms in western Kenya. A pilot study was carried out in the Ramisi Sugar factory in Kwale County and involved 13 respondents. The findings from the pilot study were crucial in determining the reliability and validity of the instruments. An increased Cronbach's Alpha coefficient indicated a higher level of internal consistency, improving the research instruments' reliability.The rating of each variable was as follows ,Just In Time 0.93,Total prevention Maintenance 0.791,Total Quality Management 0.715,Government Regulations 0.879 and Supply Chain performance 0.904 all of them over 0.7 threshold to portend satisfactory reliability.Construct and content validity was done on the questinnaires. Data analysis was conducted using SPSS. On hypothesis testing, H01: There is no significant influence of Just-In-Time practices on the supply chain of sugar manufacturing companies in Western Kenya was rejected with a value of 0.001 being below the limit of 0.05. H02: Total Preventive Maintenance has no significant influence on the supply chain performance of Sugar Manufacturing in Western Kenya was rejected at a significant value of 0.001 which is below the limit of 0.05. H03: Total Quality Management does not significantly influence the supply chain performance of Sugar Manufacturing companies in Western Kenya and was rejected at a significance value of 0.001 is below the predetermined significance of 0.05. H04: Government regulations do not moderate the relationship between lean production practices and supply chain performance of sugar manufacturing factories in Western Kenya was rejected at a significance value of 0.001 which is below the threshold of 0.05. The research revealed that performance is influenced by Total quality management.TQM, adequate staff awareness and training on the methodology, support from upper management, and resource allocation towards TQM empowerment could have facilitated this. Increased profitability, market share, sales volumes, and return on investment, in addition to enhanced customer satisfaction, will undoubtedly result from the implementation of Total Quality Management. The study suggests that manufacturing firms should prioritize JIT as a LSCM approach and allocate more resources for its adoption, while also investing in Total Quality Management for continuous improvement.

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ABBREVIATIONS AND ACRONYMS

3PL	Third Party Logistics
B2C	Business-to-consumer
C2C	Consumer-to-consumer
EA	East African
EABL	East African Breweries Limited
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
JIT	Just-In-Time
KAM	Kenya Association of Manufacturers
KNBS	Kenya national bureau of standards
LSCM	Lean Supply Chain Management
NAM	National Association of Manufacturers
TCA	Transaction Cost Analysis
TPS	Toyota Production System
USA	United States of America
VA	Value-Added
VSA	Value Stream Analysis
WB	World Bank

OPERATIONAL DEFINITION OF TERMS

Contingency planning	Contingency plan is developed to address outcomes that deviate from the normal course of action. Typically employed for risk management purposes, it aims to mitigate the impact of an extraordinary risk that, while improbable, could have severe and far-reaching consequences.
Lean Manufacturing	Approach that focuses on elimination of waste within the manufacturing cycle while maximizing on productivity.
Lean Procurement	The utilization of e-procurement and automated procurement methods. E-procurement leverages on web-based applications to facilitate transactions, strategic sourcing, bidding, and reverse auctions
Lean Practices within Supply Chain	a collection of works implemented by a manufacturing organization to facilitate efficient supply chain management
Lean Warehousing	Lean warehousing involves the removal of unnecessary steps and waste in the storage processes of products, aiming to increase efficiency and value-added activities.
Organizational performance	Encompasses the extent to which an organization achieves its financial, production, and human resource objectives and meets market-based criteria.
Supply Chain Management	A synchronized sequence of choices and activities aimed at efficiently linking the entities involved in the network.

Waste	From the customer's standpoint, it encompasses anything that is improbable that the customer will pay for, including evident wastage such as material offcuts, adjustments, and corrections. However, its scope should be expanded to encompass all unproductive activity.
Waste Elimination	refers to closing processes in the chain of waste treatment ending with the disposal of the products that are unwanted by the customers
Workplace and System Organization-	Involves arranging equipment, fixtures, and facilities within the workspace in an optimal manner to promote efficient workflow, utilize space effectively, and minimize obstacles to production.
Western Region	Refers to demographic area which comprises the counties Migori,Homa Bay,Nyamira,Kisii,Kisumu,Busia,Vihiga Siaya,Kakamega and Bungoma.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

1.1.0:Introduction To The Sugar Industry In Kenya

The sugar industry is a vital sector in Kenya, contributing significantly to the economy through job creation, revenue generation, and agricultural development. The Western region, in particular, is a key area for sugar production, housing several major companies such as Miwani, Sukari, South Nyanza, Muhoroni, Chemilil, Mumias, Nzoia, Olepito, Busia, West Kenya, and Butali. These firms play a crucial role in meeting both local and regional sugar demands while supporting the livelihoods of thousands of farmers and workers.

Implementations in the manufacturing sector, progressive management approaches like supply chain management and lean concepts are being implemented to drive innovation. A sector rooted in progressive processes and interdependencies is, therefore, important in the sector's performance *(*Sarangee, Schmidt, B., Srinath, & Wallace, 2022).

To achieve success in the present business landscape, therefore, organizations actively engage with their suppliers and customers, playing a more involving role in their respective business operations. Efficient supply chain management is essential in ensuring the smooth flow of products or services. It involves a strategic mix of decisions and actions to establish effective connections among various stakeholders within the supply chain (Alam, 2022).

.1.1.1:Lean Production Practices

In recent years, the adoption of lean production practices has gained momentum within the manufacturing sector globally, including in the sugar industry. Lean production emphasizes efficiency, waste reduction, and continuous improvement, aligning closely with concepts such as Just-in-Time (JIT) inventory management, Total Quality Management (TQM), and Total Preventive Maintenance (TPM). These practices aim to enhance operational efficiency and improve supply chain performance, which is critical in a competitive market.

The primary objective is to ensure accurate distribution of the right products or services, in correct quantities, and appropriate destinations, and the right time. This approach aims to minimize costs across the entire system while meeting customer service level expectations (Choudhary, Sangwa, Sangwan & Singh, 2022). It involves a well-coordinated activities that aim to efficiently link all the players within the supply chain, delivering the correct quantities to the appropriate locations especially when they are needed. This comprehensive approach aims to minimize overall costs while meeting customer service requirements (Jahed, Quaddus, Suresh, Salam, & Khan, 2022).

1.1.2:Supply Chain Performance

Supply chain performance is an essential aspect of operational success in manufacturing. It encompasses the efficiency and effectiveness of processes involved in the production and distribution of goods. In the context of the sugar industry, effective supply chain management can lead to reduced costs, improved product quality, and enhanced customer satisfaction. The integration of lean practices within the supply chain is believed to contribute positively to these outcomes.

The implementation of lean supply chain management (LSCM) strategies has been identified as a viable approach for waste reduction inside firms, owing to the numerous advantages that arise from its adoption (Margaret, 2013). The use of LSCM allows organizations to customize their supply chain processes and organizational roles in order to align with the concepts of lean supply chain. According to Demirbag, Koh, Tatoglu, and Zaim (2016), organizations operating inside a lean supply chain possess the capability to effectively utilize their own lean journey, resulting in enhanced customer value through improved responsiveness, agility, and predictability to customer demands. Consequently, this process enables the efficient functioning of the lean supply chain, establishing a positive feedback loop that ultimately leads to enhanced financial outcomes for these entities.

Lean approaches encompass all activities implemented by organizations to effectively manage their supply chains. These practices, as introduced by Garcia-Buendia et al. (2022), are multidimensional by nature, addressing both upstream and downstream aspects within supply chain. The primary mechanism employed by organizations to respond and to adjust to changes is the adoption of the Lean management philosophy. This concept is characterized by a methodical approach to adding value for customers by detecting and reducing wastage of time, effort, and resource upgrade. It emphasizes aligning production with customer demand and striving for perfection (Dang, 2018).

Lean practices have turned as a strategic approach crucial for manufacturers, retailers, and wholesalers to secure a competitive edge and to ensure survival in the business landscape. As outlined by Bertagnolli (2022), The most effective approaches in LSCM comprise demand management, which focuses on meeting customer requests promptly, as well as Cost and waste reduction which are key tenets of implementing LSCM. Standardizing processes

enables smooth workflow, industry standardization enhances efficiency, and cultural change plays a significant role in driving these improvements, encourages a lean mindset across the enterprise. Furthermore, cross-enterprise collaboration initiates the achievement of lean goals (Veres, 2020).

According to Sinha and Matharu (2019), the concept of lean entail a methodical procedure of identification and elimination of redundant activities through a process of continuous improvement, this approach involves aligning the production process with customer demand, striving for perfection. Essentially, lean aims to generate greater value for customers while utilizing fewer resources, thereby optimizing customer value and minimizing waste. Additionally, Pinto et al., (2018) propose Lean principles as applicable not only within the realm of manufacturing but also across various organizational levels. Maware, Okwu, & Adetunji (2022) describes lean as the former name for just-in-time (JIT) production. Psomas Antony (2019) define JIT as a manufacturing philosophy focused on eliminating all forms of waste through careful planning. JIT encompasses the efficient execution of all operational activities that implement LSCM and extends across product life cycle, encompassing activities like design engineering to final delivery. Those practices involve the strategic management of supplier relationships with long-term perspective, geared towards elimination of waste and maximization of value. They are deeply influenced by the Toyota Production System, a renowned Japanese production model, which is widely recognized as the leading framework for lean operations (Yamamoto, Milstead & Lloyd, 2019). United States of America accounts for its 12% GDP on the manufacturing sector, employing approximately 9% of the national workforce, this has a significant impact on the U.S. economy.

However, the manufacturing sector faced challenges in recent years. Holding non-responsive stock within the supply chain led to increased costs which have negatively affected the company's profitability, Managers have strived to optimize inventory levels that maintain thresholds meeting customer expectations while minimizing costs consistently (Tarafdar & Qrunfleh, 2017; Yao, 2017). Supply chain management techniques that maximize the efficiency of inventory levels, enhance supply chain performance (SCP) encompassing both technological solutions and non-technological solutions, Further, as highlighted by Levinson (2018) highlights that while the USA's output growth has outperformed that of many European countries and Japan in the past decade, it has still trailed behind the growth rates compared to Asian countries furthermore, from 2002 to 2012, the United States witnessed a decrease in its global manufacturing activity, dropping from 30% to 17.4%. , China surpassed the USA as the largest manufacturing economy in 2010 Klynveld Peat Marwick Goerdeler (KPMG) International (2015), China's GDP growth decreased from 2013 to 2014, reaching 7.4%, partially due to challenges within the manufacturing sector. China's manufacturing sectors contributes 13.9% lower GDP compared to the service sector, which accounts for 73% (Taborda, 2015).

Japan's renowned capability for continuous improvement played a significant role in establishing their manufacturing superiority, as highlighted by studies conducted in the 1980s and 1990s. During that time, the automotive industry drew attention when it became evident that Japanese cars surpassed American cars in terms of durability and required less maintenance (Wada, 2020). Toyota's production system, (TPS), was considered a unique and philosophical approach to manufacturing. However, there has been a recent questioning of

the overall effectiveness of the Japanese system, leading to a decreased interest in Japanese firms as a global business model (Oliver, Delbridge & Parton, 2022).

Despite JIT becoming more prevalent in both developed and developing nations, its adoption rate in low-income countries remains relatively low. As an illustration, manufacturing output in Tanzania is considerably inferior to that of other developing nations. According to Mapunda (2019), the estimated adoption rate across all categories of manufacturing industries is 8%. In line with findings from other scholarly sources, it has been observed that developing nations including Tanzania (Kafuku, 2019), Kenya (Maina, 2015), and Ghana (Negrão et al. 2017) report the status of lean implementation adoption according to the practices that occur most frequently, as opposed to relying on overall statistical data (Negrão et al. 2017). Moreover, the growth of lean implementation maturity levels within organizations has been phenomenal (Brito et al. 2020).

Lean thinking is an approach that emphasizes value-added lean and integrates industry-wide best practices, tools, and techniques in order to minimize waste and optimize the overall system's flow and efficiency in pursuit of complete customer satisfaction (Rosenzweig & E Aston, 2012). Total quality control and JIT manufacturing are two such procedures. The manufacturing sector implements the Japanese management philosophy of JIT manufacturing. Ensuring the appropriateness of the location, quantity, and quality of items at the designated moment is what is meant by this concept (Paneru, 2011). Customer satisfaction is the principal objective of every organization; failure to achieve precision in this domain renders all other processes futile. If properly implemented, JIT enhances the performance and efficacy of an organization by reducing expenses, increasing output, and enhancing product quality.

1.1.3:Role of Government Regulations

Government regulations play a pivotal role in shaping the operational landscape of the sugar industry. Regulatory frameworks can influence production standards, environmental compliance, pricing, and market access. Understanding the moderating effect of these regulations on the relationship between lean production practices and supply chain performance is critical for manufacturers seeking to navigate challenges and leverage opportunities in a regulated environment.

The study conducted by Achieng (2021) did not focus specifically on the impact of JIT management practices on organizational performance, but rather on the adoption of those practices. In a study by Omondi (2020), lean thinking to business process management was examined, it aimed at improving on srvice delivery and boosting tax collection. Findings revealed that there was an insufficiently established connection between human resource practices in public universities and lean practices. Lack of connection was primarily attributed to inappropriate policies within those institutions.

The study mentioned earlier specifically centered on the adoption of lean (SCM) practices and failed to investigate the direct implication of using lean SCM on organizational performance.

Non-financial criteria include indicators such as customer satisfaction, employee engagement, innovation, quality, and sustainability, among others, innovation performance, market share (Rajapathirana & Hui, 2018), quality enhancement, innovation capabilities, and resource management (Austin-Egole, Iheriohanma & Nwokorie, 2020). The field of organizational performance also encompasses assessment of performance of the supply chain management (SCM) it includes increased sales, improved coordination and integration

within the supply chain, and operational and organizational performance dimensions that may involve indicators that relate to innovation, research and development (Nureen, Liu, Ahmad & Irfan, 2022). Several of empirical studies done to investigate the correlation between supply chain management (SCM) and organizational performance. (Ahmad & Karadas, 2021; Sahoo & Vijayvargy, 2021). The measures often used to evaluate organizational performance include factors such as increased sales, enhanced costing accuracy, improved inter-departmental coordination, enhanced collaboration with suppliers, and improved customer coordination (Kumar & Singh, 2022).

In recent times, researchers, particularly in the manufacturing sector, have shown significant interest in the concept of lean philosophy. For example, Agus and Hajinoor (2016) explored the connection between lean production, relationship between (SCM), quality improvement, and business performance. The study's findings emphasized on strong association between the implementation of lean production, improvements in product quality performance, and overall performance. This has sparked significant interest among researchers, particularly in operations management, with regard to widespread adoption of lean principles. (Maware & Parsley, 2022) and competitive advantage (Cao et al., 2022). In this context, the procurement department plays a crucial and proactive role in implementing lean procurement principles to enhance efficiency, competitiveness, and ultimately ensure the organization's profitability.

Oliveira-Dias et al. (2022) conducted a study investigating processes related to agility and lean methodologies, specifically within carpet and electronic manufacturing companies. It emphasized the importance of eliminating uncertainties caused by the system through the adoption of lean and agile systems. However, it is imperative to note that this study did not

specifically investigate the impact of implementing lean supply chain practices on organizational performance has been studied extensively. The pursuit of lean excellence is perceived as a coordinated response to enhance performance within organizations. to the high level of competition within manufacturing industry today (Upadhyay et al., 2022). With the growing recognition of lean's success, various industries are embracing it and extending its application to different areas within the value chain.

In the local context, Wanjihia (2021) conducted a study within the manufacturing sector that focused on innovation management. The findings revealed a need for increased investment in innovation within this sector. Similarly, Wanjiku (2018) conducted a study that focused on lean practices within firms and acknowledged the existence of lean supply chain practices within these organizations. However, it did not establish a direct connection between JIT and its impact on organizational performance. Examining the lean procurement methodologies employed by major manufacturing companies in Nairobi, Kabuga (2021) concluded that further research in areas beyond Nairobi is necessary to explore possible similarities and differences in the findings.

Large-scale operations characterize these firms and have great importance in Kenya, contributing significantly to the country's economic development. It serves as a crucial fundamental component of the Vision 2030 plan, which endeavored to uplift the nation to a middle-income status by 2030 (Dolo, Magutu & Mogikoyo, 2018).

(KAM), Has 700 registered manufacturing firms in Kenya. Among these, approximately 80% are located in Nairobi According to Mukabwa (2017), manufacturing firms in Nairobi account for a large proportion, while the remaining firms are situated in different cities across the country. These manufacturing firms are classified into three categories based on their

annual average turnovers. Major manufacturing companies or large-scale manufacturing firms in Kenya are characterized by a turnover of over 250 million Kenyan shillings (KAM). Medium-scale manufacturing firms, fall within the turnover range of 20 million to 250 million Kenyan shillings. Small-scale manufacturing firms are characterized by turnovers ranging from 10 million to 20 million Kenyan shillings (KNBS, 2014; Weru, 2015). The manufacturing sector is considered a critical component in achieving the targeted annual economic growth rate for Kenya, as it aims to enhance and maintain the (GDP) of the country, making it an essential component of the national economy. Additionally, this sector plays a crucial role in fostering social development by generating employment opportunities, facilitating the inflow of foreign, and exchange attracting domestic and foreign investments.

1.2 Statement of the problem

The Sugar production in western Region of Kenya implying the counties of Nyamira,Kisii,Migori,Homa-Bay,Kisumju,Bondo,Siaya,Vihiga,Busia,Kakamga and Bungoma have a myriad of challenges that slacken its competitiveness and performance. In spite of the region's ability to manufacture Sugar and related products, firms incur huge losses occasioned by inefficiencies in their manufacturing processes. Major issues include huge waste of raw materials, idle stock and overproduction which occasions a state of overstated operations costs, stockout costs for under production and poor quality end products associated with outdated technology which increase challenges.

Such challenges not only decline profitability of local sugar producing firms but also contribute to a sharp decline of the country's Gross Domestic Product (GDP). Proliferation of superior sugar and related products from the international markets hitherto heighten pressure

competitive pressure on local manufacturers justifying the need for efficient supply chain performance,

In addition to that, government regulations including imposed production quotas, massive taxation, stringent licensing requirements come with enormous hindrance to optimum production which further adversely impact on the competitiveness of sugar manufacturing firms in western Kenya region compared to their global counterparts.

The research was aimed at establishing on the extent of lean production practices on supply chain performance in Sugar manufacturing firms in Western Kenya region by discovery of strategies to mitigate for waste, increase efficiency and to boost competitiveness holistically and to establish discernment of sugar producing firms in western Kenya to thrive in competitive establishment.

There has been studies conducted in similar sphere Bob Ochieng(2021) Lean manufacturing practices and supply chain performance and sugar manufacturing firms in western Kenya.The research did not focus on total quality management ,total prevention maintence and did not dwell on government regulations as a moderating variable.

Kanyoria(2018) Lean Manufacturing on operational performance of Sugar firms in Kenya.Focused on correlational research and did not factor in the government regulations as a moderating variable and thus justifying a huge gap of research to warrant the current study.

1.3 Objectives of the Study

1.3.1 General Objective

To determine the influence of the Moderating Effect Of Government Regulations In The Relationship Between Lean Production Practices And Supply Chain Performance Of Sugar Manufacturing Firms In Western Kenya.

1.3.2 Specific Objectives of the Study

Specific objectives include;

i. To establish the influence of just-in-time on supply chain performance, in Sugar manufacturing companies in Western Kenya.

ii. To establish the influence of total prevention maintenance on supply chain performance in Sugar manufacturing companies in Western Kenya.

iii. To establish the influence of Total Quality management on supply chain performance in Sugar manufacturing companies in Western Kenya.

iv. To assess the moderating effect of government regulations on the relationship between lean production practices and supply chain performance of the Sugar manufacturing factories in western Kenya

1.4 Hypothesis

The study sought to test the following hypotheses;

i. **H_{01}:** There is no significant influence of Just-In-Time practices on the supply chain of sugar manufacturing companies in Western Kenya.

ii. **H_{02}:** Total Preventive Maintenance has no significant influence on the supply chain performance of Sugar Manufacturing in Western Kenya.

iii. **H_{03}:** Total Quality Management does not significantly influence the supply chain performance of Sugar Manufacturing companies in Western Kenya.

iv. **H_{04}:** Government regulations do not moderate the relationship between lean production practices and supply chain performance of sugar manufacturing factories in Western Kenya.

1.5 Scope of the study

The study sought to establish the influence of lean production practices on supply chain performance in sugar manufacturing firms in Western Kenya implying the counties in the former Nyanza province namely Nyamira,Kisii,Homabay,Kisumu and Siaya.Also the counties in the former western province namely Vihiga,Kakamega,Bungoma and Busia counties. It narrowed to just in time, total prevention maintenance and total quality management as the independent variables, government regulations as the moderating variable, and supply chain performance as the dependent variable.

The study took place in all sugar companies in Western Kenya i.e. Chemelil, Muhoroni, Mumias, Nzoia, South Nyanza, Kibos, Busia, Butali, West Kenya, Sukari, and Olepito Busia.

The study was based on the procurement officers, finance officers, production officers, quality assurance officers, operations officers, director of audit services, logistics, and firm engineers of each of the 11 firms.

The study began in March , 2024.

1.6 Significance of The Study

This study aims to explore the moderating effect of government regulations on the relationship between lean production practices and supply chain performance, particularly

within the sugar manufacturing sector. The significance of this research is multifaceted and would be articulated as follows:

1. Policy Framework Development: By analyzing how government regulations influence lean production practices, the study provides valuable insights that can inform policymakers in creating effective regulatory frameworks. These frameworks can help integrate lean principles into manufacturing processes, ultimately enhancing operational efficiency and increasing overall output. This, in turn, has the potential to positively impact the country's GDP.

2. Enhancing Manufacturing Efficiency: The findings will assist sugar manufacturing companies in optimizing their operations. By identifying best practices for waste elimination and cost reduction, the study will enable these companies to enhance their productivity and profitability. This competitive edge is crucial for sustaining market position and improving overall industry standards.

3. Research Expansion Opportunities: The study opens avenues for researchers to explore the implications of government regulations across various manufacturing sectors. It identifies gaps in existing literature, particularly within the sugar industry, prompting further investigation into how different regulatory environments affect lean practices and performance outcomes.

4. Contribution to Academic Knowledge: For scholars, this research serves as a foundation for future studies. It highlights the importance of understanding the interplay between government policies and manufacturing practices, encouraging the development of more efficient measures to enhance knowledge in this field. The outcomes can stimulate academic discourse and foster innovative approaches to improve supply chain performance.

5. Practical Implications for Competitiveness: The insights gained from this study will not only benefit sugar manufacturers but also other industries looking to adopt lean practices. By understanding the moderating role of government regulations, companies can better navigate compliance while striving for operational excellence, ultimately leading to a more robust and competitive manufacturing landscape.

In summary, this study is significant for its potential to inform policy, enhance manufacturing efficiency, expand research opportunities, and contribute to academic discourse, all of which can lead to improved economic outcomes at both the industry and national levels.

1.7 Limitations of the Study

Limitations of the Research Study

1. **Limited Scope of Companies**: The study focused exclusively on 11 sugar manufacturing companies in the Western region of Kenya. This narrow scope did not capture the full range of practices, challenges, and regulatory impacts experienced by all manufacturers in Kenya, potentially limiting the generalizability of the findings to the broader Manufacturing sector in Kenya.

2. **Census Data Collection Method**: While a census approach aimed for comprehensive data collection from the respondents, challenges were encountered such as difficulty in obtaining responses on time because it was not possible to find all the respondence at the same time or there were also instances of incomplete responses from some respondents and thus affected the reliability and validity of the data collected to some extent.

3. **Targeted Respondent Group**: The research targete a specific group of 95 staff members which lie within the supply chain practice, including various procurement officers,logistics officers,quality assurance officers,operations officers,Audit officers,production officers,finance officers and firm engineers. This focus excluded perspectives from other critical stakeholders, such as lower-level employees or external partners, who could have provided valuable insights into lean production practices and supply chain performance.

4. **Bias in Self-Reported Data**: The reliance on self-reported data from staff members may have introduced bias. Respondents provided answers they believed were favorable, rather than reflecting their true experiences and challenges, leading to potential inaccuracies in the data.

5. **Complexity of Government Regulations**: Government regulations are multifaceted and varied significantly in their interpretations and implementation across different companies. This complexity may have been challenging to isolate the specific moderating effects of regulations on lean practices and supply chain performance.

6. **Focus on Specific Lean Practices**: The study emphasized on particular lean practices such as Just-in-Time (JIT), Total Quality Management (TQM), and Total Preventive Maintenance (TPM). That overlooked other relevant lean methodologies or innovations that could also impact supply chain performance.

