

Midocean University
College of Management
Masters in business administration



**The Impact of Business Process Reengineering Implementation on Operational
Problems in Private Sector Organizations in the Kingdom of Saudi Arabia**

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Academic Year

2025

قُلْ اِنَّ سَيِّدِي اِلَهُكَ
اَلَّذِي خَلَقَ

Dedication

To those who instilled values in me and provided me with wisdom,
To those whose prayers were the secret to my success and my
support throughout all stages of my life,
To my generous parents, I dedicate the fruits of my labor and work,
in gratitude and appreciation.
To those who supported and encouraged me in my academic career,
To my brothers, friends, and colleagues,
To all of you, I dedicate this humble work, in gratitude for all your
sincere support.

Acknowledgment

Praise be to God, by whose grace good deeds are accomplished, and with whose help and guidance I have completed this modest work.

I extend my sincere thanks and deep gratitude to my esteemed supervisors, Professors Dr. AlFaisal Abdul Hameed and Dr. Fayez Jarad, whose academic support, sound guidance, and valuable comments had the greatest impact on the completion of this thesis. They were exemplary models of knowledge, ethics, and dedication.

I also extend my sincere thanks to the esteemed members of the examination committee for their time, effort, and constructive comments that enriched this work.

I cannot fail to express my deep appreciation to everyone who supported and stood by me during the preparation of this thesis, including my family, friends, and colleagues, especially my dear parents, whose prayers and moral and material support greatly contributed to helping me reach this stage. To all of you, all thanks, appreciation and gratitude.

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Abstract

This study examines the impact of material management practices on operational efficiency at Hitachi Energy Company in the Eastern Region of Saudi Arabia. The primary objective is to determine how various material management practices, including procurement, inventory control, storage management, and supply chain coordination affect the operational performance of the company. The study adopts a quantitative methodology, utilizing a structured questionnaire as the primary data collection instrument. A total of 215 employees and managers across relevant departments participated in the study, providing comprehensive data on the company's material management practices and operational efficiency indicators. The results indicate a significant positive relationship between effective material management practices and operational efficiency. Among the practices studied, inventory control and procurement efficiency were identified as having the greatest influence on operational performance. Additionally, the study found that employees' adherence to procedures and their level of engagement in material management processes play a crucial role in enhancing workflow efficiency, reducing production delays, and minimizing operational costs. Based on these findings, the study recommends that Hitachi Energy Company: strengthen its inventory management systems through digitalization and real-time monitoring; streamline procurement processes and enhance supplier coordination; provide ongoing employee training and capacity-building programs; and implement continuous performance monitoring to identify areas for improvement and ensure sustainable operational efficiency. These measures are expected to optimize resource utilization, improve productivity, and support the company's long-term strategic objectives.

Keywords: Material Management, Operational Efficiency, Inventory Control, Procurement Practices, Supply Chain Coordination, Employee Engagement, Organizational Performance.

Chapter One

Introduction

In today's highly competitive industrial landscape, organizations increasingly recognize that effective material management is a strategic imperative for achieving superior operational performance. Material management, as a core component of supply chain operations, encompasses a wide range of activities including procurement, storage, inventory control, material handling, and distribution. These activities contribute to ensuring that the right materials are available in the right quantities, at the right time, and at the right cost. Inefficiencies in any of these processes can lead to material shortages, production delays, excessive inventory holding costs, and disruptions that compromise the overall effectiveness and profitability of an organization. Consequently, firms across various sectors are placing greater emphasis on optimizing material management practices to enhance operational efficiency and maintain sustainable competitive advantage (Fotios, 2025).

The energy and power technology sectors, in particular, faces unique challenges that make effective material management both complex and indispensable. Rapid technological advancements, stringent quality standards, and the need for timely production of highly specialized equipment require precise coordination of materials and resources. Hitachi Energy, a global leader in power technologies, operates within a dynamic environment characterized by fluctuating demand, global supply chain disruptions, and increasing customer expectations. In the Kingdom of Saudi Arabia, especially in the Eastern Region—an industrial hub where energy projects are expanding rapidly—Hitachi Energy plays a critical role in delivering reliable, innovative solutions that support the national energy infrastructure. To sustain its operational capabilities and competitive position, the company must ensure that its material management practices are robust, efficient, and adaptable to evolving market conditions (Govindan, 2022).

Despite its strategic importance, material management remains an area where many organizations continue to encounter persistent challenges. Issues such as inaccurate demand forecasting, inefficient inventory systems, prolonged lead times, and limited integration of digital technologies can significantly hinder operational performance. In the context of Hitachi Energy's operations in the Eastern Region, these challenges may translate into delayed project execution, increased operational costs, and reduced customer satisfaction. As such, understanding the extent to which current material management practices

influence operational efficiency is essential for identifying performance gaps and proposing targeted improvements (Stroumpoulis, 2024).

Given the growing emphasis on operational excellence within the Saudi industrial sector—aligned with national initiatives such as Vision 2030—empirical studies that explore material management and its impact on operational efficiency have become increasingly relevant. While a substantial body of literature examines material management in manufacturing and supply chain contexts, there remains a noticeable gap in research focusing on multinational energy-technology firms operating within Saudi Arabia. This study aims to bridge that gap by conducting an applied investigation of Hitachi Energy’s material management practices in the Eastern Region. Through this examination, the research seeks to provide valuable insights into how materials are planned, procured, stored, and controlled, and how these practices directly or indirectly affect operational efficiency indicators such as productivity, cost reduction, lead time performance, and workflow reliability (Yeung, 2018).

By exploring the relationship between material management practices and operational efficiency, this study contributes to both academic literature and practical managerial understanding. It offers evidence-based recommendations that can support Hitachi Energy—and similar organizations—in enhancing their supply chain capabilities, strengthening operational performance, and fostering long-term organizational sustainability. The findings are expected to inform strategic decision-making, support continuous improvement initiatives, and contribute to optimized resource utilization within one of the most critical sectors of the Saudi economy (Leogrande, 2024).

Study Problem

Despite the strategic importance of material management in ensuring smooth operational processes, many industrial organizations continue to face persistent inefficiencies that hinder their ability to achieve optimal performance. Hitachi Energy Company, operating in the Eastern Region of Saudi Arabia—an area characterized by rapid industrial growth, intensive energy-related activities, and high customer expectations—relies heavily on precise coordination of material flows to support its production and service operations. However, anecdotal evidence and preliminary observations suggest that various material management challenges may be impacting the company’s operational efficiency. These challenges potentially include inconsistencies in inventory accuracy, delays in material procurement, inadequate integration of digital systems,

shortages or excesses of critical materials, and limitations in warehouse planning and control. Such issues may lead to production delays, increased operational costs, reduced responsiveness to customer needs, and interruptions in workflow continuity. As global supply chains become more volatile and customer demands more stringent, the need for effective material management becomes even more critical. Yet, there remains limited empirical research that examines how the specific material management practices implemented by Hitachi Energy in the Eastern Region influence its operational efficiency. This gap necessitates a systematic investigation into the nature of these practices, the challenges associated with them, and their measurable impact on the company's overall operational performance (Sitko, 2024).

Specific Problems Arising from the Main Research Problem

From the core research problem, several subordinate issues can be identified:

1. Inefficiencies in material planning and forecasting that may result in inaccurate demand estimation and inventory imbalances.
2. Procurement delays and lengthy lead times that can affect production schedules and increase project costs.
3. Insufficient integration of digital tools and information systems needed for real-time tracking and effective coordination of material flows.
4. Ineffective inventory control and warehouse management leading to material losses, excess stock, or stockouts.
5. Limited coordination between material management functions and operational units, which may hinder communication and workflow synchronization.
6. Inadequate monitoring and performance measurement systems that restrict the company's ability to identify, evaluate, and improve material management practices (Ali, 2025).

Based on the main research problem, the primary question guiding this study is:

How do material management practices influence operational efficiency in Hitachi Energy Company in the Eastern Region of Saudi Arabia?

Study Questions

Main Study Question:

- How do material management practices influence operational efficiency in Hitachi Energy Company in the Eastern Region of Saudi Arabia?

Sub-Questions:

1. How effective are the material planning and forecasting practices at Hitachi Energy in supporting operational efficiency?
2. In what ways do procurement procedures and lead-time management affect the company's operational performance?
3. How do inventory management and warehouse control systems contribute to or hinder material availability and workflow continuity?
4. To what extent do digital technologies and information systems enhance the accuracy, tracking, and coordination of material flows within the company?
5. What challenges exist within the current material management practices, and how can improvements in these areas enhance overall operational efficiency?

Study Importance

From a scientific perspective, this study contributes significantly to the body of knowledge related to supply chain management, material management practices, and operational efficiency, particularly within the context of multinational energy-technology organizations operating in emerging markets. Although material management has been widely examined in general manufacturing and logistics environments, there remains a notable gap in empirical research focusing on the energy sector in Saudi Arabia—an industry characterized by complex supply chains, specialized materials, and strict operational requirements. By providing an applied investigation of Hitachi Energy's material management practices in the Eastern Region, the study generates new insights into how planning, procurement, inventory control, material handling, and warehousing practices interact to influence operational efficiency metrics such as cost containment, productivity, workflow continuity, and lead-time performance. The findings are expected to enrich theoretical debates on the role of material management in achieving operational excellence and to serve as a foundation for future academic research that aims to deepen understanding of material-related dynamics in high-technology industrial environments (Okeke, 2024).

From a practical perspective, the study holds substantial value for managers, policymakers, and professionals within Hitachi Energy and similar organizations operating in the Saudi energy market. By uncovering the strengths and weaknesses of the current material management system, the research provides evidence-based guidance that can help the company optimize its

operational processes, reduce inefficiencies, and improve responsiveness to customer and project requirements. The study's outcomes can support informed decision-making regarding inventory strategies, procurement policies, warehouse layout improvements, digital system adoption, and workforce training. Moreover, in alignment with Saudi Arabia's Vision 2030 initiatives, which emphasize industrial transformation, localization, and operational excellence, the study offers actionable recommendations that can assist companies in enhancing productivity, minimizing waste, and strengthening supply chain resilience. Ultimately, the practical significance of the research lies in its potential to contribute to cost savings, improved service quality, and competitive advantage for Hitachi Energy, while also offering replicable insights for other firms in the energy and manufacturing sectors facing similar material management challenges (Amin, 2024).

Study Objectives

Main Objective of the Study:

- The main objective of this study is to examine the impact of material management practices on operational efficiency in Hitachi Energy Company in the Eastern Region of Saudi Arabia.

Sub-Objectives:

1. To assess the effectiveness of material planning and forecasting processes used within Hitachi Energy and their contribution to operational performance.
2. To evaluate the efficiency of procurement practices and their influence on lead times, cost control, and workflow continuity.
3. To analyze the adequacy of inventory management and warehouse control systems in ensuring material availability and minimizing operational disruptions.
4. To examine the extent to which digital technologies and information systems support material tracking, coordination, and real-time decision-making.
5. To identify the challenges and improvement opportunities within the company's material management practices and propose recommendations to enhance overall operational efficiency.

Study Hypotheses

Main Hypothesis of the Study:

- **H₀:** Material management practices have no significant impact on operational efficiency in Hitachi Energy Company in the Eastern Region of Saudi Arabia.
- **H₁:** Material management practices have a significant impact on operational efficiency in Hitachi Energy Company in the Eastern Region of Saudi Arabia.

Sub-Hypotheses:

1. **H₁₁:** Effective material planning and forecasting have a significant positive impact on operational efficiency at Hitachi Energy.
2. **H₁₂:** Efficient procurement practices and reduced lead times significantly enhance operational performance.
3. **H₁₃:** Improved inventory management and warehouse control systems significantly contribute to material availability and workflow stability.
4. **H₁₄:** The use of digital technologies and integrated information systems significantly enhances material tracking, coordination, and decision-making.
5. **H₁₅:** Addressing challenges in material management practices leads to a significant improvement in overall operational efficiency.

Scientific Theory Used to Prepare Research

1. Systems Theory

Systems Theory serves as one of the primary scientific foundations of this research, offering a holistic framework for examining how various organizational components interact to influence overall performance. According to this theory, an organization functions as an integrated system composed of interdependent subsystems, each contributing to the effectiveness of the whole. Material management, under this theoretical lens, is not merely a discrete operational activity but a critical subsystem that intersects with procurement, production, inventory control, warehousing, logistics, and administrative functions. Any inefficiency in one of these areas—such as delays in procurement or inaccuracies in inventory records—can trigger disruptions that cascade throughout the entire operational system. By applying Systems Theory, the study views Hitachi Energy in the Eastern Region of Saudi Arabia as a dynamic structure in which the performance of material management processes directly affects operational efficiency outcomes such as cost reduction, productivity enhancements, workflow stability, and lead-time performance. This comprehensive perspective allows the research to evaluate not only the direct

relationships between variables but also the broader organizational interactions that shape operational success.

Systems Theory helps in understanding the interconnectedness between internal processes and the external environment. Hitachi Energy operates within a highly complex and competitive energy sector, where changes in market conditions, supply chain disruptions, and fluctuations in customer demand can significantly influence operational activities. Systems Theory supports the analysis of how the material management subsystem responds to such external pressures and how its efficiency contributes to the organization's resilience and adaptability. By adopting this theoretical approach, the research ensures that material management practices are evaluated within the broader operational context, providing insights into how improvements in one subsystem can enhance the performance of the entire organization. This makes Systems Theory particularly relevant for understanding the multifaceted nature of material flows, information exchange, and coordination mechanisms within Hitachi Energy's operational structure (Restrepo-Morales, 2023).

2. Lean Management Theory

Lean Management Theory forms the second theoretical foundation of the study, emphasizing the reduction of waste, optimization of workflows, and continuous enhancement of value-adding processes within organizations. Rooted in the principles of the Toyota Production System, Lean Theory highlights the importance of eliminating inefficiencies such as excess inventory, unnecessary transportation of materials, production delays, and redundant processes—all of which directly impair operational efficiency. By applying Lean Management concepts, this research investigates the extent to which Hitachi Energy's material management practices align with core lean principles such as Just-in-Time (JIT) inventory, standardized operational procedures, improved workflow organization, and seamless communication across functional units. This theoretical perspective enables the study to identify the types of waste present in material management activities and examine how their elimination can contribute to better resource utilization, lower costs, and more efficient operational performance.

Lean Management Theory provides a practical and improvement-oriented lens for evaluating current practices and proposing enhancements. The theory stresses the significance of continuous improvement, or *Kaizen*, which encourages organizations to regularly assess their processes, identify

performance gaps, and implement systematic improvements. Within the context of Hitachi Energy, lean principles guide the analysis of how material management can become more responsive, agile, and cost-effective through better forecasting, reduced lead times, improved warehouse layouts, and increased integration of digital technologies. Lean Management thus not only supports the diagnosis of existing inefficiencies but also offers a structured approach to designing solutions that enhance both material management and overall operational efficiency. By grounding the study in Lean Theory, the research acquires a strong methodological basis for generating actionable recommendations that can contribute to Hitachi Energy's long-term performance and competitive positioning in the Saudi energy sector (Jordans, 2024).

Chapter Two

Previous Studies

Introduction

Chapter Two provides the theoretical and scholarly foundation upon which this research is built, offering a comprehensive exploration of the key concepts, empirical findings, and theoretical perspectives that inform the study. As the research seeks to examine the impact of material management practices on operational efficiency within Hitachi Energy in the Eastern Region of Saudi Arabia, this chapter plays a crucial role in clarifying the intellectual basis and contextual background of the investigation. It begins by presenting an in-depth discussion of the core variables that constitute the focus of the study. These variables both representing the practices related to material management and those reflecting the dimensions of operational efficiency are essential for understanding the nature of the relationship being examined. By exploring these concepts from a theoretical standpoint and analyzing how scholars have defined, categorized, and measured them, the chapter establishes a clear conceptual foundation that guides the development of the research hypotheses and analytical framework.

The chapter offers a critical review of previous studies conducted in regional and international contexts. This review is indispensable for situating the present research within the broader academic discourse and for identifying the contributions it seeks to make. By examining empirical evidence from diverse industries and organizational environments, the chapter highlights the patterns, gaps, and methodological approaches that characterize existing knowledge about material management and operational efficiency. Such analysis not only demonstrates the relevance of the current study but also underscores its necessity, especially given the limited empirical attention devoted to multinational energy-technology companies operating in Saudi Arabia. In addition, the chapter synthesizes the theoretical perspectives that underpin the research, integrating them into a coherent framework that illustrates the expected interactions between the study variables. This theoretical framework serves as a guiding map for interpreting the findings and understanding how material management practices influence operational outcomes. Altogether, Chapter Two lays the intellectual groundwork for the study by weaving together conceptual definitions, scholarly evidence, and theoretical models, thereby ensuring that the research is anchored in robust academic foundations.