7. **Temporal Limitations**: Having conducted the study at a specific point in time may not have accounted for changes in government regulations, market conditions, or technological advancements that could influence the relationship between lean production practices and supply chain performance over time.

8. **Regional Variability**: The Western region of Kenya have unique economic, social, and cultural factors that influenced the sugar industry. Those regional characteristics may not have reflected the conditions in other regions of manufacturing firms, limiting the applicability of findings across the manufacturing industry.

9. **External Economic Factors**: The study may not have adequately considered external economic factors, such as fluctuations in global sugar prices or changes in consumer demand, which could also significantly impact supply chain performance and lean practices.

10. **Potential for Overlapping Variables**: The study's focus on multiple lean practices and their relationship with supply chain performance lead to overlapping variables, making it difficult to draw clear conclusions about the distinct effects of each practice and the moderating role of government regulations.

By recognizing those limitations, the study could have provided a more balanced interpretation of its findings and to suggest directions for future research to address these gaps.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

A comprehensive review of relevant literature was presented in this chapter. It encompassed both theoretical and empirical studies about supply chain integration. The aim was to provide an extensive analysis of the current state of knowledge in the field of supply chain management. Insights gathered from these reviews were employed to establish a strong and comprehensive conceptual framework for the present study.

2.2 Theoretical Review

The study was guided by lean theory, transaction cost theory, and resource-based view.

Main Theory

2.2.1 Lean Theory

The basics of Lean can be traced back to Toyota, a Japanese company. The development can be credited to notable individuals including Sakichi Toyoda, his sons Kiichiro Toyoda and Eiji Toyoda, and Taiichi Ohno, distinguished engineers. (Hino, 2005). The research dwelled on Lean theory, which examined and highlighted the implementation of lean practices aimed at eliminating production overload, inconsistency, and waste reduction. Ciarniene and Vienazindiene (2012) describe lean as a comprehensive model comprising various techniques that work together to reduce and eliminate waste within the production process, enabling organizations to become more responsive and adaptable to changes in demand. Building upon this, Liker (2021) The theory further expands by conceptualizing the Lean systematic approach to ensure a seamless and uninterrupted flow of high-quality products or services to

meet customer needs precisely when they require them. The underlying theory highlights the importance of processes focused on satisfying customer requirements while adhering to established principles of waste elimination. Furthermore, the operating system embody streamlined values that were applied throughout the entire process, starting from the initial stage and extending to the final delivery (Ciarniene & Vienazindiene, 2012).

Customer satisfaction was prioritized by organizations that adopt lean theory in their production lines., actively eliminate production waste on a daily basis, and possess the determination to grow and thrive in a competitive environment. Bellgran and Säfsten (2010) suggest that a well-designed production process should strive for consistent and predictable product delivery while minimizing waste. Lean theory emphasizes the continuous delivery of high-quality products tailored to meet specific customer needs at the right time, By prioritizing customer satisfaction, organizations that adopt lean theory in their production lines can eliminate waste associated with unnecessary planning meetings, excessive inventory, overproduction, unnecessary transportation, and excessive processing in the production process.JIT is a strategic approach embraced by organizations to synchronize their supply orders from suppliers with production schedules, as outlined by Ciarniene and Vienazindiene (2012). Organizations that adopt theJIT strategy strive to enhance efficiency and reduce waste by receiving goods precisely when needed in the process. This approach enables producers to forecast demand and optimize their inventory levels accurately. According to Bautista and Fortuny-Santos (2016), implementing JIT practices allows organizations to minimize working capital requirements by reducing stock levels. Additionally, the strategy promotes a step-by-step inspection of the production process, leading to waste reduction and improved overall efficiency.

Despite the successful implementation of lean practices across various industries, Lean has faced significant criticism. A study by AlixPartners (2011) revealed that approximately 70% of companies that initiated Lean efforts within the previous two years failed to achieve significant cost-cutting improvements beyond the 5% threshold. Additionally, around three-quarters of companies attempting Lean practices fail to achieve their desired results, and even when initial gains are achieved, they tend to be short-lived, with companies regressing to their pre-Lean performance (Hines, Taylor & Walsh, 2020).

One common criticism of Lean is its alleged excessive focus on cost reduction. However, this criticism is unfounded. While Lean does emphasize waste elimination, which can have cost-related implications, the underlying goal is to optimize processes and enhance overall performance. The perception of cost-centricity arises from the fact that many widely known Lean tools are cost-oriented in nature (Samuel, 2013). Nevertheless, in the current study, the theory of Lean will examine types of LSCM practices and their impact on the organizational performance of manufacturing firms.

According to Almanei, Salonitis, Y Xu (2017), lean principles are put into action through various practices aimed at improving organizational processes. The essential lean practices identified encompass collecting customer feedback, performing value stream analysis (VSA), prioritizing customer satisfaction, eliminating waste, optimizing work processes, fostering robust and efficient collaborations, and implementing continuous improvement measures. These practices are instrumental in enhancing operational efficiency, reducing costs, improving product quality, and achieving higher levels of customer satisfaction. By adopting these lean principles and employing the associated tools and techniques, organizations can streamline their operations, enhance their competitive edge, and achieve

sustainable success, producing customer-specific products only when needed, and actively seeking and solving problems (Rafique 2019).

Implementation of lean approach primarily revolves around reducing waste. Khalfallah and Lakhal (2021) emphasize the effective methods and machining processes by adopting appropriate and advanced technologies, and efficiently organizing facilities within the system. Workplace organization pertains to the appropriate arrangement of machines, tools, and other facilities to enhance efficiency, minimize unnecessary movement, and promote a smooth and productive workflow. By implementing effective workplace organization strategies, organizations can optimize their operations, reduce waste, and improve overall productivity in a workspace to facilitate easy and efficient access, A disorganized system can result in delays and errors, while a well-organized system promotes smooth production flow and is essential for process improvement (Abdelilah, El Korchi & Amine-Balambo, 2021). By implementing effective workplace organization strategies, organizations can improve operational efficiency, reduce waste, and achieve better overall performance in their supply chain management processes.

Continuous problem searching and problem-solving are integral Lean practices encompass a wide range of techniques and approaches that aim to improve operational efficiency and problem-solving without limitations or time constraints. The fundamental principle of lean is to proactively identify and address problems within a system. Lean practitioners focus on identifying the root causes of issues and developing effective solutions (Colim et al., 2021). This involves gathering relevant information on performance which allows organizations to assess and improve key performance indicators such as, working time, process operations, equipment effectiveness (OEE), cycle time, and first-time through (FTT) rates as identified

in the current state map (Santhiapillai & Ratnayake, 2023). By adopting lean practices, organizations develop the ability to anticipate and address issues proactively or efficiently manage them when they occur. This results in enhanced operational performance, better process control, and increased overall efficiency, leading to improved customer satisfaction.

A key distinguishing feature of the lean approach is the An important aspect of lean practices is the urge on fostering Establishing robust and efficient partnerships among all participants engaged in collaborative efforts to generate value. (Javaid et al., 2022). By fostering such relationships, by establishing strong and effective relationships, various activities within the supply chain will be aligned and coordinated, minimizing negative impacts that often arise in distant or arms-length relationships. This requires the active involvement of all parties involved, engaging in long-term contracts, and establishing a shared information system that connects them together. Through this collaborative approach, costs and waste associated with delays in supply chain practices can be efficiently eradicated across the entire supply chain. This leads to improved efficiency, reduced lead times, enhanced responsiveness, and ultimately, better overall performance of the supply chain, by working closely together, sharing information, and operating with a long-term perspective, Organizations can improve the efficiency of their processes.

Key differentiating factors on lean approach is the focus on producing only the units that are needed by customers, in the right quantity and time of their needs (Valamede & Akkari, 2020). This practice aims to eradicate unnecessary inventories by shifting from a push demand strategy to a demand-pull strategy. By adopting a demand-pull strategy, organizations produce goods based on actual customer demand, avoiding the accumulation of excess inventory. This approach helps in minimization waste associated with production

products based on speculative or forecasted demand, such as the costs of storing and managing excessive inventory in warehouses (Sancha 2020). implementing this lean practice allows for a more efficient and streamlined flow of products, ensuring that production is aligned with real-time customer demand. By eliminating waste associated with excessive inventory, organizations can optimize their resources and improve overall SCP.

JIT is a lean methodology that focuses on delivering required parts, components, or materials to the designated location precisely when they are needed and in the desired quantity. (Htun et al., 2019). JIT emphasizes the elimination of unnecessary stockpiling of materials and components on the shop floor or in storage areas. The JIT approach aligns with the principles of lean management, including pull production, active involvement of top management and employees, uninterrupted flow of materials and processes, waste elimination, strong supplier relationships, and a focus on total quality control (Yusup et al., 2017). By implementing JIT, organizations strive to achieve zero inventories and create a production system that responds efficiently and effectively to customer demand. JIT enables organizations to streamline their operations by reducing inventory holding costs, minimizing lead times, and improving overall operational efficiency. By delivering materials and components just in time, waste associated with excess inventory, storage, and handling can be eliminated, resulting in improved productivity and cost savings.

Auxilliary Theories

2.2.2 Transaction Cost Theory

Ronald Coase 1937 emphasized on the significance of transactional costs in the decision-making process. The transaction cost theory views transactions as focal points by categorizing and suggesting that transaction costs, which include production costs and coordination costs, emerge during the contracting phase and impact of overall operational expenses, involving tasks such as drafting, negotiation, and safeguarding, as well as during the implementation phase.

Decision-makers ought to assess and compare the expenses involved in conducting a transaction internally (in-house) versus outsourcing. The principles of Transaction Cost Analysis (TCA), originally established Coase (1937) and later elaborated by Williamson (1992; 1994) proposed a framework that considers the influence of transaction costs on the make-or-buy decision, which involves choosing between internalizing an activity within the firm or outsourcing it to external parties. Transaction cost analysis (TCA) helps in considering five key factors: Transaction frequency pertains to the frequency at which the parties engaged in contractual agreements interacting with each other. Asset specificity relates to investments made in a partnership that is unique and not easily transferable, such as specialized equipment or training.

Uncertainty was classified into two main types: environmental and behavioral uncertainty. The former related to unpredictable factors or circumstances that affect exchange and cannot be predetermined. On the other hand, behavioral refers to the challenge of verifying and ensuring compliance with established agreements among parties involved in the exchange (Yazdanparast, Manuj & Swartz, 2010).

Bounded rationality suggests that decision-makers have cognitive limitations, or restricted information-processing abilities, which affects their rationality. Opportunism suggests exploiting opportunities to serve their interests, making it challenging to determine in advance who can be trusted (Yazdanparast et al., 2010). Considering the allocation of resources and time invested analyzing the characteristics of a transaction can aid in determining the appropriate mode of governance. Nevertheless, the establishment of strong and long-lasting inter-organizational connections, facilitated by activities like information sharing and collaborative planning, has been proposed as an alternative to vertical integration (Palay, 1984; Noordewier et al., 1990; Payan, 2007), serving similar purposes.

Critics, however, point out that Transaction cost theorists have often overlooked the potential impact of the market mechanism's "invisible hand" on the risk of opportunism. Over time, the invisible hand tends to eliminate actors who consistently engage in opportunistic behaviors, emphasizing the importance of market forces in addressing this issue. (Ghoshal & Moran, 1996). The theory will be, however, instrumental in the current study when examining the influence of LSCM practices on the performance of manufacturing firms.

The relevance of transaction cost theory in the supply chain is enormous because every stage of the supply chain involves costs.

2.2.3 Resource-Based View

This is a critical theory in supply chain practice because success in the supply chain is dependent on Organization resources,human resources and physical capital resources.

Barney (1986), Teece (1988), and Teece & Pisano (2003) made major contributions to the comprehension of company behavior and competitive strategy through the Resource-Based

View (RBV) (Mowery, Oxley & Silverman, 1998). According to Lynch, Keller, and Ozment (2000), the Resource-Based View (RBV) theory asserts that the resources and competencies held by organizations are crucial in attaining long-term competitive advantage. Logistics and supply chain management research has also provided this viewpoint, as demonstrated by studies such as Lynch et al. (2000).

Barney (1991) categorizes resources into three distinct types: organizational resources, physical capital resources, and human resources encompassing the structures, systems, and culture that exist within the organization. Physical capital resources encompass tangible assets such as facilities, equipment, and technology. Human capital resources encompass the collective knowledge, skills, and abilities possessed by individuals within an organization. Capabilities, on the other hand, can be defined as the collective skills and competencies required for a firm to fully utilize its resources. These capabilities are intricate combinations Human capital resources which comprise individual accumulated knowledge, which are utilized through organizational processes to facilitate effective coordination of activities and resource leverage within firms (Olavarrieta & Ellinger, 1997). Tibben-Lembke (2002) presents three generic strategies for attaining competitive advantage in the marketplace they include low-cost leadership, differentiation, and focus. Differentiation can be achieved through diverse approaches, and one of them involves establishing a strong brand name (Grant, 1991).

To differentiate its products and showcase its competitors' subpar environmental performance, an organization chooses to prioritize the implementation of reverse logistics practices. This strategic approach requires the establishment of environmentally responsible policies, as well as investments in equipment and training. By effectively leveraging reverse

logistics practices, the organization can gain a competitive edge, expand its market share, and ultimately increase its profitability (Fortes, 2009).

RBV has faced several criticisms that have gained wide recognition. Some of these criticisms include the argument that The Resource-Based View (RBV) has been criticized for being tautological, implying that various combinations of resources can potentially yield the same value for firms, thereby lacking a distinct competitive advantage. Furthermore, the role of product markets is not sufficiently emphasized or explored within the RBV argument. (Truijens, 2008). Another general criticism is that RBV does not address how resources are created and change over time, leaving a gap in understanding this crucial aspect. Some researchers have also pointed out that RBV lacks the necessary detail for practical implementation within organizations (Henry, 2008). Despite these criticisms, the current study will utilize RBV to the objective of this study is to gain a comprehensive understanding of the challenges associated with the implementation of lean practices and their subsequent impact on the organizational performance of manufacturing firms. By exploring these aspects, valuable insights can be obtained regarding the hurdles faced during the adoption of lean practices and how they influence the overall performance of organizations in the manufacturing sector,

2.3 Conceptual Review

Conceptual review is the classifying and describing concepts relevant to the study outlined of a relationship between them including relevant theories and empirical research.

2.3.1 Just In Time

Just-in-time is a manufacturing concept that seeks to achieve excellence by continuously eliminating waste (Singh & Singh, 2015). The global need for critical resources is on the rise, and it is anticipated that future availability may not be sufficient to meet this demand. Certain materials possess such a scarcity that augmenting output becomes unattainable. Just in Time is a concept that uses Kaizen in the production processes while taking cognizance of errors and elimination of waste. It was measured by the following parameters Labour availability, Supplier rationalization and Resource availability.

2.3.2 Total Prevention Maintenance

In this study, Total Prevention maintenance was measured using condition-based maintenance, Time-based maintenance, and planned preventive maintenance.

2.3.3 Total Quality Management

Vanichchinchai and Igel (2011) researched SCP and TQM. The research encompassed the automobile sector in Thailand. The research employed a descriptive survey methodology. The study specifically focused on two prominent automobile suppliers operating in Thailand. The study utilized path analysis to test the proposed model. The results of the study suggest that the implementation of overall quality management principles has a beneficial impact on the performance of the supply chain. Given that the majority of previous studies have been conducted in other nations, it is evident that contextual gaps have been identified.

Total quality Management is; critical reducing errors, minimizing of issues and manufacturing costs and impacting positively in increased profitability and total cost reduction. In this study, Total Quality Management was measured by the internal failures, training and Defect prevention.

2.3.4 Government regulations

According to Moeke's (2021) research, government regulation moderates the relationship between supply chain collaboration and company performance. A causal, quantitative, or cross-sectional survey method was employed in the study. Data collection was carried out through the utilization of questionnaires employing the purposive sampling technique. The study's sample size comprised 55 participants who are stakeholders of a dry port corporation. The findings indicated that government regulation in logistics played a beneficial and substantial influence in reducing the impact of supply chain collaboration on the performance of dry port firms. In this study, it was measured by Incentives, Licensing and Policies.

2.3.5 Lean Concept

Lean enterprise or lean production, is an operational approach that focuses on minimizing resource consumption for purposes other than creating value for the end customer. Its primary goal is to reduce defective products and eliminate waste throughout the production process (Mckie et al., 2021). The core principle of lean is to prioritize actions and processes that customers would be willing to pay for, thereby defining value. The term "lean" originated from Krafcik's article published in 1988, which focused on the Japanese manufacturing industry. titled "Triumph of the Lean Production System" (Pakdil 2018). lean is viewed as a collection of tools that aid in identifying and systematically eliminating waste.

As waste were systematically done away with, there was a corresponding improvement in overall quality, accompanied by reductions in production time, cycle time, and costs. Put simply, the essence is to deliver increased quality to customers while minimizing the use of resources. This means maximizing customer value while minimizing waste. According to Sinkamba et al. (2023), the Toyota Production System (TPS) There are eight types of waste

commonly categorized in lean manufacturing, as identified by Gadalla (2020). These included, overprocessing, waiting, conveyance, excess inventory, wasteful activities such as unnecessary movement, defects, underutilization of employee creativity, and overproduction. These wastes were recognized as non-value-added (NVA) activities that hinder operational efficiency and consume resources without value addition to the final product. A lean organization has a deep understanding of customer value and directs its key processes toward continually enhancing it (Psomas & Antony, 2019). The primary goal was to provide customers with flawless value by implementing a value-creation process that was entirely devoid of waste. To achieve success in lean practices, a shift in thinking is required, moving away Instead of focusing on optimization, lean manufacturing seeks to optimize the flow of products across the supply chain. This involves spanning technologies, assets, and departments horizontally, with the ultimate goal of reaching the customers.

Organizations that incorporate lean approaches into their fundamental business processes and establish them as an integral culture can expect to reap its benefits. A survey conducted by Ross on Lean Supply Chain Management (SCM) practices revealed that all participating organizations surpassed their expectations in terms of inventory reduction, asset reduction, and cost savings in product development (Pinto et al., 2018). Additionally, they experienced improvements in product quality, channel flexibility, and customer service. To achieve these outcomes, companies need to foster a culture of lean not only within their own organization but also extend it beyond their organizational boundaries (Ongaro, 2019). They should develop approaches to measure the impact of improvement projects, foster stronger to achieve their goals, organizations need to demonstrate commitment and foster collaboration with their channel partners. Furthermore, they should leverage information technologies that

enhance coordination and transparency throughout the supply chain, in demand planning and demand-pull mechanisms across the entire channel network. It is also important to optimize channel inventory and make strategic decisions regarding outsourcing for warehousing, transportation, and logistics. This comprehensive approach, as outlined by (Oliveira-Dias 2022), The effective implementation of lean principles in supply chain management is crucial for achieving success in harnessing its benefits. The primary goal is to eliminate across the entire value stream. within the supply chain (Psomas & Antony, 2019). By adopting lean logistics strategies and leveraging information technology, organizations can effectively implement LSCM and enhance their overall operational efficiency and range of positive impacts on organizational performance. As stated by Rafique et al.(2019), these impacts include reduced inventory levels, shortened lead times, reduced costs, improved quality consistency, and enhanced customer satisfaction, enabling organizations to streamline operations, enhance efficiency, and ultimately deliver greater value to their customers.

The elimination of waste is a crucial objective for manufacturing companies, encompassing various aspects of business activities, Waste can manifest as time, excessive inventory, redundant processes, and defects. According to Sayid (2017), achieving this improvement is greatly influenced by the effectiveness of supply chain processes, when costs are reduced while maintaining the same supply chain output, overall supply chain efficiency improves, leading to a reduction in the "cost to serve". Inventory planning plays a critical role in this approach, as it enables the synchronization of production and helps manage the effects of demand and supply fluctuations. By implementing this approach, organizations can enhance the value added by their operations, leading to improved capacity utilization and reduced

average inventory levels across the supply chain (Tripathi & Tiwari, 2018). Nevertheless, in line with the core principle of waste elimination in lean practices, excessive stock must be identified and eliminated wherever possible by optimizing inventory levels, organizations can streamline their operations, reduce waste, and enhance overall supply chain efficiency.

According to Sony (2019), when LSCM is effectively implemented and integrated with the manufacturing process, it can contribute to improved sales performance. Plenert highlights the example of Staples Inc. in the United States, which embarked on a supply chain transformation initiative called "Summit" aimed at transforming both the organizational processes. Over a span of three years, the company successfully reduced by implementing lean initiatives throughout their supply chain processes, organizations have witnessed an increase in their inventory turns, rising from 4.9 to 5.6. As a result, they experienced a significant increase in sales, with a growth rate of 11 percent. This demonstrates a positive impact on its adoption of lean on sales highlights hence its importance of aligning supply chain management with lean principles with lean principles.

For organizations that prioritize and develop expertise in to achieve success in minimizing waste, enhancing the value stream for customers, and sustaining continuous improvement, six essential lean competencies are identified, these competencies play a crucial role in attaining the desired outcomes and ensuring the overall effectiveness of lean practices. Veres (2020) emphasizes that the usefulness of a comprehensive set of lean tools empowers businesses operating across multiple channels to effectively target waste reduction across all levels of the supply chain. This holistic approach ensures that lean practices are integrated throughout the entire supply chain, leading to improved operational efficiency, enhanced customer value, and a commitment to ongoing improvement.

2.3.5.1 Lean concepts

Lean supply chain practices revolve around collaboration of interconnected organizations that Optimize the flow of products, services, finances, and information across the entire supply chain with a critical objective encompassing both upstream downstream activities. The central objective of these practices is to achieve cost reduction and waste minimization by eliminating inefficiencies and enhancing overall supply chain efficiency, meeting the specific requirements of individual customers (Mwachari, 2018). There are various integrated elements that contribute to organizational efficiency and effectiveness. In current business orientation, these elements are crucial for any lean enterprise. Competing firms must understand the value of each element within the supply chain and assess its impact (Kristianto, Gunasekaran & Helo, 2017). A lean supply chain comprises various essential elements, including suppliers, procurement, manufacturing, warehousing, transportation, customers, and transformation practices. They serve as key building blocks for achieving operational efficiency, waste reduction, and continuous improvement according to Lambert and Enz (2017), suppliers who adopt lean practices are capable of responding to changes efficiently. They can offer lower prices due to the streamlined processes associated with lean, and quality products have improved to the extent that extensive incoming inspections are no longer necessary. Lean suppliers consistently deliver their products on time and prioritize a culture of continuous improvement (Schniederjans et al., 2018). To foster this development, organizations should integrate their value stream. It is important to encourage suppliers to undergo their own. A collaborative approach is essential for lean transformation, involving active participation of suppliers in lean activities. This collaborative effort allows for the identification and resolution of problems, as well as the sharing of cost savings

(Houman-Andersen, 2019). Organizations can support their suppliers by setting ambitious targets for price reduction and quality improvement. Additionally, lean procurement processes can benefit from practices such as e-procurement and automated procurement, which enhance efficiency and streamline operations.

Lean procurement involves utilization of automated procurement techniques, e-procurement leverages web-based applications to facilitate transactions, strategic sourcing, bidding, and reverse auctions (Uluç, 2022). On the other hand, automated procurement utilizes software systems that minimize human involvement in various procurement functions and integrate with financial systems (Viale & Zouari, 2020). A critical aspect of lean procurement is the establishment of visibility throughout the supply chain. To enable effective management, it is crucial for suppliers to have access to their customers' operations, and vice versa. By implementing lean procurement practices, several objectives can be achieved, including the removal of information barriers within the supply chain, real-time visibility into inventory movements, and the Transitioning from a "push" to a "pull" model based on consumption-driven replenishment.

Warehousing functions typically encompass activities such as receiving, storing, replenishment, picking, packing, and shipping. (Houman-Andersen, 2019). The focus of lean practices in warehousing is to optimize these functions by reducing inefficiencies and minimizing waste, ultimately improving overall operational efficiency and customer satisfaction. As stated by Kristianto *et al.*, (2017), lean transport encompasses various practices, including core carrier programs, improved transportation administrative processes with automation, In LSCM, optimization, Efficiency, and waste reduction can be achieved through various practices such as optimizing import/export transport processes cross-

docking, right-sizing equipment ,order pooling, multi-stop truckloads, and implementing efficient inbound transportation and backhauls. These practices aim to streamline operations, minimize unnecessary handling and movement, and optimize resource utilization, ultimately reducing waste and enhancing overall efficiency.