Dependent and Independent Variables

- Dependent Variable: Operational Efficiency

Operational efficiency represents the dependent variable in this study, reflecting the ability of Hitachi Energy to maximize outputs while minimizing resource utilization, costs, and process delays. It encompasses multiple dimensions, including productivity, timeliness of operations, cost-effectiveness, workflow continuity, and responsiveness to customer and project demands. In the context of energy and industrial organizations, operational efficiency is critical, as even minor disruptions in material flow or production schedules can have significant financial and operational consequences. Measuring operational efficiency allows the study to assess the effectiveness of organizational practices, evaluate performance outcomes, and identify areas for improvement. By treating operational efficiency as the dependent variable, the research examines how it is influenced by material management practices and how improvements in these practices can lead to enhanced performance across operational processes (SEUN, 2023).

- Independent Variables

1. Material Planning Crosstabulation

Material planning refers to the systematic process of forecasting material requirements, scheduling procurement, and aligning inventory levels with production and project needs. Effective material planning ensures that the right materials are available at the right time and in the correct quantities, thereby minimizing stockouts, delays, and excess inventory. In this study, material planning is analyzed through cross-tabulation to examine its distribution and correlation with operational efficiency indicators. By exploring patterns and relationships, the research identifies whether strong material planning practices are associated with higher operational performance (Kenton, 2025).

2. Inventory Control Crosstabulation

Inventory control encompasses the methods and systems used to monitor, manage, and regulate stock levels to ensure optimal availability without overstocking. This variable includes practices such as warehouse organization, stock rotation, real-time tracking, and automated inventory management systems. Inventory control is critical for preventing material shortages, reducing waste, and ensuring that production and project timelines are maintained. In the study, cross-tabulation is applied to investigate how variations in inventory

control practices correspond to levels of operational efficiency, providing insight into the extent to which effective stock management contributes to organizational performance (Ugbebor, 2024).

3. Supplier Relationship Management (SRM) Crosstabulation

Supplier Relationship Management involves the strategies and practices used to select, communicate with, and maintain productive relationships with suppliers. Effective SRM can enhance procurement reliability, reduce lead times, improve material quality, and strengthen collaboration across the supply chain. The study examines SRM using cross-tabulation to explore its influence on operational efficiency, determining whether strong supplier partnerships are associated with smoother operational processes and improved organizational outcomes (Rashid, 2024).

- Relationship Between the Variables

The relationship between the independent variables—material planning, inventory control, and supplier relationship management—and the dependent variable, operational efficiency, is central to this study. Each of the independent variables represents a critical aspect of material management that directly or indirectly affects how efficiently Hitachi Energy can operate. Effective material planning ensures timely availability of materials, inventory control prevents shortages and excesses, and strong supplier relationships guarantee reliable supply and quality standards. Together, these practices create an integrated system in which improvements in any independent variable can positively influence operational efficiency, while deficiencies in any area may lead to delays, increased costs, or workflow disruptions. The study hypothesizes that there is a statistically significant and positive relationship between these material management practices and operational efficiency, highlighting the importance of coordinated, well-managed material processes for achieving high-performance outcomes in the energy sector (Issah, 2024).

Previous Studies

Materials govern a significant portion of the construction process in the construction sector, and effective management of materials directly influences various performance metrics, including cost, duration, quality, and efficiency. The research conducted by (Yıldız, 2024) investigated how activities involved in material management—such as planning, supplying, logistics, transport,

inventory management, and waste control of construction materials—affect project performance. Material management practices were assessed using 15 criteria categorized under five different headings, while project performance was evaluated using 13 criteria organized under three different headings, based on surveys conducted with industry personnel at various construction sites. Data obtained were analyzed using multiple regression. Using multiple regression analyses, the effects of material management practices on project duration, project expenditure, project efficiency, waste performance, and overall project performance were investigated. The analysis revealed that material supply, material handling, and stock and waste control positively influenced overall project performance, whereas material planning and material logistics did not have statistically significant effects. The study's findings are expected to enhance comprehension of the connection between material management and project performance, as well as assist stakeholders in refining their material management practices.

Even though Nigeria is rich in water resources, it confronts a serious water crisis that is particularly tough to address due to the related public health and security issues. The aim of the review of (Isukuru, 2024) is to elaborate on the complex factors and consequences of water scarcity in Nigeria, with a particular focus on its impact on the overall livelihood and stability of Nigerians. This paper employs a systematic approach to review water scarcity in Nigeria, the causes of pollution such as urban activities, agrochemical run-offs, and mismanagement, and their detrimental effects on health and the environment. This study reviewed 305 studies concerning water pollution and crisis in Nigeria. Another aspect of the evaluation is that the review identifies the barriers that hinder the all-inclusive availability of clean water, such as inadequate infrastructure and ineffective resource management. The review highlights the need to enhance water treatment facilities, promote sustainable water management strategies, and strengthen certain regulations.

Due to the effects of climate change, the necessity for enhanced environmental responsibility has become more evident. As a result, businesses have escalated their endeavors to cultivate sustainable practices, among them strategies for eco-innovation. Such initiatives have sparked the interest of academics and professionals around the globe, especially over the past ten years, resulting in numerous commissioned studies aimed at evaluating companies' environmental performance. Nonetheless, the methodologies used in these

analyses have been complex and not easily replicable, which has constrained their accessibility to users. With this in mind, the purpose of (López-Pérez, 2025) research is to create a dominance-based ranking using dummy variables that enables an easy understanding of which companies, regions, and industries exhibit the highest level of environmental performance regarding eco-innovation, both overall and for each dimension of eco-innovation. This method also addresses the methodological challenge of assessing dummy variables, which are common in datasets detailing corporate or individual traits, by offering a structured and comparable ranking basis that does not rely on subjective weighting. For this purpose, the Pareto dominance method is applied to a sample of 4,671 listed companies from 2020 to 2022. This approach maintains the data's multidimensional characteristics and facilitates a more detailed comparison of alternatives without aggregating multiple criteria into a single index, resulting in a robust and interpretable ranking of eco-innovation leaders. The primary findings of this research indicate that Asian areas, particularly European ones, are at the forefront of eco-innovation. This research also emphasizes the leading industries and firms, and suggests potential future research directions that could provide additional insights into this area of study.

The research conducted by (Alhamdi, 2025) investigates how environmental management standards, particularly ISO 14000, green production, and environmental policies, affect sustainable development in Saudi Arabia's food manufacturing sector. Additionally, it examines how environmental management moderates these relationships. A total of 370 participants from different management levels were given a questionnaire. The data was analyzed using structural equation modeling (SEM) with SmartPLS 4. The results show that ISO 14000, green production, environmental policies, and environmental management all have substantial positive impacts on sustainable development. Nonetheless, environmental management has a negative moderating effect on the relationship between ISO 14000 and sustainable development, and it does not significantly impact the moderating effects of green production or environmental policies. The research provides actionable suggestions for improving sustainability performance via these standards and emphasizes potential avenues for future inquiry and practical progress in the field.

Power transformers are vital and expensive parts of electrical generation, transmission, and distribution systems. When they fail, this can lead to major

disturbances and hazards like fires and chemical spills, endangering people and the ecosystem. With the move towards automated systems for digitized grids, industry and academia have become increasingly attentive to Transformer Live Performance Management (TLFM). As a result, several continuous and offsite performance monitoring techniques for electrical transformers have been created. The paper of (Alsubaie, 2024) presents an advanced review of these status-tracking techniques for oil transformers, including monitoring methodologies, outcome evaluations, and the evolution of long-term strategies. Moreover, it offers a structure for creating an online platform that enhances transformer lifecycle information, thus improving grid reliability and sustainability. The research examines transformer failures in Saudi Arabia, with an analysis of more than 85% of the country's transformer assets. Analysis of 4 years' worth of data shows that non-catastrophic failures mainly happen in transformers that are very old, whereas catastrophic failures are more common in transformers aged 11–20 years and those over 40 years. The paper provides a thorough comparison of different tracking techniques, addressing their benefits, drawbacks, existing technological limitations, and prospective future uses.

Commentary on Previous Studies:

- Similarities in Previous Studies

Several previous studies have highlighted the central role of material management in improving organizational performance. Across industries, including construction, manufacturing, and energy, effective material planning, inventory control, and supplier management have consistently been linked to enhanced efficiency, reduced operational costs, and better overall project or operational outcomes. Many studies employ quantitative methods, such as surveys and regression analyses, to measure the impact of specific material management practices on operational performance. Additionally, the importance of integrating material management with broader operational strategies, including environmental responsibility, sustainability practices, and risk management, is a recurring theme. These studies collectively underscore that well-structured material management is critical not only for timely production and project delivery but also for achieving organizational efficiency and long-term sustainability.

- Differences in Previous Studies

Despite similarities, the studies differ in several important ways. Some focus specifically on the construction industry, examining how material planning, logistics, stock control, and waste management affect project timelines, costs,

and efficiency. Others investigate broader operational contexts, such as environmental management practices in manufacturing or the performance tracking of electrical equipment, where material availability and management indirectly influence performance outcomes. The methodological approaches also vary, ranging from structural equation modeling to dominance-based ranking systems, reflecting differences in data type, scope, and measurement criteria. Moreover, the studies differ in the variables examined; while some analyze purely operational outcomes, others incorporate environmental, sustainability, or risk-related performance indicators, showing the multidimensional impact of material management practices in different organizational settings.

- Research Gaps that Distinguish the Current Research

While prior research provides valuable insights, several gaps remain that justify the present study. First, few studies focus specifically on the energy sector, particularly in the context of the Eastern Region of Saudi Arabia, which limits the generalizability of previous findings to this critical industry. Second, there is limited research on the integrated effect of material planning, inventory control, and supplier relationship management on operational efficiency within a single organizational context. Many studies treat these practices in isolation or in industries where the consequences of inefficiency differ significantly from energy production and distribution. Third, while prior research has examined operational efficiency or sustainability separately, comprehensive studies linking material management practices directly to operational performance metrics in industrial settings remain scarce. This study addresses these gaps by providing a focused, applied examination of material management practices within an energy company, emphasizing their direct and measurable impact on operational efficiency.

Theoretical Framework of the Study

The theoretical framework provides the foundation for understanding the relationship between material management practices and operational efficiency within Hitachi Energy in the Eastern Region of Saudi Arabia. It serves as a guide for structuring the study, identifying key variables, and interpreting findings within established academic theories. By integrating insights from Systems

Theory, Lean Management Theory, and supply chain management principles, the framework offers both a conceptual and practical perspective on how material planning, inventory control, and supplier relationship management influence operational performance. This section establishes the intellectual basis for the research, demonstrating how theory informs the study's objectives, methodology, and interpretation of results.

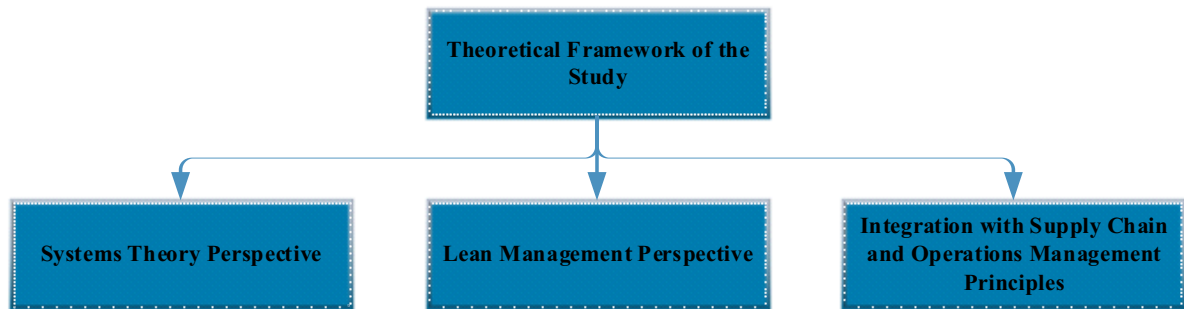


Figure 1: Theoretical Framework of the Study

1. Systems Theory Perspective

Systems Theory provides the primary lens through which this study examines the impact of material management practices on operational efficiency. According to this theory, organizations are composed of interconnected subsystems that interact continuously to achieve common objectives. Material management is a key subsystem that directly affects production, procurement, inventory control, and supplier interactions. Any inefficiency within this subsystem can disrupt other processes, causing delays, cost increases, or reduced output quality. By applying Systems Theory, this study emphasizes the interdependence of organizational functions and highlights the importance of integrating material planning, inventory control, and supplier relationship management to ensure smooth operations. This theoretical perspective enables a comprehensive understanding of how improvements in one aspect of material management can propagate positive effects across the entire operational system (Harney, 2024).

2. Lean Management Perspective

Lean Management Theory complements the systems approach by focusing on efficiency, waste reduction, and continuous process improvement. In the context of this study, lean principles emphasize the strategic value of ensuring the right materials are available at the right time and in the correct quantities, while avoiding overstocking, delays, or quality issues. Material planning, inventory

control, and supplier relationship management are treated as critical tools for eliminating inefficiencies and enhancing operational performance. For example, proper material planning prevents production stoppages, effective inventory control reduces idle stock and holding costs, and strong supplier relationships ensure timely and reliable deliveries. Lean Management Theory thus provides a practical framework for evaluating how specific material management practices contribute to operational efficiency in a measurable way (Romberg, 2024).

3. Integration with Supply Chain and Operations Management Principles

Beyond Systems and Lean theories, the study draws on supply chain and operations management principles, which emphasize the alignment of upstream material processes with downstream operational goals. Material management practices influence not only the availability and quality of resources but also the speed, reliability, and cost-effectiveness of operations. Efficient material planning ensures operational schedules are met, inventory control balances supply and demand, and supplier relationship management enhances collaboration and quality assurance. By integrating these principles into the theoretical framework, the study situates material management within a broader organizational and operational context, providing a structured basis for analyzing its effect on efficiency. This integration reinforces the notion that operational performance is a function of coordinated, strategic, and systematic material management practices (Petropoulos, 2025).

Chapter Three

Study Methodology

Introduction

Chapter Three presents the methodological foundation of the study and outlines the systematic procedures employed to investigate the impact of material management practices on operational efficiency within Hitachi Energy in the Eastern Region of Saudi Arabia. Because the credibility and reliability of any research depend heavily on its methodological rigor, this chapter assumes a central role in demonstrating how the study was designed, implemented, and validated. It begins by establishing the overall research approach and methodological orientation that guided the investigation, offering justification for the chosen techniques and explaining how they align with the nature of the research problem and objectives. This chapter not only clarifies the rationale behind selecting a specific methodological framework but also emphasizes the importance of adopting research methods that ensure objectivity, accuracy, and relevance in exploring the relationship between the study variables. Through this introduction, the chapter sets the stage for a comprehensive explanation of how the study was structured to yield dependable findings capable of supporting meaningful interpretations and conclusions.

In addition to outlining the methodological design, the chapter delves into the characteristics of the population from which the study draws its data, shedding light on why this particular group is suitable for examining material management practices and operational efficiency. The chapter also discusses the considerations that informed the determination of an appropriate sample size, demonstrating how statistical, practical, and contextual factors were balanced to ensure representativeness and analytical validity. Moreover, the chapter explains the procedures followed for collecting data, highlighting the sequence of steps taken to ensure that accurate and relevant information was obtained in a systematic and ethical manner. It acknowledges the challenges and potential constraints encountered during the research process, offering a reflective discussion on the limitations that may influence the generalizability or interpretation of the results. By bringing together these essential methodological components, Chapter Three provides a transparent and coherent account of how the research was executed, underscoring the importance of methodological rigor in producing reliable and insightful findings.

Methodology and Research Methods

- Methodology

The methodology employed in this study is quantitative in nature, which is particularly suitable for examining the relationship between material management practices and operational efficiency at Hitachi Energy Company in the Eastern Region of Saudi Arabia. Quantitative methodology allows researchers to collect and analyze numerical data to identify patterns, correlations, and potential causal relationships between variables. In the context of this study, the methodology focuses on measurable aspects of material management, such as inventory control, procurement processes, storage systems, and supply chain coordination, and how these factors influence operational efficiency indicators, including production output, process timeliness, cost reduction, and overall workflow performance. By adopting a quantitative methodology, the study ensures a high level of objectivity, as results are based on empirical evidence rather than subjective interpretation, which increases the reliability and validity of the findings.

The quantitative methodology provides a structured framework for investigating the impact of material management practices in a systematic way. It allows for the collection of standardized data from a significant number of employees and managers, ensuring that the results are representative of the organization's overall operational performance. This approach also enables the application of statistical tools to measure the strength and direction of relationships between variables, facilitating the identification of key practices that have the most significant impact on operational efficiency. In addition, the quantitative approach supports reproducibility, meaning that the study can be replicated in other industrial contexts or regions, which adds to its scientific rigor and practical relevance.