Additionally, Pinto *et al.* (2018) highlight the wide applicability of the Toyota Production System (TPS) or lean system across different industries, services, and contexts. The universality of lean is attributed to the simplicity and common-sense nature of the underlying principles of TPS. The close relationship between transportation and JIT systems is influenced by two key factors: the significant impact of transportation on the manufacturing chain and the critical requirements of JIT operations in terms of delivery time and flow (Htun, Maw & Khaing, 2019). These factors emphasize the importance of efficient transportation practices in supporting lean and JIT operations.

To establish effective partnerships, Lean organizations adopted a culture of progressive improvement across the entire supply chain, aiming to minimize costs and to enhance efficiency (Thangarajoo & Smith, 2015). Lean customers played a crucial role by not only valuing the lean approach not only focus subjected es on organizations optimizing the products they procure but also emphasizes delivering value to the end consumers they serve. By adopting the lean approach, organizations strive to streamline their processes, eliminate waste, and enhance overall efficiency to provide maximum value to their customers. prioritizes prompt responsiveness to the ever-changing customer demands, emphasizing mass customization over mass production. Through the implementation of lean systems, organizations can optimize their processes, resulting in improved efficiency and streamlined

operations, productivity, and adaptability of their workflows to accommodate changes in requirements (Ding et al., 2023).

Lean practices in manufacturing can be approached from both a conceptual philosophy and practical techniques and characteristics (Sancha, 2020). However, practical implementation of this practices forms the foundation of its application, organizations must recognize and embrace these principles as a means to eliminate waste (Ismail & Wediawati, 2023). By understanding and incorporating these lean principles, organizations can effectively implement lean practices and achieve waste reduction.

As stated by Alavi and Aghakhani (2023), lean transformation in supply chain management aims to achieve efficient and flexible production by minimizing inventory levels. It operates on the principle that production should only occur when there is a demand for the product. This practice focuses on increasing the flow velocity of products, as highlighted by Mckie et al. (2021), the transformation encompasses entirely the manufacturing process. chain, with signals for production flowing Starting from the customer and tracing back to the raw materials stage, lean organizations adopt a proactive approach to ensure value creation throughout the entire supply chain (Jamberkar, 2008).

2.3.5.2 Difficulties Encountered in Executing production practices within the supply chain

Establishing Efficient and streamlined supply chain characterized by Lean principles presented challenges due to the intricate interdependencies among various activities within the supply chain. When examining the literature on the evolution of lean practices, several shortcomings and challenges in the Process of Adopting and Implementing LSCM have been identified, as highlighted by Maware and Parsley (2022). One common challenge is the lack

of contingency planning, which arises from the predominant While the implementation of lean practices often emphasizes improving shop floor processes, there is a risk of neglecting other key factors in the external environment, it is important to recognize the breakthrough of lean implementation which extends beyond the shop floor and requires a holistic approach. This includes considering external factors such as market demands, customer preferences, supplier relationships, and regulatory requirements. By broadening the focus to incorporate these external factors, organizations can align their lean initiatives with the broader context in which they operate, ensuring a more comprehensive and sustainable implementation of lean principles throughout the entire value chain, such as establishing collaborative relationships with suppliers (Kabuga, 2021). In some cases, manufacturers hold higher levels of safety stock due to the fear of losing a customer, resulting in excess inventory that remains idle until it is sold. This build-to-forecast approach progressively increases costs and hampers the goal of LSCM.

To overcome these challenges, organizations need to extend their lean practices beyond the shop floor and engage in collaborative efforts with suppliers to create lean tiers throughout the supply chain (Moyano-Fuentes 2019). This involves establishing effective communication channels, sharing information, and jointly managing inventory levels to ensure a smooth flow of materials and minimize waste. By addressing these challenges and adopting a holistic approach to LSCM, organizations can reduce costs, enhance operational efficiency, and improve customer satisfaction through the elimination of unnecessary inventory and the promotion of lean principles throughout the supply chain (Mckie et al., 2021). Managers often face numerous obstacles when striving to improve productivity Overcoming organizational resistance to change is a significant challenge for firms and their

supply chains when implementing lean practices. Finding effective strategies to address this resistance is crucial for successful lean implementation (Maware et al., 2022). Lean approach necessitates not only changes in organizational practices but also a fundamental shift in management philosophy. Managers are required to transform their role from being decision-makers to becoming coaches who support and guide their employees in embracing and implementing lean principles. This shift in management style involves empowering employees, by Providing Training on lean practices throughout the organization.

Rafique et al. (2019) revealed that managers in the companies examined faced a significant challenge in effectively communicating the implementation plan for lean practices to their workforce. Despite dedicated programs and explaining the benefits of the new practices, employees often exhibit resistance to changes in their work environment. This resistance highlights the inherent tendency of individuals to resist change, even when presented with clear explanations and training opportunities. To address these challenges, managers need to employ effective change management strategies, including clear and transparent communication, employee involvement and engagement, and providing sufficient training and support throughout the lean implementation process. It is essential to create a shared understanding of the benefits and purpose of lean practices among employees, helping them overcome resistance and embrace the changes (Mckie et al., 2021).

By effectively managing organizational resistance to change and ensuring open and consistent communication, managers can navigate the challenges associated with adopting lean practices and foster a routine of continuous improvement within their firms and supply chains. The allocation of costs and profits presents challenges for organizations when they adopt and implement LSCM. The integration and cooperation inherent in lean supply chains

can blur the boundaries between companies, making it difficult to determine how costs and profits should be allocated (Sinha & Matharu, 2019). Furthermore, the globalization of supply chains continues to pose difficulties to LSCM. The trend towards globalized supply chains can conflict with the principles of lean. According to Haleem et al., (2023).), true lean manufacturing would involve locating manufacturing facilities closer to customers and minimizing transportation links. However, the reality of global supply chains often involves dispersed operations and long-distance transportation, introducing complexities and inefficiencies.

2.3.6. Supply Chain Performance

Performance refers to the achievement of quantifiable objectives (AlShurideh et al., 2019). Success is not solely determined by the outcome, but also by how it is achieved. Outstanding performance is achieved by the proper execution of appropriate conduct and the successful application of necessary knowledge, skills, and competencies. Performance management essentially involves the management of expectations (Shahzad et al., 2020). Performance management must assess the methods used to produce results in order to identify areas for improvement, as this provides valuable data. In response to the increasing dynamism of the competitive market, firms are now required to promptly respond and implement crucial modifications. Amidst the competition for market share, companies must consistently evaluate performance indicators to ascertain adherence to procedures and activities. Effectively leveraging it as a competitive advantage leads to a substantial enhancement in corporate profitability. Organizations prioritize the development and utilization of separate performance indicators for each business unit to measure performance. Consequently, there is a perception that the Key Performance Indicators (KPIs) are not in harmony, if not in

conflict. Businesses need effective supply chain performance management to match their workforce, resources, and processes with their strategic objectives. This can be achieved through both formal and informal methods (Caputo et al., 2004).

2.4 Empirical Review

2.4.1 Just-in-Time and Supply Chain Performance

The system made a substantial contribution to human resource development, which sought to establish a self-directed workforce. Tripathi and Tiwari (2016) undertook a study investigating the correlation between lean manufacturing practices and firm performance measurement. The objective of this research was to determine the degree to which lean manufacturing management practices impact the financial performance of Indian manufacturing companies. According to the study's findings, organizations that implemented lean manufacturing practices enjoyed a greater competitive advantage than those that did not. Culture and a cross-functional framework for resolving production line challenges (Tripathi & Tiwari, 2016). Furthermore, JIT production boosts a company's market share by ensuring that clients have access to high-quality goods while minimizing waste. According to the findings, JIT production ensures customer retention while also attracting new consumers.

Khalil, Khalil, and Khan (2019) conducted research to evaluate the relationship between supply chain management techniques and organizational performance, with innovation serving as a mediator in this relationship. From 207 small and medium-sized enterprises (SMEs) located in Punjab, Pakistan, data were gathered. Strategic supplier partnerships and the degree of information sharing had no discernible impact on organizational performance, according to the findings. In addition, the exstend of lean practices, internal supply chain processes, and information sharing quality on organizational performance was substantial.

Lubis *et al*. (2022) investigated rice demand and production forecasting analysis in the Indonesian province of North Sumatra. This study examined the relative merits of linear, quadratic, and exponential trend analyses in predicting rice demand and production from 2010 to 2021. According to the results, quadratic trend analysis was the most effective technique for emphasizing production and demand forecasts. The investigation ascertained that a substantial quantity of rice was produced.

Tripathi and Tiwari (2018) looked at how lean manufacturing strategies affected company profits. An analysis was conducted on the impact of the Kanban system,JIT production, flexible workforce, and innovative thinking on lean manufacturing practices within the Indian manufacturing sector. Data was gathered from production firms in India, and the correlation between these practices and firm output was analyzed. The study results indicated that financial constraints led to a dearth of resources. The purpose of the present study is to remedy the void by examining time, cost, and quality to enhance the performance of the supply chain.

Kwadwo (2015) investigated the effect of effective inventory management on the bottom line of Ghanaian manufacturing companies. A decade's worth of secondary data was gathered from the Ghana Stock Exchange for the purposes of this study. Inventory management pertaining to basic materials has a positive and statistically significant effect on the profitability of manufacturing companies, according to the findings. The study conducted by Mersha et al. (2018) aimed to evaluate the effects of the Integrated Water Resources Management (IWRM) policy on water availability and demand satisfaction in Ethiopia. A scenario analysis was performed in the Awash Basin of Ethiopia for the investigation. A comparison was made between the simulated and monthly stream volumes at five control

locations for fifteen years. As a consequence of the implementation of irrigation strategies to combat food insecurity, water resources were overutilized, according to the findings. As a consequence, the disparity between smallholder and commercial producers is exacerbated.

Sayid (2017) found a positive correlation between JIT and the performance of the Bangladeshi footwear industry when they studied the effects of JIT and single-piece flow on the sector. In particular, the adoption of JIT production yielded several benefits: shortened lead times, decreased revision levels, and decreased wastage while maintaining the same quantity of footwear. These benefits were achieved through the implementation of JIT production. By enabling businesses to satisfy market demands by producing precisely what was needed at a given moment,JIT production increased operational effectiveness and efficiency.

Sumo (2015) conducted a study in which automotive manufacturing firms in Kenya were examined to determine the correlation between lean assembling practices and SCP. The research centered on the lean practices implemented by the automotive industry, specifically examining the utilization of Jidoka, value stream mapping, Five (5) S, andJIT production. The study revealed that firms implemented lean practices, one of which wasJIT production. This approach facilitated firms' ability to maintain a competitive edge in the industry by enabling them to promptly address emerging demand. JIT production impacts the SCP of automotive companies by ensuring supplies are available only when required, thereby reducing inventory and waste costs, according to the study's findings. The purpose of this research is to further the understanding of just-in-time by examining the impact of resource and labor availability on lean production and SCP.

Mutua, Misoi, and Boit (2021) looked at how food and drink manufacturing companies in Nairobi County fared when they used a JIT procurement strategy. The investigation utilized a causal research design. The information was gathered via questionnaires. The sample consisted of 83 department leaders. Organizing the performance of food and beverage manufacturing companies in Nairobi County is enhanced by the JIT Procurement strategy, according to the findings of the study.

Just in time is a very good concept in lean production practices because it seeks to eliminate unnecessary costs in the production processes of manufacturing firms like cost of holding stock, cost of idle stock, stockout cost, and storage costs are eliminated and to increase profitability.

2.4.2 Total Prevention Maintenance and Supply Chain Performance

Preventive maintenance is a prevalent maintenance practice that has been implemented across numerous industries. Preventive maintenance is essentially categorized as either condition-based maintenance or predetermined/periodic maintenance. Preventive maintenance aims to minimize delay, avert equipment failure, and entail the associated expenses (Aghezzaf, Khatab, et al. 2016). Conversely, the supply chain can be described as an interconnected system comprising three or more entities that are directly engaged in the movement of goods or services towards the final consumer (Christopher, 2016). According to Ross (2015), supply chain planning and control are fundamental components of integrated supply chain management. These components also play a crucial role in facilitating cost-effective manufacturing processes, which ultimately contribute to the augmentation of profit margins. Leonidou, Fotiadis, et al. (2015) concurred that a competitive advantage could be attained through the adoption of cost leadership, which emphasized products that were

related and standardized, had a low price point relative to rivals, and utilized scale economies. In the interim, Juran (1974) defined quality as "utility." Determining quality according to the customer's perspective, this definition was developed. Conversely, Gera, Mittal, et al. (2017) defined quality as the level of consumer satisfaction; their inclination or demand about the products or services that fulfill their necessities.

Pramod, Prasanth, Poduval, and Jagathy Raj investigated the role of structural equation modeling and interpretive structural modeling in analyzing implementation barriers for total productive maintenance in 2015. An examination of the literature pertaining to Total Productive Maintenance (TPM) and the obstacles encountered during its implementation was conducted. The research commences with a concise exposition of TPM and the obstacles encountered during its implementation. A concise explanation was provided of Interpretive Structural Modeling (ISM) and its function in analyzing the obstacles to TPM implementation. Highlighted are the applications of ISM in the analysis of problems in numerous disciplines, with particular emphasis on TPM. Subsequently, the research paper presents Structural Equation Modelling (SEM) and its function in substantiating ISM when examining obstacles in the execution of TPM. The present investigation culminates in a gap analysis of the existing literature, identifying areas where further research is warranted and anticipating the results of the proposed research.

Fadly Hudin, Mustaffa, Rosli, Ong, & Fuzi (2017) suggest that the TPM tool be used as a key way to keep improving maintenance performance and, in turn, gain a competitive edge. Modern manufacturing companies will eliminate waste in operation activities by implementing a prototype of a TPM system. This will result in reduced maintenance costs, time spent on monitoring and controls, defects, lead times, and variation processes.

Additionally, it will enhance product quality and customer satisfaction through improved service. Safety, cost, quality, and performance efficacy were the variables that were incorporated. A noteworthy correlation was observed between the total productive maintenance (TPM) tool and the performance of the manufacturing sector in Malaysia, according to the study. As measuring variables, the current study examines condition-based maintenance, time-based maintenance, and planned preventive maintenance.

Sivaram (2017) conducted research on total productive maintenance. Subsequently, organizational leaders have endeavored to implement strategies that would facilitate their efforts in confronting the heightened competition. The present study presents the findings of a literature review that was undertaken to ascertain the contributions made by researchers in the field of Total Productive Maintenance. This study provides an overview of the origins of research on Total Productive Maintenance, the initial contributions made by researchers in this field, and case studies that examine Total Productive Maintenance. The study suggests that numerous organizations worldwide are implementing Total Productive Maintenance in an effort to increase productivity. At this time, Total Productive Maintenance is considered an approach to maintenance operations of international caliber.

Vigneshwaran, Maran, and Manikandan (2015) conducted a study to examine the effects of Total Productive Maintenance. The research elucidates the both concrete and abstract advantages attained through the implementation of TPM. Finally, some concluding remarks and suggestions for further investigation were presented. In order to conduct the review, the papers on Total Productive Maintenance were examined and its tangible and intangible benefits were determined. This literature emphasizes the contribution of Total Productive Maintenance to employee morale and overall equipment effectiveness.

According to Induswe (2013), large manufacturing companies in Kenya are using complete productive maintenance. The research utilized a cross-sectional survey methodology. The study's population comprised 201 prominent manufacturing enterprises located in Nairobi, as classified by the Kenya Association of Manufacturers & Exporters. The research revealed that major manufacturing companies in Kenya that adopted TPM faced a number of obstacles, including employees perceiving TPM activities as extra work, inadequate comprehension of the TPM implementation methodology and philosophy, insufficient financial support, inadequate resources, and a lack of commitment from top management, among others. Examining the impact of time-based maintenance and condition-based maintenance, which are lean maintenance methodologies, on the SCP of sugar manufacturing companies in western Kenya, the present study aims to address this research vacuum.

Total prevention maintenance though a new inception in production processes of manufacturing firms in third world countries,is essential practice that would greatly boost efficiency and to eradicate waste of time,human capital and production overheads that would be incurred in idle machinery while the factories are closed down for maintenance period which conventionally occasion heavy losses in terms of non production,cost of idle leased equipment and cost of idle manpower.

2.4.3 Total Quality Management and Supply Chain Performance

Fatuma (2015) conducted a study to determine SCP and quality management procedures in big Nairobi manufacturing enterprises. The focus of her study was on the adoption of quality management practices by manufacturing companies, the correlation between quality management practices and the SCP of manufacturing companies, and the difficulties encountered by manufacturing companies during the implementation of quality management

practices. The study conducted by Fatuma (2015) used both descriptive and inferential statistics to present the data collected and analyzed using a descriptive research approach. The results of the study revealed that prominent manufacturing companies that used quality management strategies encompassing lean production, benchmarking, six sigma practice, and supplier partnership exhibited a more advantageous position in the competitive landscape. The present study focused on the implementation of value chain management methods, which facilitated effective communication and collaboration between the firm and its stakeholders. This,contributed to the successful achievement of predetermined goals and objectives.

Masindet and Ogollah (2014) investigated the influence of total quality management techniques on the efficiency of supply chains, specifically in the context of cement manufacturing enterprises in Kenya. The study utilized a descriptive technique to investigate the influence of management commitment, staff involvement, customer orientation, and continuous improvement on supply performance. These factors are recognized as important indicators of comprehensive quality management. The results demonstrate a statistically significant relationship between SCP and all measures of total quality management. This is because these indicators directly affect the SCP (Strategic Competitive Position) of cement production firms. The current study is to analyze the influence of internal failure, training, and defect avoidance in lean production methods and management on the performance of supply chains in sugar manufacturing firms situated in western Kenya.

2.4.4 Government regulations as a moderator on Supply Chain Performance

Jamjumrus and Sritragool (2019) examined the impact of government regulations, supply chain efficiency, and agility on the operational effectiveness of companies. Questionnaires have been utilized as a survey methodology to gather data from manufacturing companies located in Thailand. The technique of purposive sampling is utilized to select samples. The constructs were transmitted via mail and direct communication with companies. Item incompleteness was corrected, resulting in a final sample size of 272. Following this, the gathered data was analyzed utilizing SPSS and AMOS. There is a distinct and significant positive correlation between SC efficiency and SC agility and the performance of firms in Thailand, as demonstrated by this study. Additionally, stringent government regulations result in a decline in both business performance and the supply chain.

Kuncoro, Sudrajat, Saroso, Syahchari, and Moeke (2021) examined the moderating effect of government regulation pertaining to logistics on the performance of dry port firms resulting from supply chain collaboration. The research employed a cross-sectional, quantitative, or causal survey design. The data was collected through the utilization of questionnaires and the purposive sampling technique. The respondents comprising the sample size were stakeholders of the dry port company, totaling 55 in number. The data for this investigation were processed utilizing SEM-PLS software. The findings indicated that government regulation of logistics played a noteworthy and favorable role in moderating the impact of supply chain collaboration on the performance of dry port firms.

Li and Sospeter (2018) examines the effect of regulations on the efficacy of the public supply chain; Tanzania as a case study. SPSS was utilized to analyze the data in order to determine

the effect of laws and regulations on the performance of the public supply chain. The research findings indicate that laws and regulations (PPA2011) have an adverse effect on the efficiency (and expense) of a public supply chain. Additionally, the research revealed that PPA2011 does not exert a substantial influence on the efficacy and innovation of a public supply chain in Tanzania. This study recommends that the Tanzanian government amend sections of the PPA2011 and regulations 2016 that appear to impede public sector supply chain performance.

The influence of government rules on SCP is mitigated. Fiorino and Bhan (2013) investigated the potential function of the government as a moderator. An examination of the impact of corporate and governmental environmental regulations on the efficiency and effectiveness of supply chains in the United States. This study has utilized a descriptive methodology to determine that government rules pertaining to environmental management, industry codes, product or building certification programs, and reporting or disclosure programs have an adverse effect on SCP. The aim of this study is to examine the impact of government regulations on the functioning of supply chains in oil marketing businesses in Kenya. The objective of this study is to analyze the impact of government-imposed limitations on the productivity, efficacy, and promptness of supply chain activities.

Organizations benefit the most at the attainment of total quality management because costs are minimized at at the attainment of defect free good quality products.

Mwinyi (2012) examines the impact of government regulations on the supply chain performance of oil marketing companies in Kenya through a combination of qualitative and quantitative analyses. Based on a survey of fifty oil marketing companies in Kenya, the

study's participants were primarily supply and procurement personnel. The results unequivocally demonstrate that the performance of oil marketing companies' supply chains in Kenya is impacted by governmental regulations. It is suggested by the study that oil marketing companies make investments in supply chain management strategies. In determining oil prices, the study also recommends that ERC take into account macroeconomic factors that influence oil companies. The study contributes to the comprehension of SCM practices, the advantages of effective SCM, and the obstacles that impede progress.

This study sought to determine the government regulations as a moderator between lean management practices and supply chain performance of sugar manufacturing firms in Western Kenya.

The effect of government regulations in the sugar manufacturing firms in western Kenya is quite significant because it affects both public and private entities both negatively and positively.

2.5 Empirical Review Summary

The current body of empirical and theoretical literature indicated a noticeable gaps in the study about the investigation of the relationship between LSCM and organizational performance, specifically within the context of Kenya. Prior research had primarily focused on geographical areas such as Europe, America, and Canada. Nevertheless, there has been a scarcity of research undertaken on this topic within the particular setting. The value of LSCM in increasing organizational success has often been underestimated by the manufacturing industry in Kenya.

Consequently, there is a scarcity of scholarly work that effectively delineates the determinants impacting the implementation of lean supply in manufacturing enterprises, particularly within local contexts. Sumo (2015) conducted a study that examined the correlation between lean assembly techniques and SCP within the automobile manufacturing sector in Kenya. However, the study did not demonstrate a direct association between these factors and lean manufacturing practices. In a study conducted by Fatuma (2015), the objective was to examine the relationship between quality management techniques and SCP in large manufacturing enterprises located in Nairobi.

The findings of this research contribute to the field of lean manufacturing. Khalil, Khalil, and Khan (2019) conducted a study to examine the correlation between supply chain management methods and organizational performance. However, it is essential to acknowledge that the study did not explore the broader influence of lean procurement practices within the manufacturing sector.

Similarly, the research conducted by Muttimos (2018), the focus was on reverse logistics impact on organizational performance, without delving into relationship between reverse logistics and lean manufacturing practices. This particular relationship will be the focus of investigation in the current study. However, their effect on lean manufacturing and overall organization performance was not established. While the study by Ongaro (2019) alone was found to focus on lean manufacturing process, the study, however, focused only on SCP while other organizational performance metrics were not investigated. The study encountered limitations in terms of empirical evidence related to private information sharing and performance. However, the researcher acknowledges that there is a need for further research.

2.6 Research Gaps

Table 2. 1: Research Gaps

No	Proponent	Research title	Research design	Finding		How it relates to the study	Research gap
1	Tripathi and Tiwari (2016)	Lean manufacturing practices and Firm's performance.	Descriptive Research Design	Firms that applied lean manufacturing practices stood a better competitive advantage compared to those which did not.	The research was based in India while my study is based in Western Kenya Region. Focused on firm's financial performance but mine is based Supply chain practices in Sugar manufacturing firms in western Kenya	They are both based on lean manufacturing practices. Both are aimed at firm's competitive advantage over those which did not apply lean concepts**.** Both studies are based on just in time concepts and quality.	The research was based on financial firms in India but the current study focuses on Sugar manufacturing firms in western Kenya.
2	Khalil, Khalil and Khan (2019)	Relationship between supply chain management practices and organizational performance with mediating role of Innovation.	Descriptive Research Design	That strategic partnership with supplier and level of information sharing had no influence on organization performance. Quality of information sharing, internal supply chain process and lean practice had significant influence on organizational performance.	The study focuses in firms' financial performance in India while my research focuses on Supply chain practices in Sugar manufacturing firms in Western Kenya Region. -Based on quality of information sharing, internal supply chain process, and lean practices while my study is based on Just in Time, Total Prevention Management and Total Quality Management had significant influence on organizational performance. -Moderating effect of innovation on organizational performance while my study focuses on government regulations as moderating to supply chain performance.	-Both studies are based on supply chain management practices. -Both studies are based on how lean practices on organization performance**.**	The research is based on firms' financial performance which the current study focuses on supply chain performance. The study was based in India while the current study is based in Sugar manufacturing firms in Western Kenya.

3	Tripathi and Tiwari (2018)	Effects of lean practices on a financial performance of firms.	Descriptive Research Design	That there was lack of resources due to financial strains.	The research examined on how just-in-time production, flexible workforce, creative thinking, Kanban system influenced lean manufacturing practices in the Indian manufacturing sector while the current study focuses mainly on how Just In Time, Total Prevention Management and Total Quality management affects supply chain performance in Sugar Manufacturing firms in Western Kenya region.	-Both studies focus on the effect of Just In Time concept on the performance of Manufacturing firms. -Both firms focus on lean practices on performance of Manufacturing firms.	The current study aims at cost, quality, and time in Manufacturing processes of sugar manufacturing firms in Western Kenya.
4	Fadly Hudin, Mustaffa, Rosli, Ong, & Fuzi, (2017)		Validation case study	There is significant relationship between Total productive Maintenance (TPM) Tool and Manufacturing sector performance.	The scope of study is in Malaysia while the scope of the current study is in western Kenya Region. -The study focusses on safety, quality, cost, and performance efficiency while the current study focuses on Condition based maintenance, Time based maintenance and planned preventive maintenance.	-Both studies focus on Total preventive maintenance. -Both studies quality and performance efficiency. -Both studies aim at improving quality product and performance efficiency. - Both studies aim to reduce defect, to reduce lead time, and reduce variation	The study focused on Total productive Maintenance (TPM) tool while the current study would focus on Total prevention Maintenance (TPM).

5	Fatuma (2015)	Quality Management practices and supply chain performance in large Manufacturing firms in Nairobi.	Descriptive Research Design	Large Manufacturing firms that adopted quality management practice characterized by lean by lean production, benchmarking, six siqma practice and supplier partnering stood a better competitive ground in the Market.	The study focusses on benchmarking, six sigma practice and supplier partnering while the current study focus on internal failures, Training and defect prevention.	Both studies focus on quality management practices and supply chain performance in manufacturing firms. -Both firms focus on implementation of quality management practices by manufacturing firms	Whereas the study focused on six sigma, benchmarking and supplier partnering the current study focuses on interior failures, Training and defect prevention.
6	Masindet and Ogollah(2014)	Influence of Total Quality Management practices on supply chain management practices.	Descriptive approach	Significant relationship between supply chain performance and all indication of total quality management since the indicators contributed to supply chain performance of cement Manufacturing firms.	The study focused on influence of management commitment, employee involvement, customer orientation and continuous improvement on supply performance while the current study focuses on Internal failures, Training and defect prevention	Both studies focus on the influence of total quality management practices on supply chain performance	The study focused on Cement manufacturing firms and different indicators than the ones to be used in the current study.
7	Fiorino and Bhan (2013)	Moderating role of government Environmental Regulation on Supply chain performance by comparing private and public regulation in USA	Descriptive approach	The government regulations touching on environmental management, industry codes, product or building certification programs and reporting or disclosure programs negatively moderated supply chain performance.	Focuses on environmental management, industry codes, product or building certification programs, and reporting or disclosure programs while the current study focuses on Supply chain performance on, incentives, licensing and policies.	Moderating effect of government regulations.	The study focused on environmental regulation in codes, product or building certification programs . The current study bases on moderating effect of government regulation on supply chain performance.

2.7 Conceptual Framework

As stated by Orodho (2009), a conceptual framework is a graphical depiction a visually representation that aims to expound on the connections and interdependencies among variables. Conceptual frameworks form the basis of defining research questions and to establish appropriate meaningful answers. It links theories, beliefs, assumptions, and concepts behind research and presents them pictorially.

The researcher conceptualizes that the independent variable Lean Production Practices which are measured using Just in Time, Total Prevention Maintenance and Total Quality Management have an effect on supply chain performance as the dependent variable which has time, cost and quality as indicators. Government regulations that include incentives, licensing and policies play as the moderators. It is important in understanding the research problem and to give guidance to developing and analyzing of the research.

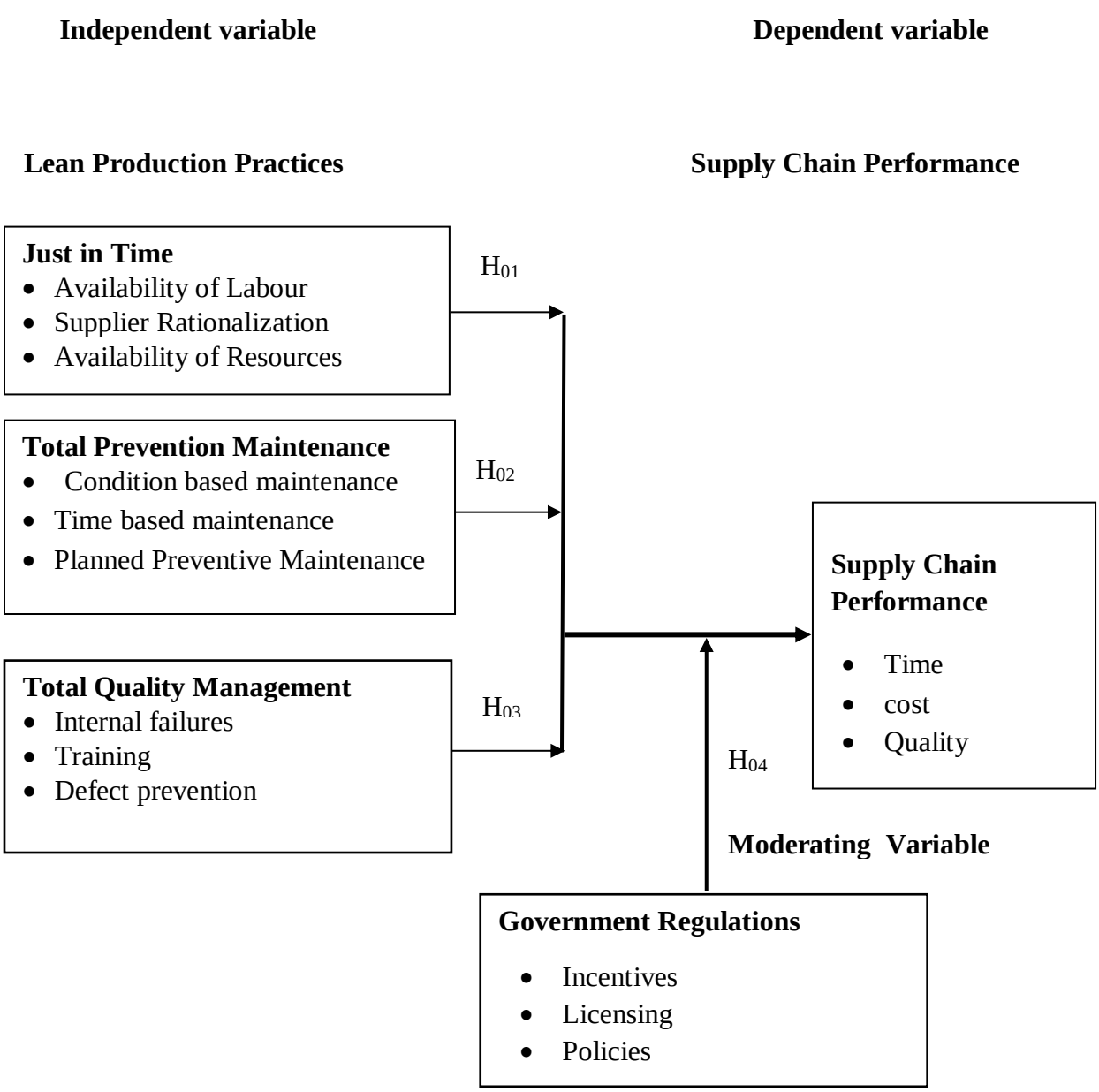

Figure 2. 1: The Conceptual Framework.

Source: Adopted from Bob Ochieng (2021),Kunyoria (2018) (2024)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter provided an overview of the research design, the geographical area where the study took place, the target population, the sampling technique, the instruments used in data collection procedure, and the data processing and analysis methods.

3.2 Study Area

The research centererd on sugar corporations in western Kenya, specifically Sony Sugar Company,Sukari in the southern region of Nyanza, Chemelil, Muhoroni and Kibos in central Nyanza, Mumias, Nzoia,Olepito,Busia and Butali,West Kenya in the former western province Kenya. The selection of western Kenya implying the former Nyanza province and former Western province as the study area is suitable due to its status as the largest single block containing the majority of sugar enterprises. The researcher is additionally facilitated in data collection in Western Kenya due to the accessibility of information and the diversity of sugar companies in terms of age, size, and operations; thus, the region provided an ideal setting for the study.

3.3 Research Design

Kothari (2004), describes a research design serves as a road map for the collection, measurement, and analysis of data. Mugenda and Mugenda (2003) states that research design involves systematic inquiry in which the researcher does not control over the independent variable as its manifestation has already taken place. This study adopted the descriptive cross-sectional survey design which is commonly employed in research to describe words, pictures, charts, or tables, indicating statistical relationships or simply describing the data

(Upagade & Shende, 2012). A descriptive cross-sectional survey research design was utilized to examine integrated supply chain optimization in production firms in Kenya. The study adopted quantitative research approach, which is well-suited for collecting and analysing large volumes of data.

The descriptive research design was used by other researchers including the following; Fatuma(2015) in the research titled quality management practices and supply chain performance in large manufacturing firms in Nairobi.

Tripathi and Tiwari(2018) in the research titled Effects of lean practices on financial management of Firms and

Khalil,Khalil and Khan(2019) Relationship between supply chain management practices and organizational performance with moderating role of innovation.

3.4 Target Population

The population of the study was the complete group of individuals or objects that the research aimed to generalize its findings to (Cooper & Schindler, 2008). The study targeted 11 sugar manufacturing firms in Western Kenya region comprising counties of Nyamira,Kisii,Migori,Homa Bay,Kisumu,Siaya,Kakamega,Busia and Bungoma counties. These sugar companies were; Chemelil, Muhoroni, Mumias, Nzoia, South Nyanza, Kibos, Butali, West Kenya, Sukari, Olepito and Busia. The study targeted procurement officers, finance officers, production officers, quality assurance officers, operations officers, director of audit services, logistics one officer in each functionality as listed apart from among engineers who were sparsely assigned with Three engineers from West Kenya company,Three from Mumias Sugar,Two engineers from Kibos,Three from Butali Sugar company and one engineer from each of the remaining firms. Which targeted 95 respondents

Table 3. 1: Target Population

Respondents	Target number
Procurement officers	11
Finance officers	11
Production officers	11
Quality assurance officers	11
Operations officers	11
Director of audit services	11
Logistics	11
Engineers	18
Total	**95**

Source: *researcher (2023)*

3.5 Census Technique of Data collection

The research employed the census technique due to the holistic nature of the population, consisting of 95 respondents, which precluded further subdivision. According to Kothari (2014), the census technique enabled the collection of data from every participant within the target population.

3.6 Data Collection Instruments

Questionnaires were used due to their perceived cost-effectiveness and ease of formulation and analysis. Furthermore, questionnaires yielded a substantial amount of data and provided a more comprehensive level of response. The questionnaires consisted of closed-ended questions that included rating items on a five-point Likert scale. The scale consisted of five options: strongly agreed, agree, fairly agree,Disagree and strongly disagree.

The questionnaire consisted of Sections A – F. Section A of the questionnaire consisted of Background information of the respondents, Section B included information on lean production practices, Section C – Just in time, Section D – Total Prevention maintenance, Section E – Total Quality Management, Section G – Government regulations while Section F constisted statements on supply chain performance.

3.7 Reliability and Validity

3.7.1. Validity

Validity pertains to the degree to which an item accurately assesses the intended construct. According to Hair and Lukas (2014), the concept of validity in data-collecting instruments refers to the degree to which they accurately assess the intended construct. Validity was established through construct validity and content validity.

3.7.2. Pilot Testing

The pilot study was undertaken in the Ramisi Sugar factory in Kwale county and involved respondents drawn from the firm. Respondents in the pilot study were separate and excluded in the actual study. The main objective of piloting was to identify weaknesses in the research instruments that were used in the actual study. That included assessing the clarity of the questions or items and gathering feedback that helped the researcher to enhance and to modify the questionnaires for improvement purposes.

The findings from the pilot study were crucial in determining the reliability and validity of instruments. Based on outcomes, necessary adjustments and refinements were made to the instruments before proceeding with the actual data collection phase. This iterative process ensured that the research instruments were robust and effective in capturing the desired information.

3.7.3. Reliability

The reliability of a research instrument refers to its ability to consistently yield identical results when used repeatedly (Kothari, 2004). The utilization of the test-retest procedure, as suggested by Mugenda and Mugenda (2003), contributed to the improvement of data reliability in the study. In the methodology, surveys were distributed to the identical cohort of participants in the pilot study on two separate occasions, with a two-week gap between each administration, and under identical circumstances. Through the process of administering the surveys multiple times, the researcher was able to evaluate the consistency of the responses. The Cronbach's Alpha coefficient was utilized to calculate the results acquired from the pilot test. The statistical measure aided in determining internal consistency of the items inside the questionnaire, so demonstrating the degree to which the items assessed the same underlying construct. An increased Cronbach's Alpha coefficient indicated a higher level of internal consistency, hence improving the dependability of the research instrument. Fraenkel and Wallen (2000) suggest that, as a general guideline, a proposed instrument was utilized only if it yielded a value of 0.70 or greater on a significant sample. This guideline was applied to the study instruments. This assessment aimed to reduce potential errors in both the instrument and the researcher, while also facilitating the reorganization of certain items within the questionnaires.

3.8 Data Analysis and presentation

3.8.1: Data Analysis

After data collection process was undertaken, questionnaires underwent assessment that ensured completeness and accuracy (Mugenda & Mugenda, 2009). Incomplete or inconsistent responses were addressed through data editing procedures. After the data was

cleaned and ready for analysis, it was coded to facilitate further processing. Data analysis involved the use of software Statistical package for social sciences (SPSS) version 27.

3.8.2: Data Presentation

The obtained data was summarized and presented using descriptive statistics, including frequencies, percentages, means, and standard deviations. The implementation of those measurements facilitated a comprehensive understanding of the distribution and core tendencies of the variables that were being examined.

3.9. Data Testing by inferential statistical techniques

The research study utilized quantitative methods of data analysis, namely descriptive and inferential statistics such as mean and standard deviation. These statistical measures were used to define and elaborate on every objective of the study. Quantitative data collected were coded, entries made and analyzed by Statistical package for social sciences (SPSS) computer software program. The data was edited by examination of collected data to establish errors and omissions. Careful analysis of the questionnaires was conducted. Data was coded using numerical attachment to the answers for the responses in categories or classes.

3.9.1 Descriptive statistics.

The analyzed data was presented by the use of frequency tables, pie charts and bar graphs. Qualitative data was analyzed thematically by the study objectives.

3.9.2 Inferential statistics

The essence of inferential statistics in research was employed in describing the multitude of facets in which data collected were used to draw conclusions on whether the populations was different. In the current research inferential statistics was important in analyzing samples and to make predictions on the entire target population.

In this research, simple linear regression analysis was used because the research involved many of independent variables and a unitary dependent variable.

3.9.3 Pearsons Correlation

Correlation provided correlation analysis(r) which falls between $-1 \leq r \leq 1$ which was used to test the strength of the relationship between the variables.

This is an inferential statistic that measured the strength of the linear relationship between two variables.

The range of correlation coefficients spans from -1 to 1, where a value of -1 indicates a negative linear connection, 0 signifies no correlation, and 1 indicates a complete positive correlation.

3.9.4 Regression

The study used the following regression models.

3.9.4.1 Simple Regression

$Y = \beta_0 + \beta_1 X_1 + €$……. (i)

$Y = \beta_0 + \beta_2 X_2 + €$ ……. (ii)

$Y = \beta_0 + \beta_3 X_3 + €$ ……(iii)

3.9.4.2 Multiple Regression

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + €$……. (iii)

3.9.4.3 Moderating variable model

$Y = \beta_0 + \beta_1 X_1 Z + \beta_2 X_2 Z + \beta_3 X_3 Z + €$……(iv)

- Where Y is the predicted value of the dependent variable for any given value of independent variable (x)
- β0 denoted the intercept, which represented the expected value of y's change with increasing x when x is zero;
- β1 signifies the regression coefficient, which indicates the magnitude of the change in y's expected value with increasing x;
- x was the independent variable, which we hypothesize to have an impact on y;
- € signifies the error of the estimate or the amount of variation in our estimation of the regression coefficient
- The moderator is Z.

3.10 Diagnostic Testing

Prior to performing inferential statistics, it was necessary to undertake diagnostic analysis in order to assess the assumptions of correlation and multiple regression analysis. This encompassed;

3.10.1 Normality.

Parametric tests typically needed the assumption of normalcy to be satisfied. Normality refered to the condition in which the distribution of the test followed a normal distribution, characterized by a bell-shaped curve with zero means, one standard deviation, and symmetry (Garson, 2012).

3.10.2 Linearity

Linear regression is a statistical model that postulates a direct and proportional relationship between independent and dependent variables. Considering outliers is essential because linear regression is highly vulnerable to the impact of outliers.

3.10.3 Homoscedasticity

This assumption was paramount to the linear regression models. Homoscedasticity helped to elucidate situation where error term is similar across all the independent variable values conversely.

3.10.4 Multicollinearity Tests

Multicollinearity arises when predictor variables are highly correlated, increasing the beta coefficients' standard errors. This phenomenon imposes a constraint on the value of R and complicates the evaluation of the significance of individual predictors within the model. To determine the existence of multicollinearity, the tolerance value and variance inflation factor (VIF) were computed. The tolerance value is a metric expressed as a number between zero and one. A value less than 0.1 indicates a substantial concern regarding multicollinearity. The VIF statistic lacks specific threshold values and is defined as the reciprocal of the tolerance value. A VIF value between one and ten, on the other hand, signifies the lack of multicollinearity. Multicollinearity arises when the VIF value deviates significantly from 1 to 10. Linear regression is a statistical model that postulates a direct and proportional relationship between independent and dependent variables. Accounting for outliers is essential because linear regression is highly vulnerable to the impact of outliers.

3.11 Ethical Considerations

The researcher conformed with requirements of ethical issues by obtaining all required documentations on ethical issues.

The following ethical issues were addressed as appropriate.

1.**Informed Consent**: It was crucial to ensure that participants provided informed consent. Participants were fully made aware of the study's purpose, procedures, potential risks, and notified of their right to withdraw at any time without penalty.

2. **Confidentiality and Anonymity**: Protecting the identities and responses of participants was essential. Concerns about how data would be kept, who would have access to it, and how anonymity would be maintained, especially while discussing sensitive topics like government regulations.

3. **Potential for Coercion**: To ensure that Employees did not feel pressured to participate due to hierarchical relationships within the companies. Ensuring that participation was truly voluntary and that there were no repercussions for non-participation was critical.

4.**Data Misuse**: There was a risk that collected data could be misused or misrepresented, particularly that sensitive information about company practices or regulatory compliance was disclosed. The esearcher ensured that data was used solely for the intended research purposes.

5. **Impact on Participants**: The study could inadvertently affect participants' job security or relationships within their organizations, especially if the findings were critical of company practices or government regulations.

6. **Bias and Objectivity**: Researchers remained objective and avoided any biases that would influence the study's outcomes. That included ensuring that the framing of questions did not lead respondents toward specific answers.

7.**Cultural Sensitivity**: Given the regional context, researchers were sensitive to local customs and practices. Failure to respect cultural norms could have led to misunderstandings or discomfort among participants.

8.**Reporting Findings**: Ethical issues arose in how findings were reported, especially that they could harm the reputation of the companies involved or that sensitive information would be disclosed without proper context.

9. **Handling Sensitive Information**: Government regulations and internal practices involved sensitive information. Researchers were cautious about how that information was collected, stored, and reported to avoid legal or ethical repercussions.

10.**Post-Study Follow-Up**: Researchers considered the implications of findings for the participants and companies which were involved. Providing feedback or insights gained from the study was quite beneficial, but it was done thoughtfully to avoid unintended consequences.

Having addressed those ethical issues proactively, the researcher enhancde the integrity of the study and adequately protected the rights and welfare of participants

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.1. Introduction

The chapter depicts data analysis, presentation, interpretation, and discussion. The analysis, presentation, interpretation, and discussion have been systematically structured according to the study objectives and hypotheses, with particular sections and sub-sections. The initial section explores the pace at which the respondents responded. The second component includes assessments of reliability and validity. The third section provides information on the demographic characteristics of the respondents. The fourth section covers descriptive statistics, testing of statistical assumptions, and analysis of the Likert-type data. The fifth portion presents an analysis, interpretation, and discussion of the relationships examined.

4.2 Rate of Questionnaire Return

Respondents comprised of logistics and firm engineers, procurement officers, finance officers, production officers, quality assurance officers, operations officers, and directors of audit services. A total of 95 questionnaires were distributed to these groups. Respondents submitted a grand total of 90 (95%). 3 (3%) of these were eliminated from the total because their responses to the variable items had noticeable gaps.

Table 4. 1: Survey response return rate

Unit of observation	Data collection method	Target population	Sample size	Usable response	% effective response rate
Respondents	Questionnaires	95	95	87	92

Source : Research Data (2024)

Table 4.1 shows that 87 questionnaires were utilized for data analysis. This represented the return rate of 92% for the questionnaire. According to Schindler and Cooper (2009), a return rate of at least 50 percent is adequate for the objectives of an investigation.

4.3 Reliability and validity tests

Reliability is defined as the extent to which repeated trials of a research instrument yield consistent data, assuming all other factors remain constant. The Cronbach's alpha coefficient of internal consistency was selected as the reliability metric for this study due to its practicality, ability to utilize all items in the research instrument, and convenience in comparison to alternative approaches requiring only one test administration approach (Tavakol and Dennick, 2011). A reliability test was conducted on the three independent variables (Just in time, total prevention maintenance, and total quality management), the moderating variable (government regulation), and the dependent variable (supply chain performance). Using information gathered from the questionnaires, the alpha was computed as

$$\alpha = \frac{\left[\frac{k}{k-1}\right]}{\left[1-\left(\frac{1-\sum_{i=1}^{n} S_i^2}{S_x^2}\right)\right]}$$

where

$k = the\ number\ of\ items\ on\ the test$

$S_i^2 = the\ obtained\ \text{var}iance\ for\ item\ i$

$S_x^2 = the\ \text{var}iance\ of\ the\ total\ test\ scores$

Different researches employ different alpha cut-off values, which according to Tavakol and Dennick (2011) range between 0.7 and 0.95. George and Mallery (2003) defined alpha coefficient values as follows: > 0.9 - Excellent, > 0.8 - Good, > 0.7 - Acceptable, > 0.6 - Questionable, > 0.5 - Poor, and <0.5 - Unacceptable. This interpretation was used to the present investigation. Table 4.2 shows the results of the reliability test performed with SPSS version 27.

Table 4. 2: Reliability nalysis

Variable	Cronbach alpha if item deleted	Cronbach alpha
Just in time	.933	
Total prevention maintenance	.791	
Total quality management	.715	
Government regulation	.879	0.842
Supply Chain performance	.904	

Source : Research Data (2024)

The findings presented in Table 4.2 indicate that Cronbach's alpha is 0.842. This value suggests that the questionnaire's reliability test was satisfactory about our scale and the given sample.

4.4. Demographic Distribution

This segment presents concise demographic information regarding the study participants, including their gender, organizational position, educational attainment, years of service, and product production.

4.4.1. Gender of the respondents

The gender of the respondents was analyzed and the results presented in the Figure 4.1.

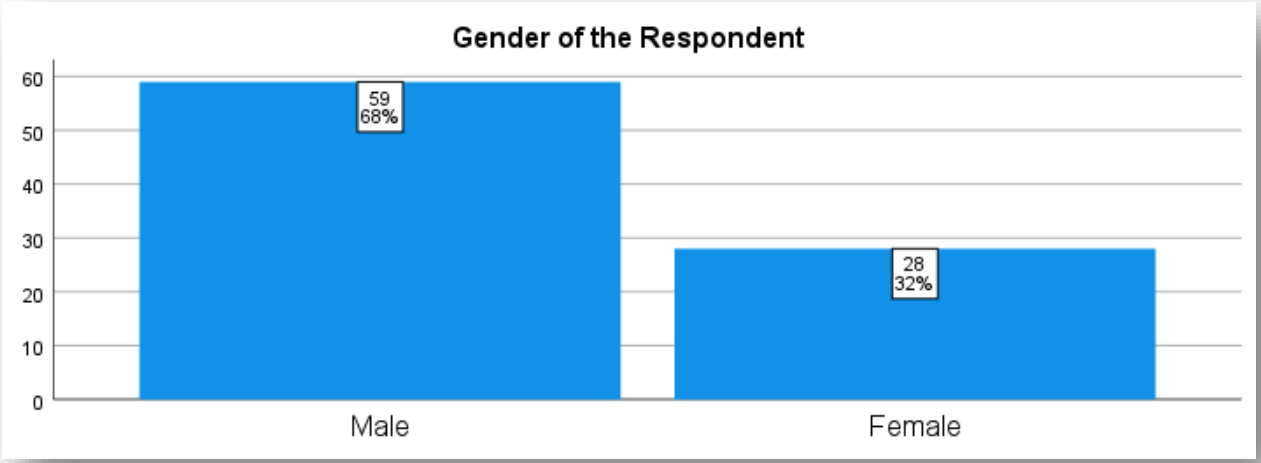

Figure 4. 1: Gender of the respondents

Source : Research Data (2024)

The findings shows that 59 (68%) of the participants identified as male, whereas 28 (32%) identified as female. The results reveals a gender discrepancy that favors male participants over their female counterparts. This distribution effectively reflects an equitable distribution

of genders. Given that a significant proportion of the responses for this research study are contingent upon the respondents' confidential measures, it is portended that this gender distribution will reflect perspectives and opinions from both extremes of the gender divide.