- Research Methods

The research methods for this study are designed to align with the quantitative methodology and primarily involve survey-based data collection coupled with statistical analysis. A structured questionnaire is used as the main instrument to gather data from employees and managers at Hitachi Energy Company. The questionnaire is carefully designed to measure the independent variable, material management practices, through items related to procurement efficiency, inventory monitoring, resource allocation, and supply chain

integration. The dependent variable, operational efficiency, is measured using indicators such as production speed, process delays, cost control, and overall workflow effectiveness. Responses are recorded using a Likert scale, providing numerical data that can be analyzed statistically to determine patterns and relationships.

Once the data is collected, the study employs both descriptive and inferential statistical techniques. Descriptive statistics, such as means, percentages, and standard deviations, are used to summarize the data and provide an overview of current practices and efficiency levels within the company. Inferential statistics, including correlation analysis and regression modeling, are applied to examine the relationship between material management practices and operational efficiency. This enables the study to quantify the extent to which improvements in material management can influence operational performance. Furthermore, steps are taken to ensure the reliability and validity of the data, including pilot testing the questionnaire, selecting a representative sample from relevant departments, and using appropriate software for analysis. These research methods ensure that the study provides robust, evidence-based insights into how material management practices affect operational efficiency at Hitachi Energy Company.

Study Tools

Given that this study adopts a quantitative methodology, the primary instrument for data collection is a structured questionnaire, which is designed to measure both the independent variable—material management practices—and the dependent variable—operational efficiency. The questionnaire is composed of closed-ended questions, mostly using a Likert scale, allowing respondents to indicate the extent of their agreement or frequency of practice. This format ensures that the data collected is standardized and quantifiable, making it suitable for statistical analysis. By employing a structured questionnaire, the study ensures objectivity, consistency, and ease of comparison across different respondents and departments within Hitachi Energy Company.

The questionnaire is divided into two main sections. The first section focuses on material management practices, capturing dimensions such as procurement procedures, inventory control, storage management, supply chain coordination, and resource allocation. Each dimension includes multiple items designed to evaluate how systematically and effectively these practices are

implemented within the organization. The second section of the questionnaire addresses operational efficiency, measuring factors such as production output, workflow optimization, cost reduction, downtime frequency, and overall performance effectiveness. By clearly defining and operationalizing these variables, the questionnaire allows for precise measurement and facilitates the statistical examination of relationships between material management practices and operational efficiency.

In addition to the structured questionnaire, the study employs complementary instruments to enhance the reliability of the data. These include company records and reports related to production performance, inventory logs, and procurement documentation. While the questionnaire captures employees' perceptions and self-reported practices, these organizational records provide objective numerical data that can be cross-verified with survey responses, ensuring the accuracy and validity of the study results. Together, these instruments provide a comprehensive quantitative dataset, enabling rigorous statistical analysis and robust conclusions regarding the impact of material management practices on operational efficiency at Hitachi Energy Company.

Research Community

The study population refers to the entire group of individuals from which the researcher intends to collect data and to whom the results of the study can be generalized. In this research, the population consists of employees and managerial staff of Hitachi Energy Company in the Eastern Region of Saudi Arabia, who are directly or indirectly involved in material management processes and operational activities. This includes personnel working in procurement, logistics, inventory control, warehouse management, production planning, and other departments that contribute to the flow and utilization of materials within the company. By focusing on this population, the study ensures that the data collected reflects practical experiences, perceptions, and operational realities that are relevant to the investigation of material management practices and their impact on operational efficiency.

The population for this study is chosen deliberately to include individuals who possess the necessary knowledge and experience regarding both material management practices and the operational procedures of the company. Managers and supervisors provide insights into strategic and procedural aspects of material handling, including planning, policy implementation, and coordination across

departments, while operational staff provide detailed information on the execution of these practices and the daily challenges affecting efficiency. This combination ensures that the data collected captures a comprehensive view of the organization's material management processes from multiple perspectives, enabling a robust assessment of how these practices influence operational efficiency.

The size of the study population is considered with respect to the company's overall workforce in the Eastern Region. While the exact number of employees may vary, the study targets a sufficiently large and representative sample to ensure statistical reliability and validity. By focusing on a representative segment of employees across different departments and hierarchical levels, the study can identify trends and correlations that accurately reflect the broader population, reducing the risk of bias in the results. The selected population is also accessible and cooperative, which is essential for obtaining accurate and complete responses, particularly in the context of a quantitative survey-based study. By clearly defining and carefully selecting the study population, this research ensures that its findings are grounded in the practical realities of Hitachi Energy Company's operational environment and can provide actionable insights for improving material management practices and operational efficiency.

Data Collection Steps

The process of data collection in this study follows a systematic and structured approach, consistent with the quantitative methodology employed to investigate the impact of material management practices on operational efficiency at Hitachi Energy Company in the Eastern Region of Saudi Arabia. The first step involved a review of existing literature and internal documentation to identify the key variables, operational definitions, and appropriate measures for material management practices and operational efficiency. This preliminary step ensured that the study's questionnaire items and data collection instruments were grounded in established research and aligned with practical organizational processes, providing a reliable foundation for gathering accurate and relevant data.

Following this preparatory phase, the researcher developed a structured questionnaire as the primary data collection instrument. The questionnaire was designed to include closed-ended items on a Likert scale, enabling respondents

to quantify their perceptions and experiences related to material management practices, such as procurement, inventory control, supply chain coordination, and storage management, as well as indicators of operational efficiency, including workflow optimization, production output, and cost control. To ensure clarity, relevance, and reliability, the questionnaire underwent a pilot testing phase with a small subset of employees. Feedback from this pilot allowed the researcher to refine question wording, adjust scaling, and remove any ambiguities that could compromise the accuracy of responses, thereby enhancing the validity of the instrument.

The next step involved administering the questionnaire to the selected study population, which included employees and managers across various departments involved in material handling and operational processes. The researcher employed both digital and paper-based distribution methods, depending on accessibility and departmental preferences, to maximize response rates and ensure inclusivity. Respondents were provided with clear instructions on how to complete the questionnaire, along with assurances of confidentiality and anonymity, which encouraged honest and accurate reporting. The researcher also followed up with reminders to enhance participation and reduce the risk of nonresponse bias.

Once data collection was complete, the researcher performed a preliminary review and organization of responses, checking for completeness, consistency, and accuracy. Any incomplete or inconsistent responses were addressed according to predetermined criteria, such as exclusion or clarification where possible. The cleaned data was then coded and entered into statistical software for analysis. Throughout the entire data collection process, the researcher adhered to ethical standards, ensuring voluntary participation, informed consent, and the secure handling of all collected data. By following these systematic steps, the study ensured that the quantitative data collected was reliable, valid, and suitable for subsequent statistical analysis, enabling robust conclusions about the relationship between material management practices and operational efficiency.

Research Limits

- Human Limitations

One of the primary limitations of this study relates to human factors, particularly the reliance on employees' and managers' responses to the questionnaire. Since the study uses a self-report instrument, there is a potential for response bias,

including social desirability, exaggeration, or misinterpretation of questions. Employees may overstate the effectiveness of material management practices or operational efficiency to reflect positively on their department or themselves. Additionally, some participants may lack complete knowledge of all operational processes, particularly if they are not directly involved in certain material management functions. These human-related limitations can affect the accuracy and consistency of the data, making it essential for the researcher to carefully design the questionnaire, provide clear instructions, and cross-validate responses with objective organizational records where possible.

- Temporal Limitations

The study is also constrained by temporal limitations, as the data collection process is conducted over a specific and relatively short period. Operational efficiency and material management practices may vary over time due to changes in production schedules, seasonal fluctuations in demand, supply chain disruptions, or organizational restructuring. As a result, the study captures a snapshot of practices and efficiency levels at a particular moment, which may not fully reflect long-term trends or seasonal variations. This limitation means that the findings are primarily applicable to the period in which the data was collected and may require further longitudinal studies to confirm the consistency and sustainability of the observed relationships over time.

- Spatial Limitations

Another important limitation is spatial, as the study focuses exclusively on Hitachi Energy Company in the Eastern Region of Saudi Arabia. While this provides an in-depth understanding of material management practices and operational efficiency within this specific regional context, the results may not be generalizable to other branches of the company in different regions or to other organizations operating in distinct cultural, regulatory, or economic environments. Regional variations in infrastructure, workforce expertise, and supply chain conditions can influence both material management practices and operational outcomes. Therefore, the spatial limitation highlights that the findings are context-specific and should be interpreted with caution when considering applications outside the Eastern Region or in different organizational settings.