4.4.2 Age of The Respondents

The researcher aimed to ascertain the age distribution of the study participants. The findings are illustrated in Figure 4.2.

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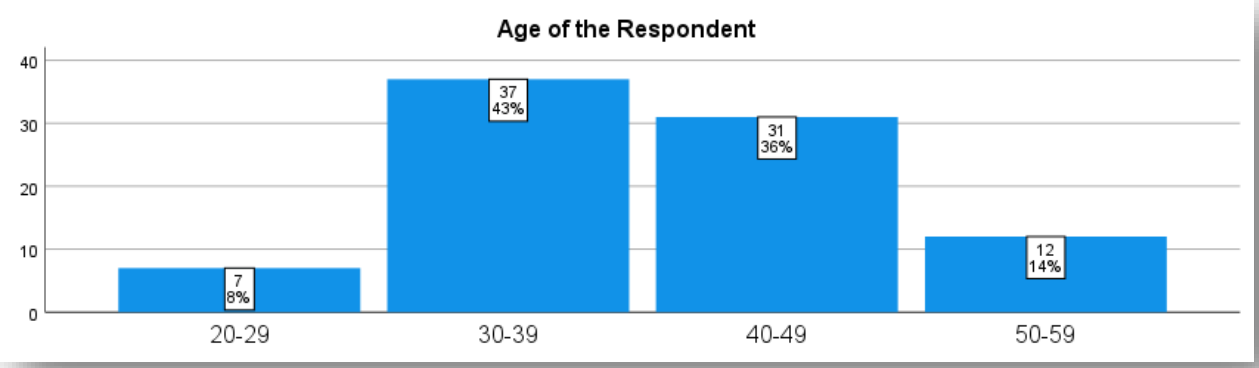

Figure 4. 2: Gender of the respondents

Source : Research Data (2024)

The findings indicate that a minority of the respondents (seven individuals, or 8%), falling within the age range of 20-30 years, were 37 (or 43%) between 30-39 years, 31 (or 36%) between 40-49 years, and 12 (or 14%) between 50-59 years. Additionally, the results regarding the ages of the respondents indicate that the sugar companies exhibited a diversity of age. The perspectives of all age groups were therefore incorporated into the collected data for the study.

4.4.3 Academic Qualifications

The study's researcher aimed to ascertain the distribution of academic credentials among the participants of the research. The outcomes are illustrated in Figure 4.3. As illustrated in Figure 4.3, the majority of the participants (56 individuals, or 64 percent) possessed a Bachelor's degree as their greatest level of education. This was followed by 30 individuals (or 34 percent) who held a Diploma. Conversely, one percent of the respondents possessed a master's degree, which represents the highest level of education.

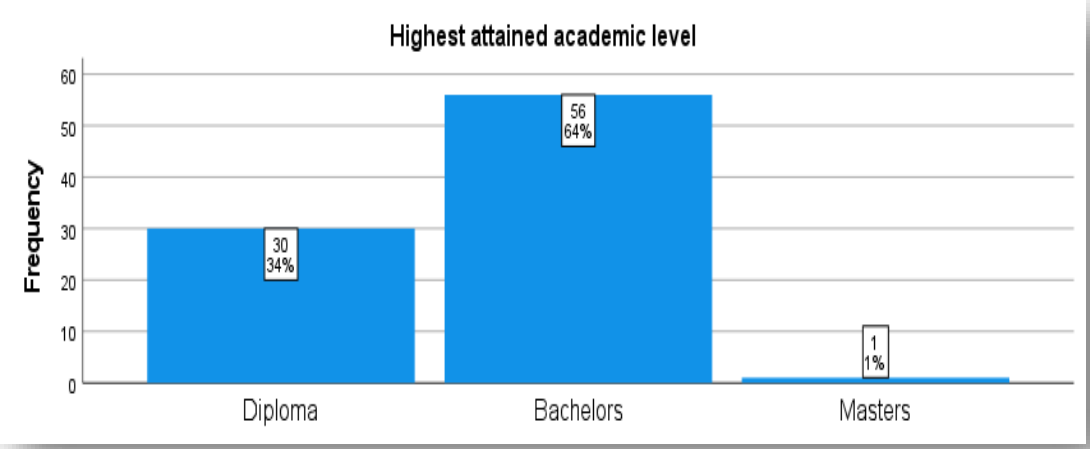

Figure 4. 3: The highest level of education attained

Source : Research Data (2024)

4.4.4 Position of the respondents

The researcher aimed to ascertain the status of the participants in the research. The illustrations of the outcomes are presented in Figure 4.4.

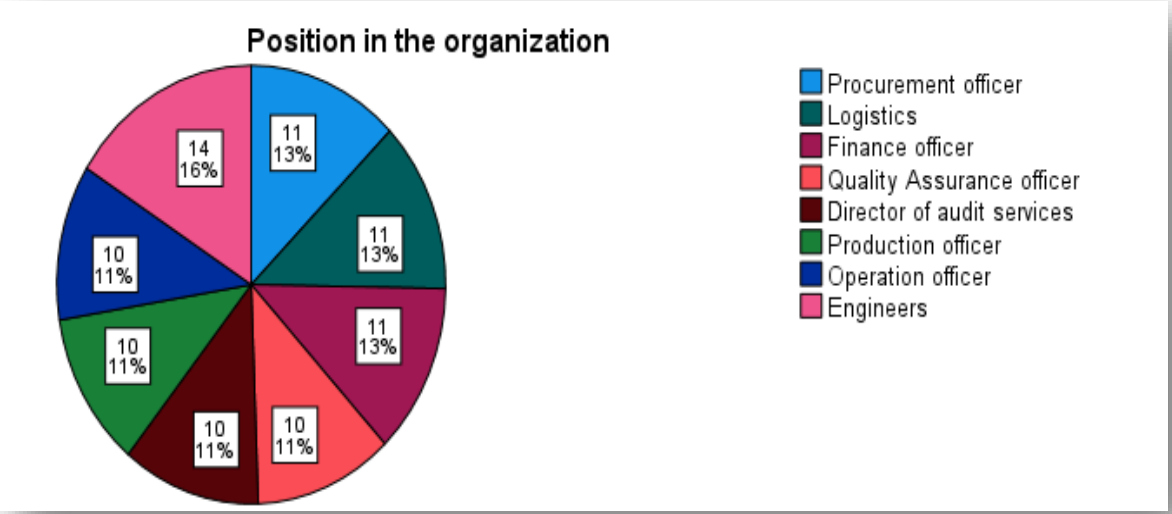

Figure 4. 4: Position in the company

Source : Research Data (2024)

The findings presented in Figure 4.4 indicate that the sugar firm's respondents are predominantly engineers, comprising 14 individuals (16 percent). Procurement officers, logistics officers, and finance officers each accounted for 11 individuals (13 percent).

4.4.5 Number of Years Worked

The researcher aimed to ascertain the duration of service that the participants had accumulated at the sugar manufacturing company. The years spent by respondents in supply chains of the manufacturing company improves the depth, dependability, and application of the results, therefore supporting more successful supply chain management practices. The illustrated outcomes are presented in Figure 4.5.

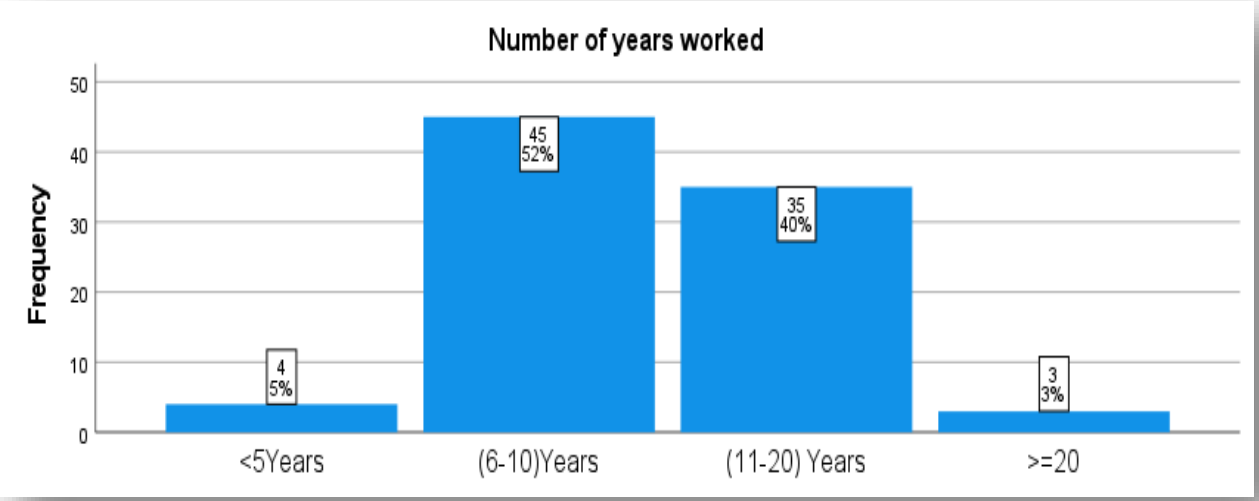

Figure 4. 5: Number of years worked

Source: Research Data (2024)

Based on the findings presented in Figure 4.5, it can be observed that 4% of the respondents have less than 5 years of experience working for the sugar company, whereas 52% have between 6 and 10 years of experience, 40% have between 11 and 20 years of experience, and 3% have more than 20 years of experience. As determined by the analysis, the respondents possess an adequate amount of work experience in the sugar manufacturing industry.

4.5 Descriptive Findings

The researcher aimed to identify the product that sugar manufacturing companies manufacture in the greatest quantity. The findings are illustrated in Figure 4.6.

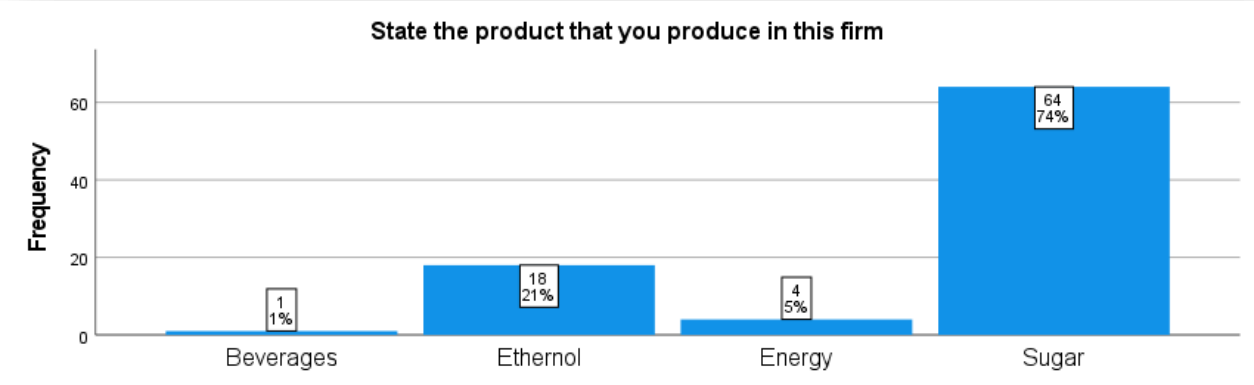

Figure 4. 6: Product produced

Source : Research Data (2024)

According to the data presented in Figure 4.6, sugar is the most produced product at 64%, followed by ethanol at 21%. Energy and beverages are the least produced products, accounting for 4% and 1%, respectively, of output.

Additionally, the researcher aimed to ascertain whether sugar manufacturing companies implement lean production practices and, if so, which lean production methods are most prevalent. The findings are illustrated in Figure 4.7 and Table 4.8.

Table 4. 3: Lean production practices

		Frequency	Percent
lean production practices	Yes	87	100
	No	0	0
	Total	87	100.0

Source: Researcher's survey(2024)

From Table 4.3, the results shows that 87(100%) of the sugar manufacturing firm practice lean production practices while only 0(0%) that do not practice.

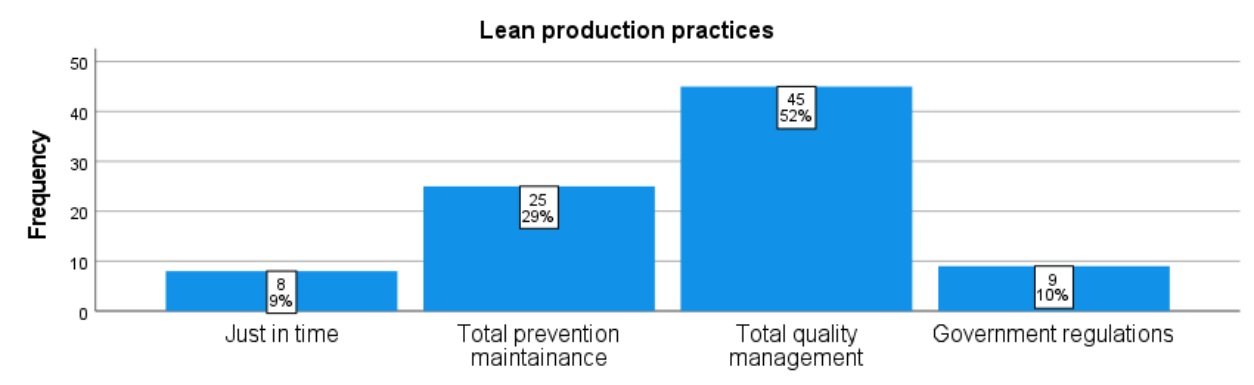

Figure 4. 7: Lean production practiced

Source : Research Data (2024)

According to Figure 4.7, the lead production technique that is most commonly applied is total quality management, with a percentage of 52%, followed by total prevention maintenance at 29%. The production practices ofJIT and government regulation have the lowest percentages, with 8% and 9% respectively.

4.6 Analysis of the Likert scale

The study collected Likert-type data on the study variables using a five-point Likert scale. On the scale, there were three options: strongly disagree (SD = 1), strongly agree (SA) = 5, agree (A) = 4, and fairly agree (FA) = 3. Even though the study's researcher believed that individual Likert scale items produced ordinal data, the Likert-type data that resulted from using multiple Likert scale items to test a concept on a summative scale might be thought of as interval scales (Carifo and Perla, 2007). Benard (2006) states that an ordinal scale with five ranks or more can be used in research and handled similarly to an interval-level scale. In order to collect data for this study, Likert type questions were utilized. Summative scale

items were employed to gather Likert type data on one variable, enabling the application of nonparametric tests. The study used the equidistance of 8 proposed by Carifo and Perla (2007) in order to meet the Likert scale assumption of equidistance. The resulting summative score range from 5 to 30, as each variable was scored using distinct Likert scale items (e.g., 5 - 7 items) on an attitudinal scale of 1-5. Using the following scale, which was employed in the study for objectives, an equidistance of 5 results equals 5 strongly disagree. Ten, ten disagree; fifteen, fairly agree; twenty, twenty agree; twenty, agree; and twenty, highly agree. The same scale was used for individual things with a low of 1 and a high of 5, with 1 denoting strongly disagree. 2.3 and 2.3 are in disagreement. 3.3 and 3.3 4.3 agree, 4.3 strongly agree, 5.3 agree, and 5.3 agree 6.3.

4.7 Just in time on supply chain performance

The objective of the study was to determine the impact of JIT on the performance of supply chains in Western Kenyan sugar manufacturers. Participants were instructed to provide their ratings on a five-point Likert scale in response to five statements. A rating of five corresponded to 'Strongly Agree' and a rating of one to 'Strongly Disagree'. The frequencies, mean, standard deviation (StD), composite mean, and composite standard deviation were utilized to analyze the ratings. Table 4.4 displayed the results, with the following categories: SA (Strongly Agree), A (Agree), FA (Fairly Agree), D (Disagree), and SD (Strongly Disagree).

Table 4. 4: Likert on Just in time

No.		SD	D	FA	A	SA	Mean	Std
1	There is availability of labour in the sugar manufacturing firm	0 (0%)	0 (0%)	10 (11.5%)	19 (21.8%)	58 (66.7%)	4.55	0.695
2	Availability of labour affects the supply chain performance of sugar manufacturing firms	3 (3.4%)	2 (2.3%)	2 (2.3%)	21 (24.1%)	59 (67.9%)	4.51	0.926
3	The sugar manufacturing firms contacts supplier rationalization of supplier chain practices	0 (0%)	1 (1.1%)	7 (8.0%)	21 (24.1%)	58 (66.8%)	4.56	0.694
4	Supplier rationalization affects supply chain performance of sugar manufacturing firms	1 (1.1%)	0 (0%)	5 (5.7%)	26 (29.9%)	55 (63.3%)	4.54	0.712
5	There is availability of resources in the sugar manufacturing firms	0 (0%)	6 (6.9%)	15 (17.2%)	18 (20.7%)	48 (55.2%)	4.24	0.976
6	The availability of resources affects supply chain performance in the sugar manufacturing firm	2 (2.3%)	1 (1.1%)	0 (0%)	11 (12.7%)	73 (83.9%)	4.75	0.735
Composite Mean and Std							**4.53**	**0.789**

Source: Researcher's survey(2024)

When queried about the degree to which labor is readily available at the sugar manufacturing company, 77 (88.5%) of the respondents indicated agreement with the statement, whereas 10 (11.5%) agreed fairly. With an average score of 4.55 and a standard deviation of 0.695, the findings suggest that a significant proportion of the participants concurred that sugar manufacturing companies do indeed have access to labor. The positive impact on the

composite mean was indicated by the fact that the item mean was greater than the composite mean of 4.53. The item's standard deviation was smaller than the composite standard deviation of 0.789, suggesting that the item's response had a narrower range than that of the variable.

Concerning the impact of labor availability on the SCP of sugar manufacturing companies, a majority of the respondents (80% or 92%) expressed agreement with the statement. Conversely, a minority of 5 (5.7%) disagreed with the notion, and a mere 2 (2.3%) maintained a neutral stance. The data indicates that a substantial number of the participants (0.626) concurred that the presence of labor had a discernible effect on the SCP of sugar manufacturing enterprises, as demonstrated by the average score of 4.51. When compared to the composite mean of4.53, the item mean was significantly lower, indicating a negative influence on the composite mean. A lower standard deviation for the item (0.789) than for the variable (0.789) suggests that the range of possible responses to the item is more limited.

The participants were also requested to provide their assessment on whether or not the supplier contacts of the sugar manufacturing firms rationalize their supply chain practices. A significant majority of the respondents (79 individuals, or 90.9%) agreed with this statement. Conversely, a minority of one respondent (1.1%) disagreed, and seven individuals, or 8.0 percent, remained undecided. Based on the data, the majority of respondents (0.694) agreed that sugar manufacturing firms contact suppliers to rationalize their supply chain practices, as indicated by the mean score of 4.56. The positive impact on the composite mean was indicated by the fact that the item mean was greater than the composite mean of 4.53. The

item's standard deviation was smaller than the composite standard deviation of 0.789, suggesting that the item's response had a narrower range than that of the variable.

In regard to the impact of supplier rationalization on the SCP of sugar manufacturing companies, a significant proportion of the participants (1.1%), or 81 individuals (93.2%), expressed agreement with the statement. Conversely, 5 individuals (5.7%) maintained a neutral stance. Based on the data, the majority of respondents (n=4.54) and the standard deviation (0.712) agreed that supplier rationalization has an impact on the SCP of sugar manufacturing firms. The mean score was 4.54. The item mean exceeding the composite mean of 4.53 served as evidence of the favorable influence on the composite mean. The standard deviation of the item was found to be less than the composite standard deviation of 0.789. This indicates that the response range of the item was more limited in scope compared to that of the variable.

The participants were also requested to provide their assessment on the availability of resources in sugar manufacturing firms. A majority of the respondents (66 individuals, or 75.9%) agreed with this statement, while a minority (6.9%) and 15 individuals (17.2%) objected. Based on the calculated mean score of 4.24 and standard deviation of 0.976, it can be concluded that a significant proportion of the participants concurred that resources are accessible within sugar manufacturing companies. The negative impact on the composite mean was indicated by the fact that the item mean was lower than the composite mean of 4.53. The item's standard deviation exceeded the composite standard deviation of 0.789, suggesting that the item exhibited a more extensive range of responses compared to the variable.

In relation to the impact of resource availability on the SCP of the sugar manufacturing company, a significant majority of the participants (33.4%) agreed with the statement, while 84 individuals (96.6%) disagreed. Based on the data, the majority of respondents (0.735) agreed that sugar manufacturing firms contact suppliers to rationalize their supply chain practices, as indicated by the mean score of 4.75. The positive impact on the composite mean was indicated by the fact that the item mean was greater than the composite mean of 4.53. The item's standard deviation was smaller than the composite standard deviation of 0.789, suggesting that the item's response had a narrower range than that of the variable.

4.8 Total prevention maintenance

The objective of the study was to determine the impact of total prevention maintenance on the performance of supply chains in Western Kenyan sugar manufacturers. The respondents were instructed to provide their ratings on a five-point Likert scale in response to five statements: five indicates 'Strongly Agree' and one indicates 'Strongly Disagree'. The frequencies, mean, standard deviation (StD), composite mean, and composite standard deviation were utilized to analyze the ratings. Table 4.5 displayed the results in the following order: SD-Strongly Disagree, SA-Strongly Agree, FA-Fairly Agree, D-Disagree, and FA-Fairly Agree.

Table 4. 5: Likert on total prevention maintenance

No.		SD	D	FA	A	SA	Mean	Std
1	The sugar manufacturing firms practice condition-based maintenance	0 (0%)	0 (0%)	2 (2.3%)	34 (39.1%)	51 (58.9%)	4.56	0.543
2	The condition-based maintenance affects supply chain performance of the sugar manufacturing firms	1 (1.1%)	0 (0%)	0 (0%)	25 (28.7%)	61 (70.2%)	4.67	0.604
3	Sugar manufacturing firms provide time-based maintenance of the firms's machines	2 (2.3%)	1 (1.1%)	2 (2.3%)	21 (24.1%)	61 (70.2%)	4.59	0.800
4	Time-based maintenance of the supply chain affects supply chain performance	1 (1.1%)	0 (0%)	13 (14.9%)	29 (33.3%)	44 (50.7%)	4.32	0.814
5	The sugar manufacturing firms conduct planned preventive maintenance	0 (0%)	1 (1.1%)	3 (3.4%)	16 (18.5%)	67 (77.0%)	4.71	0.589
6	Planned preventive maintenance adds value to the supply chain performance of sugar manufacturing firms	2 (2.3%)	9 (10.3%)	3 (3.4%)	12 (13.8%)	61 (70.2%)	4.39	1.103
Composite Mean and Std							**4.54**	**0.742**

Source: Researcher's survey(2024)

Additionally, the participants were requested to provide their viewpoints on whether sugar manufacturing companies implement condition-based maintenance. A significant majority of the respondents (85 individuals, or 97.7%) agreed with this statement. Conversely, no respondents expressed disagreement with it, and 2 individuals (or 2.3%) remained undecided.

The data reveals that a significant proportion of the participants (0.543) concurred that sugar manufacturing firms implement condition-based maintenance, as evidenced by the mean score of 4.56. The positive impact on the composite mean was indicated by the fact that the item mean was greater than the composite mean of 4.54. The item's standard deviation was smaller than the composite standard deviation of 0.742, suggesting that the item's response had a narrower range than that of the variable.