Chapter Four

Study Results

Introduction

Chapter Four represents the analytical core of this study, focusing on the systematic examination of the data collected to assess the impact of material management practices on operational efficiency within Hitachi Energy in the Eastern Region of Saudi Arabia. This chapter is essential because it translates the conceptual framework and research design into measurable insights, allowing the study to move from theoretical assumptions to evidence-based conclusions. By carefully analyzing the collected data, the chapter provides a rigorous assessment of how different material management practices—ranging from planning and procurement to inventory control and digital integration—affect operational performance outcomes. Beyond merely presenting numerical or statistical results, this chapter interprets the findings in light of the study's objectives, connecting empirical evidence to the theoretical foundations discussed in earlier chapters. Such interpretation is critical for understanding the practical implications of material management strategies and identifying areas where improvements can enhance organizational efficiency.

Chapter Four emphasizes the broader significance of the findings for both academic research and organizational practice. It contextualizes the results within the existing literature, highlighting consistencies and discrepancies with prior studies, and demonstrates how the research contributes to knowledge in the fields of supply chain management, operational efficiency, and industrial engineering. The chapter also addresses the actionable insights derived from the data, showing how the findings can inform managerial decisions, optimize material flows, reduce operational waste, and improve responsiveness to project and market demands. By integrating analysis, interpretation, and practical implications, this chapter not only validates the research hypotheses but also forms the foundation for drawing meaningful conclusions and formulating evidence-based recommendations. Ultimately, Chapter Four bridges the gap between empirical investigation and real-world application, ensuring that the study offers both scientific rigor and tangible value to Hitachi Energy and the broader industrial community.

Data Analysis

- Descriptive Statistics

Descriptive statistics is a branch of statistics that focuses on summarizing and organizing data in a meaningful way. It involves the use of numerical measures and graphical tools to describe the basic features of a dataset. Common techniques include measures of central tendency (mean, median, mode), measures of variability (range, variance, standard deviation), and data visualization methods like histograms, bar charts, and pie charts. Unlike inferential statistics, which makes predictions or generalizations about a population, descriptive statistics simply presents data in a clear and concise manner.

Descriptive statistics plays a vital role in helping researchers, analysts, and decision-makers understand and interpret large amounts of data quickly. By providing simple summaries and visualizations, it allows for easy identification of patterns, trends, and anomalies within a dataset. This is essential for making informed decisions, generating hypotheses for further study, or communicating findings effectively to others. In fields such as business, healthcare, education, and social sciences, descriptive statistics serves as the foundation for more complex data analysis and supports evidence-based decision-making (Cooksey, 2020).

Statistics										
	N		Me an	Std. Err or of Me an	Medi an	Std. Deviati on	Skewn ess	Std. Error of Skewn ess	Kurto sis	Std. Error of Kurto sis
	Val id	Missi ng								
1- Age	21 5	0	2.9 7	.09 9	3.00	1.458	.020	.166	- 1.385	.330
2- Gender	21 5	0	1.5 5	.03 4	2.00	.499	-.198	.166	- 1.979	.330
3- Educational Level	21 5	0	3.3 2	.09 1	3.00	1.334	-.236	.166	- 1.122	.330

4. The company effectively plans material requirements based on accurate demand forecasts.	21 5	0	3.2 5	.09 2	3.00	1.344	-.094	.166	- 1.183	.330
5. Inventory levels are regularly reviewed to prevent shortages or excess stock.	21 5	0	3.3 3	.09 3	4.00	1.370	-.359	.166	- 1.071	.330
6. The company maintains accurate and up-to-date records of all materials.	21 5	0	3.2 7	.10 1	3.00	1.482	-.204	.166	- 1.365	.330
7. Procurement decisions are based on cost, quality, and supplier reliability.	21 5	0	3.3 2	.10 6	4.00	1.554	-.329	.166	- 1.410	.330
8. There is a clear process for selecting and evaluating suppliers.	21 5	0	3.3 9	.08 9	3.00	1.310	-.263	.166	- 1.080	.330
9. Long-term relationships with	21 5	0	3.3 6	.09 4	3.00	1.380	-.319	.166	- 1.140	.330

suppliers help ensure timely delivery of materials.										
10. The company uses technology (e.g., ERP systems) to track and manage material flow.	21 5	0	3.2 0	.10 5	3.00	1.540	-.154	.166	- 1.506	.330
11. Storage facilities are organized to ensure easy access and minimal material loss.	21 5	0	3.0 7	.10 5	3.00	1.542	-.025	.166	- 1.466	.330
12. Safety and quality standards are consistently applied in material handling and storage.	21 5	0	3.2 6	.09 4	3.00	1.380	-.219	.166	- 1.199	.330
13. Communication between procurement, warehousing, and production departments is efficient.	21 5	0	3.3 3	.09 6	4.00	1.411	-.339	.166	- 1.165	.330

14. Material management practices help reduce operational delays.	21 5	0	3.3 1	.09 7	4.00	1.428	-.388	.166	- 1.160	.330
15. Effective material planning contributes to lower operational costs.	21 5	0	3.3 1	.10 7	4.00	1.571	-.315	.166	- 1.453	.330
16. Efficient inventory control enhances the overall productivity of the company.	21 5	0	3.3 9	.09 1	4.00	1.331	-.422	.166	-.958	.330
17. Reliable supplier management positively impacts production continuity.	21 5	0	3.4 0	.09 5	4.00	1.387	-.406	.166	- 1.072	.330
18. Material management systems improve the company's responsiveness to customer needs.	21 5	0	3.2 9	.10 4	4.00	1.529	-.259	.166	- 1.442	.330

19. Proper material utilization reduces waste and improves resource efficiency.	21 5	0	3.2 0	.11 1	4.00	1.629	-.214	.166	- 1.585	.330
20. Effective material management practices contribute directly to improving operational efficiency.	21 5	0	3.3 3	.08 8	3.00	1.297	-.254	.166	- 1.029	.330

Table 1: Statistical Description of Experimental Data.

- Age

The study included 215 participants whose ages varied across different ranges. The largest age group was 20–30 years, comprising 48 participants or 22.3% of the total sample. This was followed closely by both the 50–60 and 60+ age groups, each accounting for 44 participants or 20.5% of the sample. Participants aged 30–40 made up 43 individuals, representing 20% of the total, while the smallest group was 40–50 years, with 36 participants, accounting for 16.7% of the sample. Overall, the distribution shows a relatively balanced spread across age categories, with a slightly higher concentration in the younger (20–30) and older (50–60, 60+) groups.

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-30	48	22.3	22.3	22.3
	50-60	44	20.5	20.5	42.8
	60+	44	20.5	20.5	63.3
	30-40	43	20.0	20.0	83.3
	40-50	36	16.7	16.7	100.0
	Total	215	100.0	100.0	

Table 2: Statistical description of age.

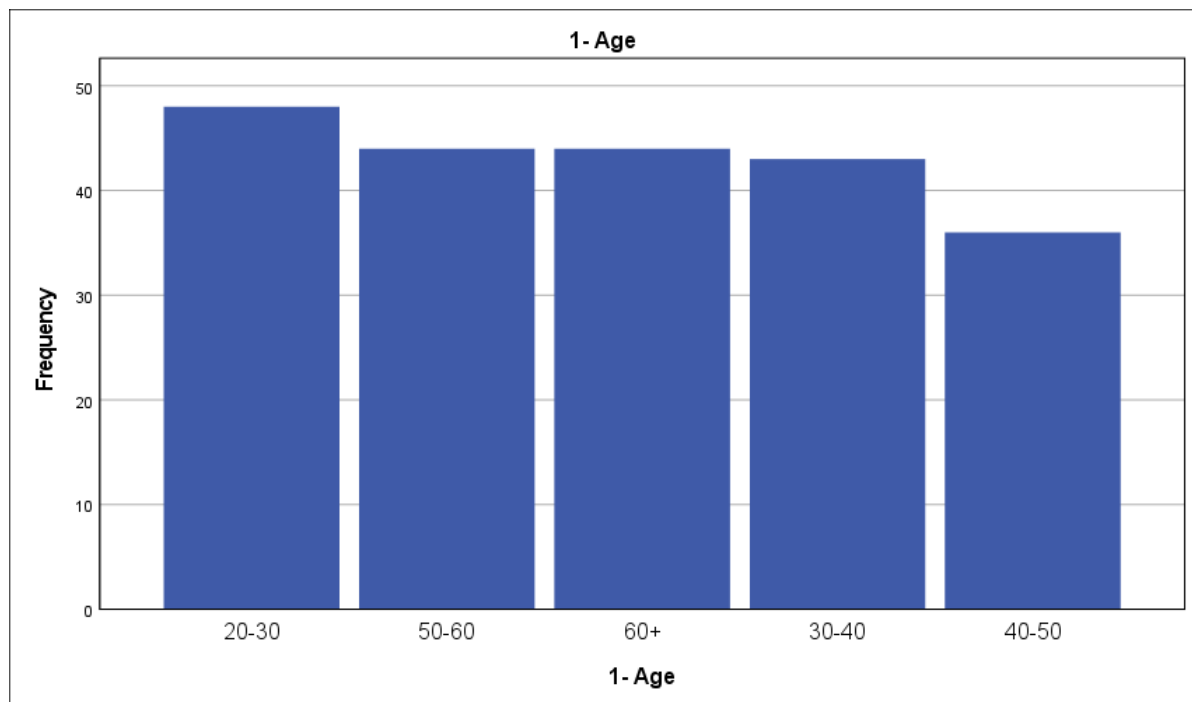


Figure 2: Graphical representation of age

- Gender

The study sample consisted of 215 participants, with a slightly higher representation of females than males. Specifically, 118 participants were female, accounting for 54.9% of the total, while 97 participants were male, representing 45.1% of the sample. This indicates a fairly balanced gender distribution, with a modest predominance of female participants.

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	118	54.9	54.9	54.9
	Male	97	45.1	45.1	100.0
	Total	215	100.0	100.0	

Table 3: Statistical description of gender.

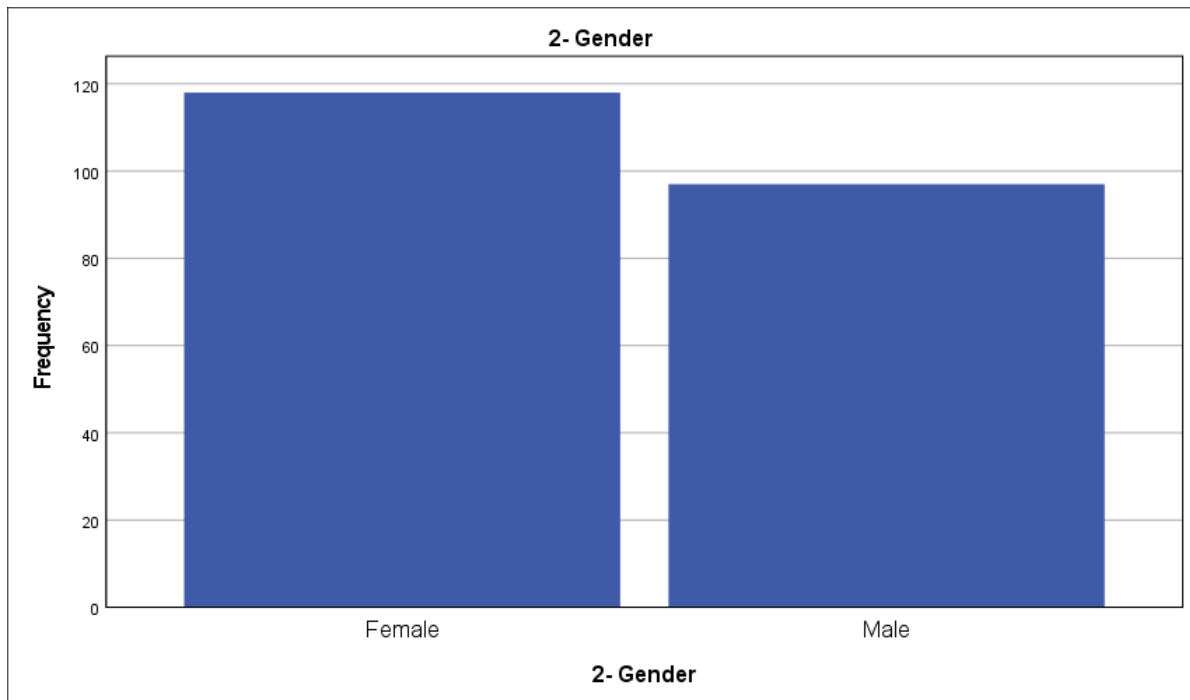


Figure 3: Graphical representation of gender

- Educational Level

The educational levels of the 215 participants varied, with the largest group holding a level “5” qualification, comprising 55 individuals or 25.6% of the sample. This was followed by participants with a level “3” qualification (49 participants, 22.8%) and level “4” qualification (47 participants, 21.9%). Those with a bachelor’s degree accounted for 40 participants, representing 18.6% of the sample, while the smallest group held a high school diploma, totaling 24 participants or 11.2%. Overall, the data indicate a diverse educational background among participants, with a concentration in intermediate qualification levels.

Educational Level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PhD	55	25.6	25.6	25.6
	Master's Degree	49	22.8	22.8	48.4
	Postgraduate Degree	47	21.9	21.9	70.2
	Bachelor	40	18.6	18.6	88.8
	High School Diploma	24	11.2	11.2	100.0
	Total	215	100.0	100.0	

Table4 : Statistical description of educational Level.

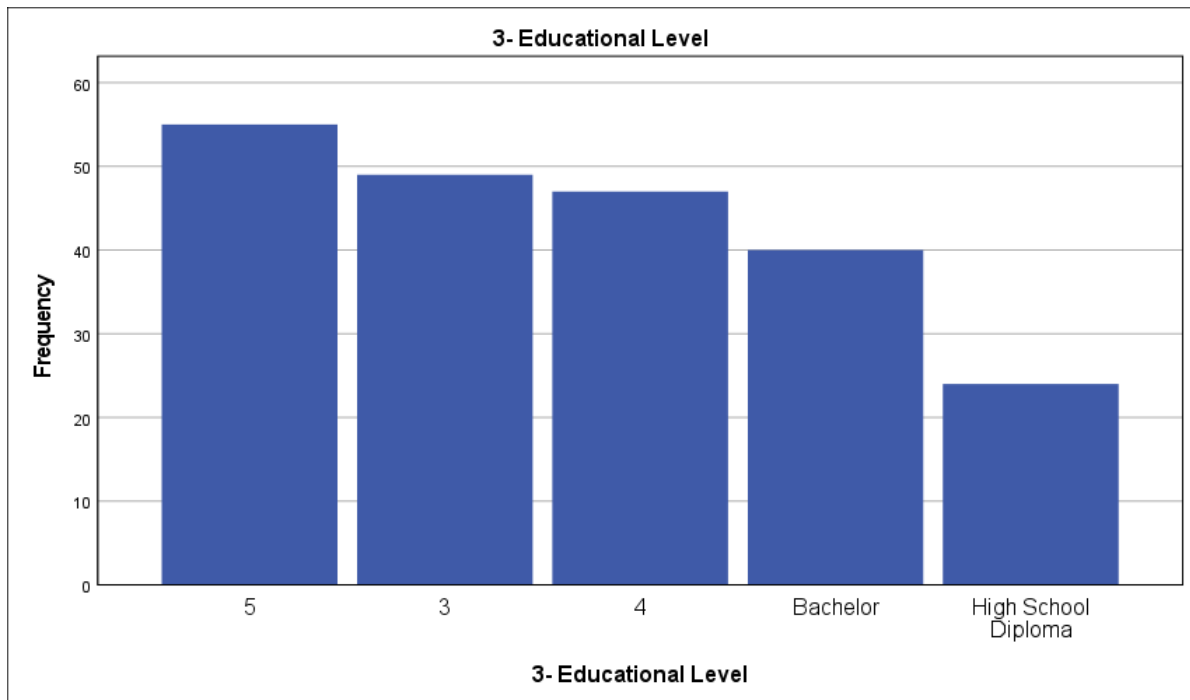


Figure 4: Graphical representation of educational level

- **The company effectively plans material requirements based on accurate demand forecasts.**

Regarding the effectiveness of the company in planning material requirements based on accurate demand forecasts, participants' opinions were varied. A total of 56 participants (26%) strongly agreed that the company effectively plans materials, while 35 participants (16.3%) agreed. Meanwhile, 55 participants (25.6%) neither agreed nor disagreed, indicating a neutral stance. On the other hand, 45 participants (20.9%) disagreed, and 24 participants (11.2%) strongly disagreed, reflecting some dissatisfaction or skepticism about the company's planning practices. Overall, while a substantial portion of participants expressed agreement, there is also a notable proportion of neutral or negative responses, suggesting room for improvement in material planning based on demand forecasts.