The statement that condition-based maintenance has an impact on the SCP of sugar manufacturing firms was accepted by a majority of 86 respondents (98.9%), with only one respondent (1.1%) expressing disagreement. Based on the data, the majority of respondents (0.604) agreed that condition-based maintenance has an impact on the SCP of sugar manufacturing firms, as indicated by the mean score of 4.67. The positive impact on the composite mean was indicated by the fact that the item mean was greater than the composite mean of 4.54. The item's standard deviation was smaller than the composite standard deviation of 0.742, suggesting that the item's response had a narrower range than that of the variable.

The participants were also asked to assess whether sugar manufacturing companies perform time-based machine maintenance. The findings reveal that the majority of respondents (82%), or 94.3%), agreed with this statement. Only 3% (or 3.4%) disagreed, and 2.3% (or 2.2%) moderately agreed with the same statement. Based on the data, the majority of respondents (0.8, or 4.59 on average) agreed that condition-based maintenance has an impact on the SCP of sugar manufacturing firms. The positive impact on the composite mean was

indicated by the fact that the item mean was greater than the composite mean of 4.54. The item's standard deviation exceeded the composite standard deviation of 0.742, suggesting that the item exhibited a more extensive dispersion in response rates compared to the variable.

The majority of respondents (73 out of 84) agreed with the assertion that the supply chain's time-based maintenance has an impact on SCP. Thirteen individuals (14.8%) remained undecided, while one individual (1.1%) expressed disagreement. The findings suggest that a substantial number of participants agreed that the supply chain's time-based maintenance has an effect on SCP, as evidenced by the mean score of 4.32 and the standard deviation of 0.814. The item mean below the composite mean of 4.54 was indicative of the adverse effect on the composite mean. Given that the item's standard deviation was greater than the composite standard deviation, which was 0.742, it may be inferred that the item displayed a wider range of response rates than the variable.

In addition, respondents were asked to rate their agreement with the statement that planned preventive maintenance is performed by sugar manufacturing companies. A significant majority of 82 respondents (94.3%) agreed with this statement. Although one individual (1.1%) expressed disagreement, three (3.4%) moderately concurred with the statement. The data reveals that a significant proportion of the participants (mean = 4.71, standard deviation = 0.589) concurred that sugar manufacturing companies perform scheduled preventive maintenance. The item mean was higher than the composite mean of 4.54, indicating a positive impact on the composite mean. A lower standard deviation for the item (0.742)

compared to the composite standard deviation (0.742) indicates that the response range for the item was more constrained.

Regarding whether planned preventive maintenance improves the SCP of sugar manufacturing companies, the findings indicate that 73 (84%), or the majority of respondents, concurred with the statement. Only 11 (12.6%) of the respondents disagreed, whereas 3 (3.4%) agreed fairly.Based on the data, the majority of respondents (1.103 standard deviations) agreed that planned preventive maintenance enhances the SCP of sugar manufacturing firms, as indicated by the mean score of 4.39. The negative impact on the composite mean was indicated by the fact that the item mean was lower than the composite mean of 4.54. The item's standard deviation exceeded the composite standard deviation of 0.742, suggesting that the item exhibited a more extensive dispersion in response rates compared to the variable. This aligns with the results obtained from a study conducted by Maletic, Al-Najjar, and Gomiscek (2014) that examined the impact of maintenance on the profitability and competitive success of an organization.

4.9 Total Quality Management

The objective of the study was to determine the impact of total quality management on the performance of supply chains in Western Kenyan sugar manufacturers. The respondents were instructed to provide their ratings on a five-point Likert scale in response to five statements: five indicates 'Strongly Agree' and one indicates 'Strongly Disagree'. The frequencies, mean, standard deviation (StD), composite mean, and composite standard deviation were utilized to analyze the ratings. Table 4.6 displays the results, with the following categories: Strongly Agree (SA), Agree (A), Fairly Agree (FA), Disagree (D), and Strongly Disagree (SD).

Table 4. 6: Likert on total Quality management

No.		SD	D	FA	A	SA	Mean	Std
1	The sugar manufacturing firms has internal failures on the supply chain operations	12 (13.8%)	5 (5.7%)	13 (14.9%)	35 (40.2%)	22 (25.4%)	3.57	1.31
2	Internal failures affect supply chain performance in the sugar manufacturing firms	6 (6.9%)	4 (4.6%)	7 (8.1%)	35 (40.2%)	35 (40.2%)	4.02	1.14
3	Inbuilt procurement flow affects supply chain performance in sugar manufacturing firms	1 (1.1%)	1 (1.1%)	9 (10.3%)	29 (33.3%)	47 (54.2%)	4.38	0.810
4	The sugar manufacturing firms provides training to its staff	1 (1.1%)	1 (1.1%)	12 (13.8%)	21 (24.1%)	52 (59.8%)	4.40	0.855
5	Training affects supply chain performance of sugar manufacturing firms	5 (5.7%)	0 (0%)	13 (14.9%)	11 (12.6%)	58 (66.8%)	4.34	1.11
6	There is defect prevention in the sugar manufacturing firms	1 (1.1%)	2 (2.3%)	2 (2.3%)	24 27.6%	58 (66.8%)	4.56	0.758
7	Defect prevention affects supply chain performance of manufacturing firms	5 (5.7%)	2 (2.3%)	3 (3.4%)	9 (10.3%)	68 (78.3%)	4.53	1.08
Composite Mean and Std							**4.26**	**1.01**

Source: Researcher's survey(2024)

The findings reveal a relatively divergent viewpoint among respondents regarding the presence of internal failures in the supply chain operations of sugar manufacturing firms. A majority of 57 individuals (65.6%) agreed with this statement, whereas a smaller proportion of 17 individuals (19.5%) disagreed and 13 individuals (14.9%) remained neutral. The data

reveals that a majority of the respondents (1.31 standard deviation) agreed that internal failures in the supply chain operations of sugar manufacturing firms do occur, as indicated by the mean score of 3.57. The negative impact on the composite mean was indicated by the fact that the item mean was lower than the composite mean of 4.26. The item's standard deviation exceeded the composite standard deviation of 1.01, suggesting that the item exhibited a more extensive range of responses compared to the variable.

The participants were also requested to provide ratings on whether they believed internal failures had an impact on the performance of supply chains in sugar manufacturing companies. The findings revealed that the majority of the respondents (70, or 80.5%) agreed with this statement, while 10 (or 11.5%) disagreed and 7 (or 8%) remained neutral.The data reveals that a majority of the participants (1.14 standard deviation) agreed that internal failures have an impact on the SCP of sugar manufacturing companies, as indicated by the mean score of 4.02. The negative impact on the composite mean was indicated by the fact that the item mean was lower than the composite mean of 4.26. The item's standard deviation exceeded the composite standard deviation of 1.01, suggesting that the item exhibited a more extensive range of responses compared to the variable.

The findings indicate that regarding the impact of inbuilt procurement flow on SCP in sugar manufacturing companies, only two respondents (2.3%) agreed with the statement. Nine others (10.3%) remained undecided, while the majority of respondents (76,87.6%) were in agreement. Based on the calculated mean score of 4.28 and standard deviation of 0.81, it can be concluded that a majority of the participants held the view that SCP in sugar manufacturing firms is influenced by inherent procurement flow. The item mean exceeded

the composite mean by 4.26, suggesting that the item mean had a positive impact on the composite mean. The item's standard deviation was found to be less than the composite standard deviation of 1.01, suggesting that the item's response followed a narrower range than that of the variable.

In addition, participants were requested to assess whether sugar manufacturing companies offer staff training. The findings indicate that the majority of respondents (73.9%) agreed with this statement, while only 2 (2.3%) disagreed. Additionally, 12 (13.8%) respondents considered the statement to be reasonably accurate. Based on the calculated mean score of 4.40 and standard deviation of 0.855, it can be inferred that a majority of the participants held the view that sugar manufacturing firms do indeed offer staff training. The item mean exceeded the composite mean by 4.26, suggesting that the item mean had a positive impact on the composite mean. The item's standard deviation was found to be less than the composite standard deviation of 1.01, suggesting that the item's response followed a narrower range than that of the variable.

The statement that training has an impact on the SCP of sugar manufacturing firms was accepted by 69 (79.4%) of the respondents. Five (5.7%) of the respondents were opposed to this view, and thirteen (14.8%) were undecided. Based on the data, which indicated a mean score of 4.34 and a standard deviation of 1.11, the majority of participants agreed that training has an impact on the SCP of sugar manufacturing companies. The item mean exceeded the composite mean by 4.26, suggesting that the item mean had a positive impact on the composite mean. The item's standard deviation exceeded the composite standard

deviation of 1.01, suggesting that the item exhibited a more extensive range of responses compared to the variable.

In addition, participants were requested to assess whether defect prevention is implemented in sugar manufacturing companies. The results revealed that the majority of respondents (82%), or 94.3%), concurred with the given statement. Conversely, 3.4% disagreed and 2.3% somewhat agreed, suggesting that some respondents were still undecided. Based on the calculated mean score of 4.56 and standard deviation of 0.758, it can be inferred that a majority of the participants held the view that defect prevention is implemented within sugar manufacturing companies. The item mean exceeded the composite mean by 4.26, suggesting that the item mean had a positive impact on the composite mean. The item's standard deviation was found to be less than the composite standard deviation of 1.01, suggesting that the item's response followed a narrower range than that of the variable.

In addition, participants were requested to assess whether defect prevention impacts the SCP of sugar manufacturing companies. The findings indicate that the majority of respondents (77%), or 88.6%, agreed with this statement. Conversely, 8% disagreed and 3.4% remained undecided. Based on the data points (mean = 4.53, standard deviation = 1.08), it can be concluded that a majority of the participants agreed that defect prevention has an impact on the SCP of sugar manufacturing companies. The item mean exceeded the composite mean by 4.26, suggesting that the item mean had a positive impact on the composite mean. The item's standard deviation exceeded the composite standard deviation of 1.01, suggesting that the item exhibited a more extensive range of responses compared to the variable. The results of the study corroborated Shahram's (2011) claim that implementing TQM, which is focused on both processes and consumers, results in increased satisfaction and pride among both

employees and clients. The results of the study corroborated Deming's (1986) claim that for a management system to achieve excellence, there must be dedication to critical quality variables throughout every division of the organization.

4.10 Government regulations

The objective of the study was to determine whether government regulations moderated the relationship between lean production practices and SCP in western Kenyan sugar factories. Participants were instructed to provide their ratings on a five-point Likert scale in response to five statements. A rating of five corresponded to 'Strongly Agree' and a rating of one to 'Strongly Disagree'. The frequencies, mean, standard deviation (StD), composite mean, and composite standard deviation were utilized to analyze the ratings. Table 4.7 displays the results, with the following categories: Strongly Agree (SA), Agree (A), Fairly Agree (FA), Disagree (D), and Strongly Disagree (SD).

Table 4. 7: Likert on Government regulation

No.		SD	D	FA	A	SA	Mean	Std
1	The sugar manufacturing firms in Kenya enjoys government incentives on the supply chain operations	24 (27.6%)	7 (8.0%)	9 (10.3%)	16 (18.4%)	31 (35.7%)	3.26	1.66
2	Availability of government incentives affects supply chain performance in the sugar manufacturing firms in Kenya	4 (4.6%)	5 (5.7%)	4 (4.6%)	16 (18.4%)	58 (66.8%)	4.37	1.11
3	Government licensing affects supply chain performance in sugar manufacturing firms in Kenya	1 (1.1%)	1 (1.1%)	7 (8.0%)	14 (16.2%)	64 (73.6%)	4.60	0.784
4	Government policies on the operations of sugar manufacturing firms in Kenya has an impact on supply chain performance	0 (0%)	1 (1.1%)	1 (1.1%)	17 (19.5%)	68 (78.3%)	4.75	0.533
5	Regulated licensing affects supply chain performance of sugar manufacturing firms in Kenya	0 (0%)	1 (1.1%)	5 (5.7%)	8 (9.3%)	73 (83.9%)	4.76	0.609
6	Government incentives in the operations of supply chain processes including production of sugar manufacturing firms in Kenya	1 (1.1%)	4 (4.6%)	12 (13.8%)	18 (20.7%)	52 (59.8%)	4.33	0.960
Composite Mean and Std							**4.35**	**0.943**

Source: Researcher's survey(2024)

The participants were requested to assess whether they believed sugar manufacturing firms in Kenya received government incentives for supply chain operations. The findings indicate that opinions were fairly divided, with the majority of respondents (45%) agreeing with the statement (35.7%), 31 (35.7%) disagreeing, and 7 (10.3%) remaining undecided. Based on the data, the majority of respondents (1.66 standard deviation) agreed that sugar manufacturing firms in Kenya receive government incentives for supply chain operations (3.26 mean). The negative impact on the composite mean was indicated by the fact that the item mean was lower than the composite mean of 4.35. The item's standard deviation exceeded the composite standard deviation of 0.943, suggesting that the item exhibited a more extensive dispersion in response rates compared to the variable.

In regard to the impact of government incentive availability on SCP in sugar manufacturing firms in Kenya, the findings indicate that a significant proportion of the participants (74% or 87%) agreed with the assertion. Conversely, a minority of 4 (or 4.6%) held a moderately agreeable stance. Based on the data, the majority of respondents (1.66 standard deviation) agreed that sugar manufacturing firms in Kenya receive government incentives for supply chain operations (3.26 mean). The negative impact on the composite mean was indicated by the fact that the item mean was lower than the composite mean of 4.35. The item's standard deviation exceeded the composite standard deviation of 0.943, suggesting that the item exhibited a more extensive dispersion in response rates compared to the variable. The participants were additionally requested to assess whether government licensing has an impact on the SCP of sugar manufacturing companies in Kenya. The findings revealed that a significant proportion of the respondents, 78 (89.7%), agreed with this statement. Conversely, 2 (2.3%) disagreed, and 7 (8%) agreed fairly. Based on the data, which indicated

a mean score of 4.60 and a standard deviation of 0.784, the majority of participants expressed agreement regarding the impact of government licensing on the SCP of sugar manufacturing companies in Kenya. As the item mean exceeded the composite mean by 4.35, this suggests that the item mean had a positive impact on the composite mean. The item's standard deviation was found to be less than the composite standard deviation of 0.943, suggesting that the item's response followed a narrower range than that of the variable.

The findings indicate that regarding the influence of government policies on the operations of sugar manufacturing firms in Kenya on SCP, the majority of respondents (85% or 97.8%) agreed with the statement. Conversely, a minority of one percent (1.1%) disagreed, mirroring the proportion of undecided respondents (1% or 1.1%). Based on the calculated mean score of 4.75 and standard deviation of 0.533, it can be concluded that a majority of the participants held the view that SCP is indeed influenced by government policies about the operations of sugar manufacturing firms in Kenya. As the item mean exceeded the composite mean by 4.35, this suggests that the item mean had a positive impact on the composite mean. The item's standard deviation was found to be less than the composite standard deviation of 0.943, suggesting that the item's response followed a narrower range than that of the variable.

In addition, participants were requested to assess whether regulated licensing has an impact on the SCP of sugar manufacturing companies in Kenya. The findings indicate that the majority of respondents (81, or 94.2%) agreed with the statement, whereas one respondent (1.1%) expressed disagreement and five remained undecided (5, or 5.7%). Based on the data, which indicated a mean score of 4.76 and a standard deviation of 0.609, the majority of participants expressed agreement regarding the impact of regulated licensing on the SCP of sugar manufacturing companies in Kenya. As the item mean exceeded the composite mean

by 4.35, this suggests that the item mean had a positive impact on the composite mean. The item's standard deviation was found to be less than the composite standard deviation of 0.943, suggesting that the item's response followed a narrower range than that of the variable.

The stance of the respondents regarding whether government incentives should be implemented in the production of sugar manufacturing firms in Kenya pertaining to supply chain processes was as follows: 70 (80.4%) of the respondents expressed agreement, 5 (5.7%) disagreed, and 12 (13.9%) remained neutral on the matter. The data indicates that the majority of participants (mean = 4.33; standard deviation = 0.960) agreed that government incentives should be implemented in the production of sugar manufacturing firms in Kenya, as per supply chain processes. The negative impact on the composite mean was indicated by the fact that the item mean was lower than the composite mean of 4.35. The item's standard deviation exceeded the composite standard deviation of 0.943, suggesting that the item exhibited a more extensive dispersion in response rates compared to the variable.

4.11 Supply chain performance

The objective of the study was to ascertain the impact that lean production practices had on the SCP of western Kenya's sugar manufacturing facilities. The respondents were instructed to provide their ratings on a five-point Likert scale in response to five statements: five indicates 'Strongly Agree' and one indicates 'Strongly Disagree'. The frequencies, mean, standard deviation (StD), composite mean, and composite standard deviation were utilized to analyze the ratings. Table 4.8 displayed the results, with the following categories: SA (Strongly Agree), A (Agree), FA (Fairly Agree), D (Disagree), and SD (Strongly Disagree).

Table 4. 8: Likert on Supply Chain Performace

No.		SD	D	FA	A	SA	Mean	Std
1.	The just in time has led to time management in the supply chain	0 (0%)	1 (1.1%)	11 (12.6%)	10 (11.5%)	65 (74.8%)	4.60	0.754
2.	The just in time has led to reduced cost in the supply chain	3 (3.4%)	1 (1.1%)	7 (8.0%)	13 (14.9%)	63 (72.6%)	4.52	0.951
3.	The just in time has improved the quality of services in the supply chain	2 (2.3%)	3 (3.4%)	9 (10.3%)	11 (12.6%)	62 (71.4%)	4.47	0.975
4.	Total prevention maintenance improved the quality services of supply chain performance	1 (1.1%)	1 (1.1%)	3 (3.4%)	18 (20.7%)	64 (73.7%)	4.64	0.715
5.	Value chain management practices affect supply chain performance	4 (4.6%)	1 (1.1%)	6 (6.9%)	11 (12.6%)	65 (74.8%)	4.52	1.01
Composite Mean and Std							**4.55**	**0.88**

Source: Researcher's survey(2024)

The participants were requested to assess whether JIT has facilitated time management in the supply chain. The findings indicate that the majority of respondents (75.3%) concurred with this statement, whereas 1 (1.1%) disagreed and 12.6 percent (fairly agreed). With a mean score of 4.60 and a standard deviation of 0.754, the majority of respondents agreed thatJIT

practices have facilitated supply chain time management. As the item mean exceeded the composite mean by 4.55, this suggests that the item mean had a positive impact on the composite mean. The item's standard deviation was found to be less than the composite standard deviation of 0.88, suggesting that the response for the item was more tightly packed together than the variable.

Regarding whether JIT has resulted in cost reductions in the supply chain, the findings indicate that a majority of respondents (76, or 87.6%) concurred with the statement. Additionally, 4% and 8%, respectively, held a moderate level of agreement. With a mean score of 4.52 and a standard deviation of 0.951, the majority of respondents agreed thatJIT delivery has resulted in supply chain cost reductions. The negative impact on the composite mean was indicated by the fact that the item mean was lower than the composite mean of 4.55. The item's standard deviation exceeded the composite standard deviation of 0.88, suggesting that the item exhibited a more extensive range of responses compared to the variable.

The participants were also requested to provide ratings on whether they agreed or disagreed with the statement thatJIT has enhanced the quality of services in the supply chain. 74 respondents (87%) expressed agreement with this statement, whereas 5 respondents (5.7%) disagreed and 9 respondents (10.3%) remained neutral on the matter. With a mean score of 4.47 and a standard deviation of 0.975, the majority of respondents agreed thatJIT delivery has enhanced the integrity of supply chain services. The negative impact on the composite mean was indicated by the fact that the item mean was lower than the composite mean of 4.55. The item's standard deviation exceeded the composite standard deviation of 0.88, suggesting that the item exhibited a more extensive range of responses compared to the

variable.

With respect to the question of whether total preventive maintenance enhanced the quality of services provided by the supply chain, a significant proportion of the participants (94.3%) expressed agreement. Only 2% disagreed with this notion, and 3.4% remained undecided. With a mean score of 4.64 and a standard deviation of 0.715, the majority of respondents agreed that total preventive maintenance enhanced the performance of supply chain quality services. As the item mean exceeded the composite mean by 4.55, this suggests that the item mean had a positive impact on the composite mean. The item's standard deviation was found to be less than the composite standard deviation of 0.88, suggesting that the response for the item was more tightly packed together than the variable.

Finally, in regard to the inquiry into the potential impact of value chain management practices on SCP, the researcher obtained 76 affirmative responses (87.6%), with 5 respondents (5.7%) and 6 respondents (6.9%) indicating a moderate level of agreement. With a mean score of 4.52 and a standard deviation of 1.01, the majority of respondents agreed that SCP is impacted by value chain management practices. The negative impact on the composite mean was indicated by the fact that the item mean was lower than the composite mean of 4.55. The item's standard deviation exceeded the composite standard deviation of 0.88, suggesting that the item exhibited a more extensive range of responses compared to the variable.

4.12 Basic tests of statistical assumption

Diagnostic tests were performed to check the fitness of data in meeting the basic tests of statistical assumptions.

4.12.1 Test for Normality

A test for normality was conducted with a confidence interval of 95%. The null hypothesis is rejected and evidence suggests that the data under investigation originates from a normally distributed population if the p-value is less than 0.05. The null hypothesis, which posits that the data did not originate from a normally distributed population, is accepted when the p-value exceeds 0.05. The hypothesis was examined using the Kolmogorov-Smirnov (KS) goodness-of-fit test and the Shapiro-Wilk (SW) test for normality.

H_o: The data is not drawn from the normal distribution

The findings are as shown in Table 4.9.

Table 4. 9: Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Just in time	.309	87	.000	.710	87	.000
Total prevention maintenance	.224	87	.000	.758	87	.000
Total quality management	.189	87	.000	.916	87	.000
Government regulation	.194	87	.000	.874	87	.000

a. Lilliefors Significance Correction

Source: Research Data (2024)

The Kolmogorov-Smirnov (KS) test results in Table 4.9 show that the information gathered on Just in time (df = 87, p = 0.001), Total prevention maintenance (df = 87, p = 0.001), Total quality management (df = 87, p = 0.001), and Government regulation (df = 87, p = 0.001) was normally distributed, which means it was statistically significant at the 5% level. The

findings suggest that the null hypothesis is rejected in favor of the conclusion that the data followed a normal distribution, and thus the data were normally distributed. In contrast, the Shapiro-Wilk (SW) results presented in Table 4.9 p indicate that the data points pertaining to government regulation (df = 87, p = 0.001), just in time (df = 87, p = 0.001), and total prevention maintenance (df = 87, p = 0.001) followed a normal distribution. Consequently, these values were deemed statistically significant at the 5% level of significance. The findings suggest that the null hypothesis is rejected in favor of the conclusion that the data followed a normal distribution, and thus the data were normally distributed.

The SW results validated the KS results that the data on the questionnaire completed by respondents originated from a normally distributed population and were, in fact, normally distributed. The lack of significance in the tests for normality indicates that the parametric test should be employed for the analysis.

4.12.2 Multicollinearity Tests

Multicollinearity occurs when predictor variables are highly correlated with one another. This can lead to an increase in the standard errors associated with the beta coefficients, impose a constraint on the value of R, and complicate the assessment of the relative significance of individual predictors within the model. Multicollinearity was evaluated through the utilization of the Variance inflation factor (VIF) and the tolerance value. The tolerance value is in the interval of 0 to 1, where a value less than 0.1 signifies a significant multicollinearity issue. The VIF statistic, which is the inverse of the tolerance value, lacks specific thresholds; however, multicollinearity is not present if the VIF value falls within the range of 1 to 10. Multicollinearity exists when the VIF value is above 10 or below 1 equivalent. The outcomes of the multicollinearity examination are displayed in Table 4.10

Table 4. 10: Multicollinearity test

Model		Collinearity Statistics	
		Tolerance	VIF
	Just in time	.536	1.866
	Total prevention maintenance	.570	1.755
	Total quality management	.610	1.639
	Government regulation	.654	1.530

Source: Research Data (2024)

The absence of multicollinearity is indicated by the fact that all tolerance values are greater than 0.5 and are closer to the maximum value of 1 than to the minimum value of 0. This is shown in Table 4.10. Conversely, the VIF values exhibit a proximity to 1 rather than 10, which signifies the lack of collinearity.

4.12.3 Homoscedasticity

Homoscedasticity refers to a scenario in which the errors' variance remains constant across all levels of the predictor variable. On the other hand, heteroscedasticity is the lack of homoscedasticity, meaning that the errors' variance varies over all observations. Failure to address heteroscedasticity undermines the validity of statistical tests of significance, such as regression analysis, and raises the likelihood of incorrect conclusion. This study employed the Levene statistic to examine the null hypothesis that the variance of the explained variable is not uniform across all levels of explanatory factors. The findings are displayed in Table 4.11.

Table 4. 11: Test of Homogeneity of variance

	Levene Statistic	df1	df2	Sig.
Just in time	6.465	1	85	.013
Total prevention maintenance	10.736	1	85	.002
Total quality management	2.531	1	85	.015
Government Regulation chain	5.926	1	85	.017

Source: Research Data (2024)

The Levene statistic's significance level is 0.05, indicating that the null hypothesis is rejected when $p < 0.05$. Acceptance of the null hypothesis takes place when the p-value is greater than 0.05. It is crucial to emphasize that the p-value in Table 4.11 is below 0.05. Therefore, the rejection of the null hypothesis suggests that the variances of the dependent variable do not demonstrate uniformity across different levels of the explanatory factors. This statement fulfills the assumption of homogeneity of variance.

4.12.4 Linearity Tests

The purpose of a linearity test is to ascertain whether or not there exists a linear relationship between the independent and dependent variables. The findings are displayed in Table 4.12.

Table 4. 12: Linearity

		Deviation from linearity	Sig.value for linearity
Supply chain	Just in time	0.201	.001
	Total prevention maintenance	0.071	.001
	Total quality management	0.101	.001
	Government Regulation chain	0.211	. 001

Source: Research Data (2024)

The results presented in Table 4.12 indicate that the relationship between the dependent variable and independent variables is linearly significant ($p < 0.05$). Conversely, the significance value of the deviation from linearity is $p > 0.05$. Consequently, it can be inferred that the dependent variable and independent variables exhibit a linear relationship.

4.12.5 Correlation Analysis For All the Variables

The Pearson product-moment correlation coefficient (r) was used to compute the bivariate correlation, which quantifies the relationship between two variables, for the observed variables. The coefficient R quantifies the strength of a linear association between two variables, with values ranging from zero to one hundred percent correlation, signifying the lowest and highest levels of correlation, respectively. The findings of the correlation analysis can be found in Table 4.13.

Table 4. 13: Correlation

		Just in time	Total prevention maintenance	Total quality management	Government regulation	Supply chain performance
Just in time	Pearson Correlation	1	.602**	.505**	.518**	.621**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	87	87	87	87	87
Total prevention maintenance	Pearson Correlation	.602**	1	.526**	.415**	.437**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	87	87	87	87	87
Total quality management	Pearson Correlation	.505**	.526**	1	.500**	.445**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	87	87	87	87	87
Government regulation	Pearson Correlation	.518**	.415**	.500**	1	.687**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	87	87	87	87	87
Supply chain performance	Pearson Correlation	.621**	.437**	.445**	.687**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	87	87	87	87	87

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

Source: Research Data (2024)

The results presented in Table 4.13 indicate a significant and positive association between SCP and the explanatory factors of just-in-time, total prevention maintenance, and total

quality management. Additionally, the moderating variable of government regulation also plays a role in this relationship.

4.13 Hypothesis testing

The researcher conducted hypothesis test to determine the relationship between the independent variables of just in time, total prevention maintenance, and total quality management, with the moderating factor of government regulation, and the dependent variable of SCP in Sugar manufacturing factories in Western Kenya. The statistical significance of the correlation was assessed to determine whether to accept or to reject the null hypotheses offered in the study. The link between lean production strategies and supply chain performance was established using regression analysis.

4.14 Objective 1: To ascertain the influence of just in time on SCP, in Sugar manufacturing companies in Western Kenya.

The primary aim of this research was to determine the impact of JIT practices on the performance of supply chains within the sugar manufacturing sector of Western Kenya. A linear regression analysis was utilized to ascertain this. The research employed the subsequent null hypothesis, which was examined at a significance level of 0.05.

H_{01}: Just In Time has no significant impact on supply chain performance in Sugar manufacturing factories in Western Kenya.

The results are shown in Table 4.14 – 4.16

Table 4. 14: Model Summary[b]; Just in time and supply chain performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.621[a]	.386	.379	2.631

a. Predictors: (Constant), Just in time

b. Dependent Variable: Supply chain performance

As shown in Table 4.14, R-squared equals 0.386. According to the findings of this research, 38.6% of the observed variability in SCP among sugar manufacturing firms in Western Kenya can be attributed to just in time. The remaining 61.4% may be ascribed to additional variables that were not overtly investigated in the research, which centered on assessing the correlation between JIT and SCP.

Table 4. 15: ANOVA[a]; Just in time and supply chain performance

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	370.056	1	370.056	53.460	.000[b]
	Residual	588.381	85	6.922		
	Total	958.437	86			

a. Dependent Variable: Supply chain performance
b. Predictors: (Constant), Just in time

The results presented in Table 4.15 demonstrate that the independent variable, just in time, significantly influences the SCP of sugar manufacturing companies in Western Kenya in a predictive manner. The aforementioned deduction is supported by the results of the analysis of variance (ANOVA) performed with a significance level of 0.05 ($p=0.001 < 0.05$). The finding that the significance value of 0.001 is less than the predetermined significance limit of 0.05 gives credibility to this claim.

Table 4. 16: Coefficients[a]; Just in time and supply chain performance

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.705	2.756		.982	.329
	Just in time	.738	.101	.621	7.312	.000

a. Dependent Variable: Supply chain performance

A substantial impact of Just in Time concept on the SCP of sugar manufacturing enterprises in Western Kenya was established based on the study's results (t-statistic=7.312, p-value = 0.001< 0.05). as perceived by sugar manufacturing enterprises in Western Kenya; thus, the null hypothesis was rejected at a 5% level of significance, indicating the existence of a significant correlation between JIT and SCP. There was therefore a correlation of 0.738 between an increase in SCP and just-in-time by one unit. Consequently, the null hypothesis that just-in-time production has no significant impact on SCP in sugar production enterprises in Western Kenya is rejected.

Thus the model equation is

$$Y = 2.705 + 0.738X$$

Where

Y-Supply chain performance

X-Just in time

4.15 Objective 2: To establish the influence of total prevention maintenance on supply chain performance in Sugar manufacturing companies in Western Kenya.

The study's goal was to establish of how total prevention maintenance affects the performance of the supply chain in sugar manufacturing companies in Western Kenya. A linear regression analysis was employed to determine that. The research utilized the subsequent null hypothesis, which was examined at a significance level of 0.05.

H_{02}: Total Prevention Maintenance does not significantly affect supply chain performance in Sugar manufacturing factories in Western Kenya.

The results are shown in Table 4.17 – 4.19

Table 4. 17: Model Summaryb; Total prevention maintenance and supply chain performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.437[a]	.191	.182	3.020

a. Predictors: (Constant), Total prevention maintenance

b. Dependent Variable: Supply chain performance

As shown in Table 4.17, R-squared equals 0.191. Total prevention maintenance accounted for 19.1% of the observed variation in SCP among sugar manufacturing firms in Western Kenya, according to the findings of this study. The remaining 80.9 percent may be attributed to additional factors that were not explicitly investigated in the research, which primarily sought to ascertain the correlation between SCP and total preventive maintenance.

Table 4. 18: ANOVA[a]; Total prevention maintenance and supply chain

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	183.229	1	183.229	20.091	.000[b]
	Residual	775.208	85	9.120		
	Total	958.437	86			

a. Dependent Variable: Supply chain performance

b. Predictors: (Constant), Total prevention maintenance

The results presented in Table 4.18 demonstrate that total prevention maintenance, the independent variable, significantly predicts the SCP of sugar manufacturing companies in Western Kenya. The aforementioned deduction is supported by the results of the analysis of variance (ANOVA) performed with a significance level of 0.05 ($p=0.001 < 0.05$). The finding that the significance value of 0.001 is less than the predetermined significance limit of 0.05 lends credibility to this claim.

Table 4. 19: Coefficients[a]; Total prevention maintenance and supply chain

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	8.458	3.204		2.639	.010
	Total prevention maintenance	.525	.117	.437	4.482	.000

a. Dependent Variable: Supply chain performance

The findings of the research demonstrated that total preventive maintenance significantly influenced the SCP of sugar manufacturing companies in Western Kenya (t-statistic = 4.482, p-value = 0.001< 0.05). Therefore, at a 5% level of significance, the null hypothesis was rejected, indicating that a significant correlation existed between total prevention maintenance and SCP as observed in sugar manufacturing companies located in Western Kenya. Consequently, a 0.525 improvement in SCP was attributed to a one-unit increase in total preventive maintenance. Consequently,the null hypothesis that total preventive maintenance has no discernible impact on the SCP of sugar manufacturing firms in Western Kenya is rejected

Thus the model equation is

$$Y = 8.458 + 0.525X$$

Where

Y-Supply chain performance

X-Total prevention maintenance

4.16 Objective 3: To ascertain on the influence of Total Quality management on supply chain performance in Sugar manufacturing companies in Western Kenya.

This research aimed to determine the impact that total quality management has on the performance of supply chains in sugar manufacturing firms in Western Kenya. A linear regression analysis was utilized to determine this. The research employed the subsequent null hypothesis, which was examined at a significance level of 0.05.

H_{03}: Total Quality Management has no significance on supply chain performance in Sugar manufacturing factories in Western Kenya.

The results are shown in Table 4.20 - 4.22

Table 4. 20:Model Summaryb; Total quality management and supply chain

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.445[a]	.198	.188	3.008

a. Predictors: (Constant), Total quality management
b. Dependent Variable: Supply chain performance

The value of R-squared is 0.198, as indicated in Table 4.20. 19.8% of the observed variation in SCP among sugar manufacturing firms in Western Kenya may be attributable to total quality management, according to the findings of this study. The residual 80.2% may be ascribed to supplementary variables that were not explicitly examined in the research, which focused on discovering the relationship between preventive maintenance (SCP) and total preventive maintenance.

Table 4. 21: ANOVA[a]; Total quality management and supply chain

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	189.472	1	189.472	20.944	.000[b]
	Residual	768.965	85	9.047		
	Total	958.437	86			

a. Dependent Variable: Supply chain performance
b. Predictors: (Constant), Total quality management

The findings illustrated in Table 4.21 indicate that the SCP of sugar manufacturing companies in Western Kenya is substantially impacted by total quality management, the independent variable. The conclusion mentioned above is corroborated by the outcomes of the analysis of variance (ANOVA) conducted at a 0.05 level of significance ($p=0.001 < 0.05$). This claim is bolstered by the discovery that the significance value of 0.001 is below the predetermined significance threshold of 0.05.

Table 4. 22: Coefficients[a]; Total quality management and supply chain

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	12.155	2.337		5.201	.000
	Total quality management	.419	.092	.445	4.576	.000

a. Dependent Variable: Supply chain performance

Total quality management had a great impact on the SCP of sugar manufacturing enterprises in Western Kenya, according to the study's results (t-statistic = 4.576, p-value = 0.001< 0.05). Hence, the null hypothesis was rejected at a 5% level of significance, signifying the identification of high correlation between SCP and total quality management in sugar manufacturing firms situated in Western Kenya. Thus, there was a correlation between a 0.419 increase in SCP and a one-unit increase in total quality management. Thus, the null hypothesis, which indicates that total quality management has no substantial impact on the SCP of sugar manufacturing firms in Western Kenya, is rejected.

Thus the model equation is

$$Y = 12.155 + 0.419X$$

Where

Y-Supply chain performance

X-Total quality management

4.17 Multiple Linear Regression Analysis on lean production practices and supply chain performance of the Sugar manufacturing factories in western Kenya.

The association between SCP and lean production practices was established through the utilization of multiple linear regression analysis. A 0.05 level of significance was applied to the following null hypothesis in the study:

H_{03}: Lean production practices has no significance on supply chain performance in Sugar manufacturing factories in Western Kenya.

The results are shown in Table 4.23.

Table 4. 23: Model Summary[b]; lean production practices and supply chain performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.640[a]	.410	.389	2.610

a. Predictors: (Constant), Total quality management, Just in time, Total prevention maintenance

b. Dependent Variable: Supply chain performance

The R-squared value of 0.410 is displayed in Table 4.23. The findings of this study suggest that the infusion of lean production strategies, such as Total Quality Management, Just-in-Time, and Total Preventive Maintenance, accounted for 41% of the variation in SCP seen in sugar-producing companies in Western Kenya. The study primarily investigated the

correlation between lean production techniques and SCP. However, this study did not specifically analyze the other 59 percent of the elements that influence SCP.

Table 4. 24: ANOVAa; lean production practices and supply chain performance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	393.088	3	131.029	19.237	.000[b]
	Residual	565.349	83	6.811		
	Total	958.437	86			

a. Dependent Variable: Supply chain performance

b. Predictors: (Constant), Total quality management, Just in time, Total prevention maintenance

Based on the results presented in Table 4.24, it can be concluded that lean production practices (including Just-in-time, Total prevention maintenance, and Total quality management) significantly influence the SCP of sugar manufacturing companies in Western Kenya. The deduction is supported by the results of the analysis of variance (ANOVA) performed with a significance level of 0.05 ($p=0.001 < 0.05$). The finding of 0.001 is less than the significance limit of 0.05 gives credibility to this assertation.

Table 4. 25: Coefficients[a]; lean production practices and supply chain performance

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.915	3.086		.296	.768
	Just in time	.610	.131	.514	4.674	.000
	Total prevention maintenance	.051	.134	.042	.379	.006
	Total quality management	.154	.097	.163	1.582	.018

a. Dependent Variable: Supply chain performance

The findings of the research study showed that the implementation of lean production methods, namely Total Quality Management, Just in Time, and Total Prevention Maintenance, largely improved the SCP of sugar manufacturing companies based in Western Kenya. To project the impact of lean production practices (namely, Total Quality Management, Just in Time, and Total Prevention Maintenance) on the SCP of sugar manufacturing firms in Western Kenya, a multiple regression analysis was carried out. The SCP was largely predicted by these variables ($F(3,83) = 19.237$, $P < 0.05$, $R2 = 0.410$). All three variables contributed to the prediction of SCP in a statistically significant way ($P < 0.05$). As a result, the null hypothesis was rejected at a 5% significance level, showing that SCP in sugar manufacturing firms in Western Kenya was extensively influenced by lean production practices (Total quality management, Just in time, Total prevention maintenance). As a result, a rise of one unit in JIT was found to be correlated with a 0.610 improvement in SCP ($t (86) = 4.674$, $p < 0.05$); a rise of one unit in total quality management was associated with a 0.154 improvement in SCP ($t (86) = 1.582$, $p < 0.05$); and a 0.051 increase in SCP was observed with an increase of one unit in total prevention maintenance ($t (86) = 0.379$, $p < 0.05$).

By considering SCP,JIT operations, total preventive maintenance, and total quality management, the regression coefficients presented in Table 4.25 indicate the following:

$$Y = \beta_0 + \beta_1 \times X_1 + \beta_2 \times X_2 + \beta_3 \times X_3 + \varepsilon$$

$$Y = 0.915 + 0.610X_1 + 0.051X_2 + 0.154X_3$$

4.18 Objective 4: To assess the moderating effect of government regulations on the relationship between lean production practices and supply chain performance of the Sugar manufacturing factories in western Kenya.

The primary objective of the researcher was to establish a correlation between SCP and lean production strategies. The impact of lean production practices on SCP was determined by the use of Pearson Product Moment Correlation. The study implemented the null hypothesis that was tested for significance at a 0.05 level of significance.

H_o: There is no relationship between lean production practices and supply chain performance

Table 4. 26: Correlational analysis

		Supply chain performance	Lean production practices
Supply chain performance	Pearson Correlation	1	.596**
	Sig. (2-tailed)		.000
	N	87	87
Lean production practices	Pearson Correlation	.596**	1
	Sig. (2-tailed)	.000	
	N	87	87

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

According to the findings presented in Table 4.26, a positive correlation (r = 0.596, n = 87, p = 0.001) exists between SCP and lean production practices. At the 0.05% level of significance, the correlation is significant. Hence, at a significance level of 5%, we reject the null hypothesis and pronounce that a correlation exists between SCP and lean production practices.

Hierarchical regression analysis was used to examine the moderating influence of government regulation on the association between lean production practices and SCP in sugar manufacturing facilities in western Kenya. The findings are presented in Table 4.27 – 4.29.

Table 4. 27: Model summary

				Std. Error		Change Statistics			
Model	R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.640[a]	.410	.389	2.610	.410	19.237	3	83	.000
2	.754[b]	.569	.548	2.245	.159	30.143	1	82	.000
3	.755[c]	.570	.532	2.284	.001	.085	3	79	.968

a. Predictors: (Constant), Total quality management, Just in time, Total prevention maintenance

b. Predictors: (Constant), Total quality management, Just in time, Total prevention maintenance, Government regulation

c. Predictors: (Constant), Total quality management, Just in time, Total prevention maintenance, Government regulation, Total prevention maintenance-Government regulation, Just in time-Government regulation, Total quality management-Government regulation

The outcomes revealed that the initial model, which examined the relationship between supply chain performance and lean production practices (namely, Just in time, Total prevention maintenance, and Total quality management), yielded significant results (R2 = 0.410, p = 0.000 < 0.05). The correlation between government regulation, SCP, and lean production practices (including Just in Time, Total Prevention Maintenance, and Total Quality Management) was found to be statistically viable in the second model (R2 = 0.569, p = 0.000 < 0.05). The R2 value increased to 0.570 upon the introduction of the interaction between government regulation and the primary predictor variable into the model; however, this increase did not reach statistical significance (p=0.001 > 0.05). The observed modification indicates that the models demonstrate dependability and consistency in their capacity to predict the impact of SCP, government regulation, and lean production practices (just in time, total prevention maintenance, and total quality management) on sugar manufacturing companies in western Kenya.

Table 4. 28: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	393.088	3	131.029	19.237	.000[b]
	Residual	565.349	83	6.811		
	Total	958.437	86			
2	Regression	545.049	4	136.262	27.029	.000[c]
	Residual	413.388	82	5.041		
	Total	958.437	86			
3	Regression	546.373	7	78.053	14.964	.000[d]
	Residual	412.064	79	5.216		
	Total	958.437	86			

a. Dependent Variable: Supply chain performance
b. Predictors: (Constant), Total quality management, Just in time, Total prevention maintenance
c. Predictors: (Constant), Total quality management, Just in time, Total prevention maintenance, Government regulation
d. Predictors: (Constant), Total quality management, Just in time, Total prevention maintenance, Government regulation, Total prevention maintenance-Government regulation, Just in time-Government regulation, Total quality management-Government regulation

The ANOVA test is deployed to ascertain the significance of the model in predicting the potency of lean production strategies. In Model 1, the ANOVA test showed that the independent variables Total quality management, Just in time, and Total prevention maintenance were remarkable predictors of the SCP of sugar manufacturing firms in western Kenya. This was indicated by a significance value of 0.001, which is lower than the 0.05 level of significance ($p=0.001 < 0.05$).

Model 2 includes the moderating variable (government regulation) with a significance level of 0.05. The ANOVA test revealed that the additional predictor variables significantly influenced the SCP of sugar production enterprises in western Kenya. A p-value of 0.001 indicates a lesser degree of significance than 0.05 ($p=0.001 < 0.05$). Finally, the inclusion of interaction terms in Model 3 revealed that the independent variables - Total quality management, Just in time, Total prevention maintenance, government regulation, Just in time* government regulation, Total quality management * government regulation, and Total prevention maintenance * government regulation - were significant indicators of SCP in sugar manufacturing firms in western Kenya. The p-value of 0.001 was less than 0.05, indicating statistical significance.

Table 4. 29: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.915	3.086		.296	.768
	Just in time	.610	.131	.514	4.674	.000
	Total prevention maintenance	.051	.134	.042	.379	.006
	Total quality management	.154	.097	.163	1.582	.018
2	(Constant)	-.972	2.677		-.363	.718
	Just in time	.417	.118	.351	3.540	.001
	Total prevention maintenance	.018	.115	.015	.154	.878
	Total quality management	.013	.087	.013	.143	.886
	Government regulation	.445	.081	.493	5.490	.000
3	(Constant)	2.158	12.122		.178	.859
	Just in time	.403	.672	.339	.600	.550
	Total prevention maintenance	.315	.801	-.262	.393	.695
	Total quality management	.247	.660	.262	.374	.709
	Government regulation	.289	.597	.320	.484	.630
	Just in time-Government regulation	.001	.028	.036	.032	.005
	Total prevention maintenance-Government regulation	.014	.032	.553	.435	.022
	Total quality management-Government regulation	-.009	.026	-.422	-.364	.017

Table 4.29 shows that at a 5% level of significance, the following variables were significant predictors of SCP for sugar-producing enterprises in western Kenya: just in time (p=0.0.001 < 0.05), total prevention maintenance (p=0.006< 0.05), and total quality management (p=0.018< 0.05). All lean production practices (total quality management, just in time, and total preventive maintenance) failed to demonstrate statistical significance when government regulations were incorporated (p values > 0.05). Each of the predictor variables for lean production practices—total preventive maintenance, just-in-time, and total quality management—became statistically significant when interaction terms were incorporated. This indicates that the moderating variable (government regulation) is positively correlated with the predictor variables lean production practices (just in time, total prevention maintenance, and total quality management). Therefore, based on the observed correlation, it can be concluded that the relationship between lean production practices (namely Total Quality Management, Just in Time, and Total Prevention Maintenance) and the SCP of sugar manufacturing firms in western Kenya is moderated by government regulation.

Therefore the model equation is

$$Y = \beta_0 + \beta_1 X_1 Z + \beta_2 X_2 Z + \beta_3 X_3 Z + \varepsilon$$

$$Y = 2.158 + 0.403X_1 + 0.315X_2 + 0.247X_3 + 0.289Z + 0.001X_1Z + 0.014X_2Z + 0.009X_3Z$$

- Where Y is the supply chain performance
- X is the independent variable, (Just in time (X_1), Total prevention maintenance (X_2) Total quality management(X_3)
- The moderator is Z (government regulation)

Table 4. 30: Summary of the hypotheses on Descriptive findings

Objectives	Hypotheses	Results
To ascertain the influence of just-in-time on supply chain performance, in Sugar manufacturing companies in Western Kenya.	**H_{01}:** Just In Time does not significantly impact supply chain performance in Sugar manufacturing factories in Western Kenya.	The null hypothesis was rejected
To establish the influence of total prevention maintenance on supply chain performance in Sugar manufacturing companies in Western Kenya.	**H_{02}:** Total Prevention Maintenance does not significantly affect supply chain performance in Sugar manufacturing factories in Western Kenya.	The null hypothesis was rejected
To ascertain on the influence of Total Quality management on supply chain performance in Sugar manufacturing companies in Western Kenya.	**H_{03}:** Total Quality Management has no significance on supply chain performance in Sugar manufacturing factories in Western Kenya.	The null hypothesis was rejected
To assess on the moderating effect of government regulations on the relationship between lean production practices and supply chain performance of the Sugar manufacturing factories in western Kenya	**H_{04}:** Government regulation has no significant influence on the relationship between lean procurement and supply chain performance in Sugar manufacturing firms in Western Kenya.	The null hypothesis was rejected

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The results, recommendations, and ideas for additional research were summarized in this chapter.

Discussion of Findings Summary

The study aimed to investigate the impact of lean production strategies on supply chain performance in sugar mills in Western Kenya. The specific objective of the study was to ascertain the influence of JIT on supply chain performance in sugar manufacturing companies in Western Kenya, to establish the influence of total prevention maintenance on supply chain performance in sugar manufacturing companies in Western Kenya, to ascertain the influence of Total Quality management on supply chain performance in sugar manufacturing companies in Western Kenya, and to assess the moderating effect.

5.2.1 To establish the influence of just-in-time on supply chain performance in Sugar manufacturing companies in Western Kenya

A one-unit increase in just-in-time results in a measurable enhancement of 0.078 in supply chain performance, according to the study ((85) = 7.312, M <.05). This indicates that just-in-time provides sugar factories in Western Kenya with a substantial impact on supply chain performance. A lack of fast consumer goods production and the absence of a buffer stockpile to sustain output may have contributed to this rapid increase in demand. The results indicated that lean supply chain strategies, including Just-in-Time (JIT) and other similar approaches, were implemented in the manufacturing sector to decrease both time and cost wastage. As a consequence, firms achieved increased profitability and stability in their operations.

(Tripathi & Tiwari, 2016). Furthermore, JIT production boosts a company's market share by ensuring that clients have access to high-quality goods while minimizing waste. According to the findings, JIT production ensures customer retention while also attracting new consumers.

Khalil, Khalil, and Khan (2019) conducted research to evaluate the relationship between supply chain management techniques and organizational performance, with innovation serving as a mediator in this relationship. From 207 small and medium-sized enterprises (SMEs) located in Punjab, Pakistan, data were gathered. Strategic supplier partnerships and the degree of information sharing had no discernible impact on organizational performance, according to the findings. In addition, the exstend of lean practices, internal supply chain processes, and information sharing quality on organizational performance was substantial.

Tripathi and Tiwari (2018) looked at how lean manufacturing strategies affected company profits. An analysis was conducted on the impact of the Kanban system,JIT production, flexible workforce, and innovative thinking on lean manufacturing practices within the Indian manufacturing sector. Data was gathered from production firms in India, and the correlation between these practices and firm output was analyzed. The study results indicated that financial constraints led to a dearth of resources. The purpose of the present study was to remedy the void by examining time, cost, and quality to enhance the performance of the supply chain.

Indeed,the study established that Just In Time has impact on supply chain performance of sugar manufacturing firms in Western Kenya.

5.2.2 To establish the influence of total prevention maintenance on supply chain performance of Sugar manufacturing companies in Western Kenya

According to the study's second purpose, a one-unit increase in total prevention maintenance enhances supply chain performance by.525, suggesting a significant change ((85) = 4.482, p <.05.). This meant that the implementation of comprehensive preventative maintenance significantly influenced the performance of the supply chains in the sugar production businesses of Western Kenya. The respondents believe that the condition-based maintenance approach offers the most significant potential for improvement in total productive maintenance practices, as indicated by their research findings. Moreover, the pivotal empirical discoveries of the research indicated that the weaving machine could generate additional revenue, especially if all unanticipated downtimes and quality degradation resulting from a decline in output were circumvented. Enhancing the organization's performance can be achieved by increasing machine availability and eliminating unscheduled stoppages via maintenance.

Fadly Hudin, Mustaffa, Rosli, Ong, & Fuzi (2017) suggest that the TPM tool be used as a key way to keep improving maintenance performance and, in turn, gain a competitive edge. Modern manufacturing companies will eliminate waste in operation activities by implementing a prototype of a TPM system. This will result in reduced maintenance costs, time spent on monitoring and controls, defects, lead times, and variation processes. Additionally, it will enhance product quality and customer satisfaction through improved service. Safety, cost, quality, and performance efficacy were the variables that were incorporated. A noteworthy correlation was observed between the total productive maintenance (TPM) tool and the performance of the manufacturing sector in Malaysia,

according to the study. As measuring variables, the current study examines condition-based maintenance, time-based maintenance, and planned preventive maintenance.

According to Induswe (2013), large manufacturing companies in Kenya are using complete productive maintenance. The research utilized a cross-sectional survey methodology. The study's population comprised 201 prominent manufacturing enterprises located in Nairobi, as classified by the Kenya Association of Manufacturers & Exporters. The research revealed that major manufacturing companies in Kenya that adopted TPM faced a number of obstacles, including employees perceiving TPM activities as extra work, inadequate comprehension of the TPM implementation methodology and philosophy, insufficient financial support, inadequate resources, and a lack of commitment from top management, among others. Examining the impact of time-based maintenance and condition-based maintenance, which are lean maintenance methodologies, on the SCP of sugar manufacturing companies in western Kenya, the present study aims to address this research vacuum.

This study established that Total Preventive Mintenance is quite beneficial a concept to improves on cost reduction and waste reduction in terms of times wasted which manufacturing machines remained idle during periodic maintenance with interrupted production.

5.2.3 To establish the influence of Total Quality management on supply chain performance of Sugar manufacturing companies in Western Kenya

As per the third objective of the research, a substantial enhancement in supply chain performance results from a one-unit improvement in total quality management (TQM) (.419, $b(85)= 4.576$, $p <.05$. Suppressing the null hypothesis at the 5% level of significance was the result. Thus, it is evident that supply chain performance in sugar-producing facilities located in Western Kenya is significantly influenced by overall quality management. The significant positive impact on performance suggests that TQM was effectively implemented, suggesting that when implemented correctly, TQM could potentially enhance the performance of an organization.

Masindet and Ogollah (2014) investigated the influence of total quality management techniques on the efficiency of supply chains, specifically in the context of cement manufacturing enterprises in Kenya. The study utilized a descriptive technique to investigate the influence of management commitment, staff involvement, customer orientation, and continuous improvement on supply performance. These factors are recognized as important indicators of comprehensive quality management. The results demonstrate a statistically significant relationship between SCP and all measures of total quality management. This is because these indicators directly affect the SCP (Strategic Competitive Position) of cement production firms. The current study is to analyze the influence of internal failure, training, and defect avoidance in lean production methods and management on the performance of supply chains in sugar manufacturing firms situated in western Kenya.

The study conducted by Fatuma (2015) used both descriptive and inferential statistics to present the data collected and analyzed using a descriptive research approach. The results of the study revealed that prominent manufacturing companies that used quality management strategies encompassing lean production, benchmarking, six sigma practice, and supplier partnership exhibited a more advantageous position in the competitive landscape. The present study focused on the implementation of value chain management methods, which facilitated effective communication and collaboration between the firm and its stakeholders. This,contributed to the successful achievement of predetermined goals and objectives.

5.2.4 To assess the moderating effect of government regulations on the relationship between lean production practices and supply chain performance of the Sugar manufacturing factories in western Kenya

When government regulations were considered, none of the lean manufacturing strategies (total quality management, just in time, and total preventive maintenance) showed any statistically significant results (p values > 0.05). When interaction terms were included, each of the predictor variables for lean production techniques, namely total preventive maintenance, just-in-time, and total quality management, exhibited statistical significance. This suggests that the moderating variable, government regulation, has a positive correlation with the predictor variables lean manufacturing strategies, specifically just in time, total prevention maintenance, and total quality management. Hence, drawing from the observed correlation, it can be inferred that the connection between lean production methods (namely Total Quality Management, Just in Time, and Total Prevention Maintenance) and the SCP of sugar-producing enterprises in western Kenya is influenced by government regulation.

The influence of government rules on SCP is mitigated. Fiorino and Bhan (2013) investigated the potential function of the government as a moderator. An examination of the impact of corporate and governmental environmental regulations on the efficiency and effectiveness of supply chains in the United States. This study has utilized a descriptive methodology to determine that government rules pertaining to environmental management, industry codes, product or building certification programs, and reporting or disclosure programs have an adverse effect on SCP. The aim of this study is to examine the impact of government regulations on the functioning of supply chains in oil marketing businesses in Kenya. The objective of this study is to analyze the impact of government-imposed limitations on the productivity, efficacy, and promptness of supply chain activities.

Organizations benefit the most at the attainment of total quality management because costs are minimized at at the attainment of defect free good quality products.

Mwinyi (2012) examines the impact of government regulations on the supply chain performance of oil marketing companies in Kenya through a combination of qualitative and quantitative analyses. Based on a survey of fifty oil marketing companies in Kenya, the study's participants were primarily supply and procurement personnel. The results unequivocally demonstrate that the performance of oil marketing companies' supply chains in Kenya is impacted by governmental regulations. It is suggested by the study that oil marketing companies make investments in supply chain management strategies. In determining oil prices, the study also recommends that ERC take into account macroeconomic factors that influence oil companies. The study contributes to the comprehension of SCM practices, the advantages of effective SCM, and the obstacles that impede progress.

This study sought to determine the government regulations as a moderator between lean management practices and supply chain performance of sugar manufacturing firms in Western Kenya.

The effect of government regulations in the sugar manufacturing firms in western Kenya is quite significant because it affects both public and private entities both negatively and positively.

5.3 Conclusion of the Study

On Objective One, the study revealed that performance will slightly decrease as just-in-time (JIT) increases. By encouraging suppliers to obtain ISO certification and procuring materials by demand, sugar manufacturing enterprises were able to rationalize their supply bases to facilitate effective cooperation, thereby achieving a reduction in stockholding costs, and benefit from the implementation of JIT procurement procedures. For fast-moving consumer goods that require promptly available raw materials, buffer stock is necessary because JIT encourages inventory minimization. Customers may be subjected to significant delivery delays and substandard order fulfillment in the absence of buffer stockpiles. Production and demand cannot be synchronized in the event of market supply chain disruptions; this negatively affects the success of the organization.

On Objective Two, as a performance enhancement strategy, implementing TPM in organizations has several delineated effects, according to the findings of this study. By addressing these effects, a successful TPM program can enhance the performance of the cocepts.

The results in objective three revealed that performance is significantly influenced by whole quality management. Effective leadership and coordination regarding TQM enrollment,

adequate staff awareness and training on the methodology, support from upper management, and resource allocation towards TQM empowerment could have facilitated this. Increased profitability, market share, sales volumes, and return on investment, in addition to enhanced customer satisfaction, will undoubtedly result from the implementation of Total Quality Management.

On objective four, the effective implementation of lean production practices in the sugar manufacturing sector in Western Kenya is intricately linked to the regulatory environment. Government regulations not only support but also moderate the impact of these practices on supply chain performance. Stakeholders in the sugar industry, including policymakers and factory managers, should thus consider the regulatory landscape when designing and implementing lean production strategies to achieve optimal supply chain performance.

5.4 Recommendations

5.4.1 Recommendations from findings

Arising from the results and conclusions above, the study recommends that:

i. Reduce inventory by ordering raw materials as needed. This lowers holding costs and decreases waste. Develop excellent supplier relationships to ensure that raw materials are delivered on time and consistently. To reduce overproduction and underproduction, use flexible and efficient production schedules that match demand estimates. Establish strong communication links with suppliers to ensure alignment and a prompt reaction to changing demands. Establish strategic partnerships and long-term agreements with suppliers to ensure stability and mutual benefit. Use Enterprise Resource Planning (ERP) systems to integrate all areas of the supply chain, including

procurement, production, and distribution. Invest in automation technologies to improve process flow, eliminate errors, and boost efficiency.

ii. Create and follow a detailed maintenance schedule to ensure that all equipment is maintained on a regular basis and that possible problems are detected early on. Prioritize preventive maintenance over reactive maintenance to reduce downtime and increase equipment longevity. Provide intensive TPM training to maintenance people and operators to ensure their knowledge and competence. Encourage employee participation in TPM activities by instilling a sense of ownership and accountability for equipment upkeep. Implement a CMMS to track maintenance activities, manage work orders, and maintain detailed maintenance records. Use condition monitoring methods like vibration analysis, thermography, and oil analysis to predict and avoid equipment failures.

iii. Integrate sustainability into your TQM methods by emphasizing environmental stewardship, social responsibility, and financial viability. Maintain meticulous documentation of quality processes, procedures, and records to ensure transparency, traceability, and accountability. Form cross-functional teams to handle quality issues, carry out improvement efforts, and share best practices between departments. Establish key performance indicators (KPIs) for quality, such as defect rates, rework rates, and customer complaints, and monitor them on a regular basis. Use SPC techniques to monitor and regulate manufacturing processes, ensuring that they stay within the quality limitations. Implement Six Sigma approaches to detect and remove faults, minimize variability, and boost overall quality. Implement a comprehensive

supplier review and selection process to guarantee that suppliers meet quality requirements. Collect and analyze customer feedback on a regular basis to better understand their wants and expectations, and then use that information to drive quality improvement. Provide all staff with continuing training and development programs that focus on TQM principles, quality control, and process improvement. Establish and follow high-quality standards like ISO 9001 to assure product uniformity and excellence. Create a culture of continuous improvement (Kaizen) by regularly evaluating and improving processes, products, and services.

iv. Ensure that all workers, particularly those involved in procurement and supply chain activities, are familiar with applicable government legislation and compliance standards. Conduct frequent internal and external audits to guarantee compliance with government rules and to identify areas for improvement. Maintain open and proactive communication with government regulatory organizations to stay informed of any changes in regulations and seek guidance as needed. Form collaborations with regulatory authorities to improve compliance processes and obtain insight into best practices. Provide staff with frequent training on government procurement and supply chain requirements. Develop organizational capacity for effectively interpreting and implementing regulatory requirements. Set key performance indicators (KPIs) to track compliance with government rules and the efficacy of lean procurement techniques.

5.4.2 Recommendations for Further Research

1)Expansion of the scope: Future researchers in the same area should consider broadening the scope of the study to include other manufacturing sectors to allow for

comparative analysis.By so doing it shall be beneficial in establishing whether the conclusions of the study were consistent across the various industries beyong the sugar manufacturing and hence boost the generalization of the study findings.

2) Implementing longitudinal research: Bringing in longitudinal design could raise significance into how the relationship between lean production practices ,government regulations and supply chain performance change over time.That would assist to reveal casual relationships instead of mere correlations.

3) **Introducing qualitative research:**Introducing qualitative research such as interviews or focus groups in future research could deepen the comprehension of how government regulations impact on the implementation of lean production practices .That would eradicate overlooking insights that quantitative data may not have covered.

4)Indepth Regulatory framework: Future studies should dwell on extensive evaluation of all government regulations affecting the sugar sector.This would involve classifying regulations by classes such as economic or even environmental to evaluate their exact impact on lean practices and supply chain performance.

5)Additional factors exploration: Delving in other of moderationg factors such as organizational culture ,technology,market dynamics may present with much comprehensive view of factors impacting on supply chain performance.

6)Extensive measurement techniques: Incorporation of both qualitative and quantitative factors to analyze lean practices and supply chain performance may improve reliability of the findings by employing multiple data sources as performance dynamics,workers feedback would present with comprehensive analysis.

7)Sector comparisons: Carrying out comparative research in other sectors within Kenya or in other global regions faced with related regulatory framework may present with important facets in the effectiveness of lean practices under different government establishment.

8: Dimensions of stakeholders: Future studies may incorporate dimensions from various stakeholders like industry giants,government agencies,and workers to comprehend wider effects of regulations on lean practices and supply chain performance.

9)Assessment of policy impacts: Future researchers should see to it to inculcate specific government policies on the introduction of lean practices.That may span across case studies that focus on successful or unsuccessful regulatory frameworks and their impact on industry performance.

10)Intersectoral Dimensions: Employing intersectoral dimensions entrenching economics,sociology and environmental studies may come up with a more robust comprehension of complex relationships at stake**.**

In conclusion,by implementing these recommendations ,future research would improve on existing studies by coming up with more comprehensive dimensions into the moderating impact of government regulations on lean production practices and supply chain performance.

That would not only boost academic comprehension but also to inform policymakers and industry players in their aspiration to maximize efficiency of operations.

5.5 Contributions to the body of knowledge

5.5.1 Implications for theory

The study would contribute immensely to lean theory by showing empirical evidence on the manner by which lean production practices especially the Just -In-Time(JIT),Total preventive

maintenance (TPM) and the Total Quality Management(TQM)impacts on supply chain performance in sugar manufacturing companies.It shows clearly on the inclusion of government regulations as moderating factor and thereby adding to the theoretical purview in addition to external regulatory effects.

Introduction of other theories.

By introducing Transaction cost theory and Resource based view theories the study adds to the comprehension of how lean practices can be utilized under various regulatory sanctions .It shows of how the government regulations impacts transaction costs and resource mobilization hence resulting to either increased or declined supply chain performance.

5.5.2 Avenue for future research

The conclusions of the study would serve as the genesis for future studies highlighting on the interlink between government regulations and operation practices amongst different sectors and landscapes.This could yield to varied theoretical models that comprise extrenal regulatory vicinities.

5.5.3 Implications for policy frameworks

a) Lean implementation support

Conclusions of the study may trigger government agencies to advance incentives or to promote programs that adopts lean practices in sugar manufacturing firms.It maay span to training programs,financial support or even entrenching regulatory environment that appreciates efficiency and enhanced quality.

b) Analysis of policy dynamics

The study focuses on the significance of analyzing existing regulations to unearth their impact on supply chain performance.Makers of policy may employ the strides attained in the

study to evaluate whether existing regulations match with the objectives of boosting operational efficiency and competitiveness within the sugar manufacturing firms.

c) Stakeholders collaboration

The study highlights on the requirement of collaboration between government entities ,manufacturing stakeholders and academic bodies to come up with robust tactic to lean production and supply chain performance.Such links would boost sharing of information and creativity in regulatory practices that promote lean practices.

d) Developmenty of Regulatory framework

The study underscores the importance of policy makers to come up with regulations that promote lean production practices instead of undermining them.By getting to know of how government regulations moderate the relationship between lean practices and supply chain performance,policymakers can initiate supportive environmernts that promote operational efficiency in the sugar manufacturing industry.

In conclusion,the study on the moderating impact of government regulations in the relationship between production practices and supply chain performance in sugar manufacturing companies in Western Kenya regioncomes with substantive contributions to both theoretical frameworks and policy initiation.It not only bolsters comprehension of lean theoryin particular context but also provides actionable purview for makers of policy to promote industry performance through regulatory measures support.

5.6 Limitations of the Study

1)Cross-sectional Design: The study adopted descriptive cross-sectional design which captured only the snapshot of the relationship between lean production practices ,government regulations and supply chain performance.The approach limited the potency to draw conclussions on causality or even dynamic change over time.

2) Responses subjectivity: The use of questionnaires to collect data came with biases as respondents provided socially desirable answers instead of their true experiences .That impacted negatively the accuracy of the findings regarding the influence of lean practicesand government regulations.

3)Specific context findings: The research mainly dwelled on sugar manufacturing firms in western Kenya which restricted the generalizablity of the findings.The exceptional economic,cultural and regulatory contexts of the western region did not reflect conditions in other sectors or geographic landscapes.

4)Government regulations limited scope: The study may not have covered all relevant government regulations affecting sugar manufacturing sector.Focusing on restricted scope of regulations may have overlooked other critical factors that could impact supply chain performance.

5)Lean practices variability: Lean production practices vary a great deal between firms and even within the same sector.Variability complicated analysis because different firms implement JIT,TPM and TQM differently or variously and therefore affecting of how those practices relate to supply chain performance.

6)Confounding variables potential: All confounding potential variables that influence supply chain performance may not have been accounted for such as market dynamics,advancement of technology,size of firms.Failure to control those variables may have skewed the results.

7)Challenges in measuring variables: Accuracy in measuring supply chain performance and lean practices posed great challenges and thereby leading to subjective metrics or varying

definitionsof performance across all targeted firms which impacted the reliability of the results.

8)Changes in Regulations: Conventionally,government regulations change a great deal and therefore the study's findings may become outdated quickly and that dynamism may affect the relevance in future policy discussions or operational strategies.

9)Reliance of quantitative measures: The study mainly dwelled on quantitativemethods which overlooked qualitative metrics which would provide nuances in the relationship between lean practices ,government regulations and supply chain performance.

10)Constrained resources: Scarcity of time,funding and access to data restricted the extent of the study and thus leading to narrower focus that desired.

In conclusion,attending to these limitations in future would boost the robustness and applicability of the findings thereof.

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APPENDICES

Appendix I: Introduction Letter

"To the relevant parties concerned:

Re: Request for authorization to conduct a research study within your organization.

I am currently pursuing a postgraduate degree in Business Administration supply chain option at Masinde Muliro University. In fulfillment of my academic program requirements, I intend to undertake a research study that will investigate the implementation of lean supply chain management practices within the context of Sugar manufacturing firms in Western Kenya.

The research will explore various aspects related to how those firms implement and benefit from lean practices in their supply chain operations.

Your Sugar manufacturing firm has been selected as a participant in the research study for piloting based on its strategic significance in relation to the study's objectives. I would like to request your approval to collect data within your organization through the enclosed questionnaire. The questionnaire will be distributed to the heads of the Procurement, Logistics, Finance, Audit, Quality Assurance and Production departments, and their responses will provide valuable insights for the study. Please rest assured that all research information gathered will be treated as confidential and used solely for academic purposes. Your cooperation and participation in this research study are greatly appreciated. Thank you in advance for your consideration,

Cosmas Rutto Cheptoo.

Appendix II: Questionnaire

Dear Participant,

We would like to kindly request your participation in a questionnaire aimed at collecting data regarding the impact of lean supply chain management practices in sugar manufacturing firms in Kenya. Your valuable insights are greatly appreciated, and we assure you that all information provided will be treated with the utmost confidentiality and used solely for academic purposes. Please note that there are no correct or incorrect answers, and we kindly ask you to respond to the questions as instructed. Thank you for your time and contribution.

Best regards.

Kindly respond to the questions below by ticking were appropriately. Your privacy will be carefully protected.

SECTION A: BACKGROUND INFORMATION - Respondent's

1. Gender Male ( ) Female ( )
2. Kindly indicate your age in years.....
3. What is your highest attained academic level ?
   O-levels ( ) Diploma ( ) Bachelors ( ) Masters ( )
   Others (specify) _____
4. How many years have you served in this firm?
   Less than 5 yrs ( ) 6 – 10 yrs ( ) 11 – 20 yrs ( )
   30 yrs and Above ( )
5. Position in the Organization…….
6. How many employees do you have in this firm?
   Less than 100 ( ) 101 – 200 ( ) 201 – 300 ( )
   Above 300 ( )
7. State the product that you produce in this firm?
   Bevarages ( ) Ethernol ( ) Energy ( )
   Sugar ( )
8. State any other product
   ……

SECTION B: LEAN PRODUCTION PRACTICES

(Tick where appropriate)

1. Does your sugar manufacturing firm consider lean production practices?

   Yes ☐ No ☐

2. If it does, which one is the most practiced? (**Tick more than once**)

   Just in Time ☐

   Total Prevention maintenance ☐

   Total Quality Management ☐

   Government regulations ☐

SECTION C: **JUST IN TIME**

4. On a scale of 1-5, where 5 = Strongly Agree, 4= Agree, 3=Fairly Agree, 2= Disagree, and 1=strongly Disagree, indicate how you agree or disagree with the following statements.

S/NO	**Statement**	**5**	**4**	**3**	**2**	**1**
1	To what extent do just in time impact of Availability of Labour in the sugar manufacturing firm?					
2	To what extent do Just in Time affect availability of Labour of your organization?					
3	To what extent do Just-In-Time impact on your firm in conducting supplier rationalization?					
4	How far does supplier rationalization affect performance of your company?					
5	How does Just In Time impact on availability of resources in your firm?					
6	How far does Just In Time affect availability of resources in your firm?					

SECTION D: TOTAL PREVENTION MAINTENANCE

5. On a scale of 1-5, where 5 = Strongly Agree, 4= Agree, 3=Fairly Agree, 2= Disagree, and 1=strongly Disagree, indicate how you agree or disagree the following statements.

S/NO	**Statement**	**5**	**4**	**3**	**2**	**1**
1	To what extent does your firm practice condition-based maintenance ?					
2	Does your company practice condition-based maintenance?					
3	Does your organization provide time-based maintenance on its Machines?					
4	Does Time-based maintenance impact on performance of your firm?					
5	Does your firm conduct Planned preventive maintenance ?					
6	To what extent does planned preventive maintenance impact on the performance of your firm?					

SECTION E TOTAL QUALITY MANAGEMENT

6 On a scale of 1-5, where 5 = Strongly Agree, 4= Agree, 3=Fairly Agree, Agree, 2= Disagree, and 1=strongly Disagree, indicate how you agree or disagree with the following statements.

S/NO	Statement	5	4	3	2	1
1	Does your company have have Internal failures in its machines?					
2	To what extent does Internal failures affect operations of your company?					
3	Does inbuilt procurement flow affect operations of your firm?					
4	To what extent does your firm provide training to its staff?					
5	Does Training impact on performance of your employees?					
6	Is there defect prevention your company?					
7	Does defect prevention affect performance of your company?					

SECTION G GOVERNMENT REGULATIONS

6 On a scale of 1-5, where 5 = Strongly Agree, 4= Agree, 3=Fairly Agree, Agree, 2= Disagree, and 1=strongly Disagree, indicate how you agree or disagree with the following statements.

S/NO	Statement	5	4	3	2	1
1	How does government regulations affect your supply chain performance?					
2	To what extent does government regulations moderate effects of Just In Time,Total preventive Maintenance and Total Quality Management in your company?					
3	How much does government Licensing affect performance of your firm?					
4	How does government policies impact on the operations of your firm?					
5	To what extent does regulated licensing affect the operations of your company?					
6	Does your firm enjoy government Incentives?					

SECTION F: SUPPLY CHAIN PERFORMANCE

7. On a scale of 1-5, where 5 = Strongly Agree, 4= Agree, 3= Fairly Agree, 2= Disagree, and 1=strongly Disagree, indicate how you agree or disagree with the following statements.

S/NO	Statements	5	4	3	2	1
1	How would you rate the overall performance of your supply chain?					
2	To what extent do you believe that just-in-time leads to reduced costs?					
3	How far do you think just-in-time has improved improved the quality of services in your firm?					
4	To what extent do you think Total prevention maintenance improved the quality services in your company?					
5	What is your overall rating of implementation of lean practices within supply chain in your company?					

The End"