The company effectively plans material requirements based on accurate demand forecasts.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	56	26.0	26.0	26.0
	Neither agree nor disagree	55	25.6	25.6	51.6
	Disagree	45	20.9	20.9	72.6

	Agree	35	16.3	16.3	88.8
	Strongly Disagree	24	11.2	11.2	100.0
	Total	215	100.0	100.0	

Table 5: Statistical Description of the company effectively plans material requirements based on accurate demand forecasts.

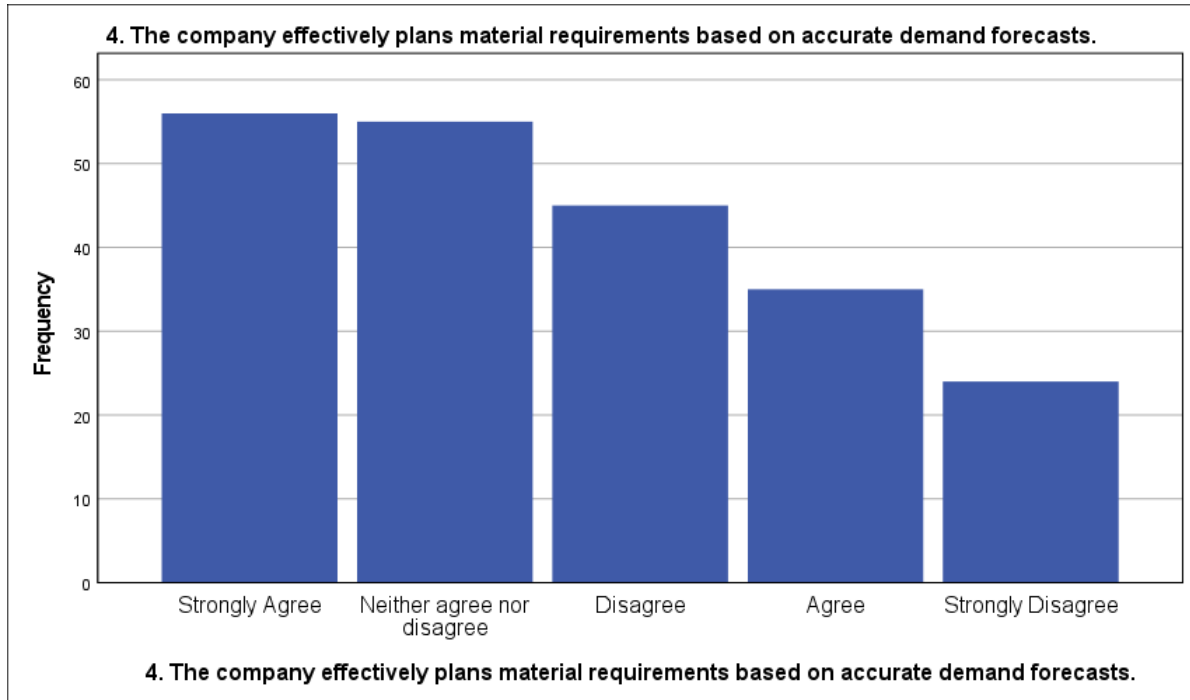


Figure 5: Graphical representation of the company effectively plans material requirements based on accurate demand forecasts

- **Inventory levels are regularly reviewed to prevent shortages or excess stock.**

Regarding the regular review of inventory levels to prevent shortages or excess stock, participants' responses were somewhat mixed. A total of 55 participants (25.6%) strongly agreed and 53 participants (24.7%) agreed that inventory levels are regularly reviewed, indicating that just over half of the respondents viewed this practice positively. Meanwhile, 47 participants (21.9%) neither agreed nor disagreed, reflecting a neutral stance. On the other hand, 29 participants (13.5%) disagreed and 31 participants (14.4%) strongly disagreed, highlighting that a notable portion of participants perceive gaps in inventory management practices. Overall, while many participants acknowledged the company's efforts in reviewing inventory, the data suggest areas for potential improvement.

Inventory levels are regularly reviewed to prevent shortages or excess stock.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	25.6	25.6	25.6
	Agree	53	24.7	24.7	50.2
	Neither agree nor disagree	47	21.9	21.9	72.1
	Strongly Disagree	31	14.4	14.4	86.5
	Disagree	29	13.5	13.5	100.0
	Total	215	100.0	100.0	

Table 6: Statistical Description of Inventory levels are regularly reviewed to prevent shortages or excess stock.

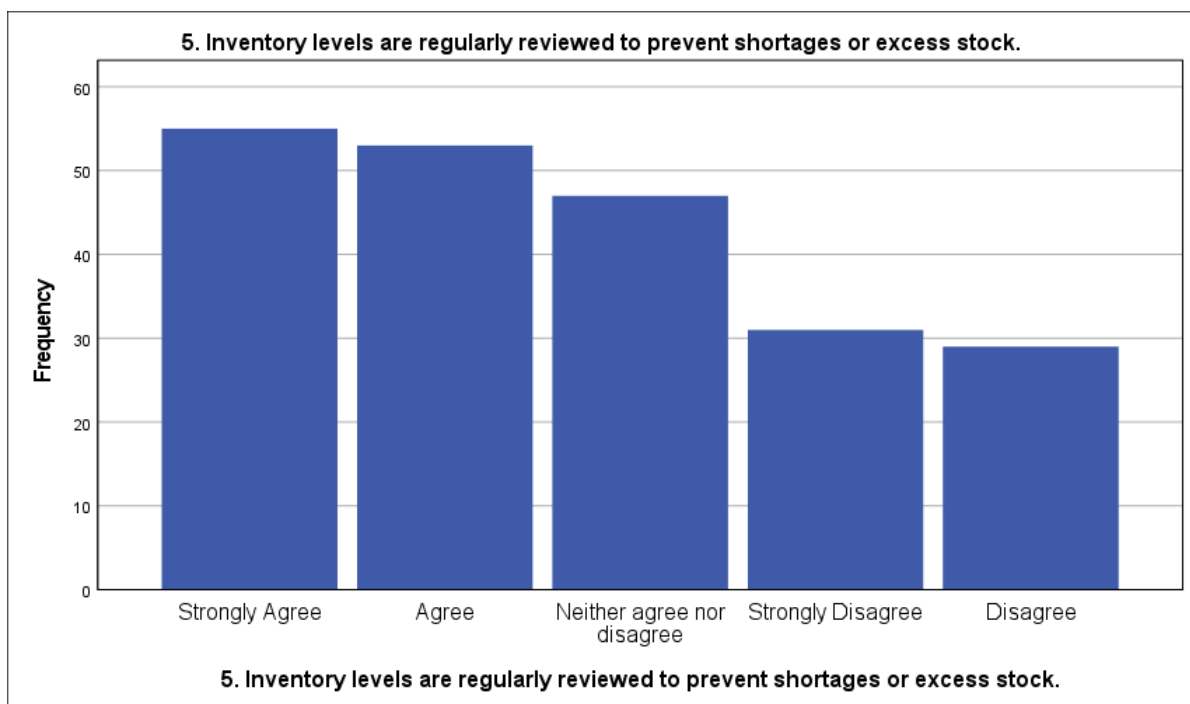


Figure 6: Graphical representation of Inventory levels are regularly reviewed to prevent shortages or excess stock

- **The company maintains accurate and up-to-date records of all materials.**

Regarding the maintenance of accurate and up-to-date records of all materials, participants' opinions were varied. A total of 67 participants (31.2%) strongly agreed that the company maintains accurate records, while 33 participants (15.3%) agreed. Meanwhile, 42 participants (19.5%) neither agreed nor disagreed, reflecting a neutral perception. Conversely, 36 participants (16.7%) disagreed and 37 participants (17.2%) strongly disagreed, indicating that a significant portion of participants perceive deficiencies in record-keeping

practices. Overall, although a notable group acknowledges the company's efforts in maintaining accurate material records, the considerable proportion of neutral and negative responses suggests room for improvement in this area.

The company maintains accurate and up-to-date records of all materials.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	67	31.2	31.2	31.2
	Neither agree nor disagree	42	19.5	19.5	50.7
	Strongly Disagree	37	17.2	17.2	67.9
	Disagree	36	16.7	16.7	84.7
	Agree	33	15.3	15.3	100.0
	Total	215	100.0	100.0	

Table 7: Statistical Description of the company maintains accurate and up-to-date records of all materials.

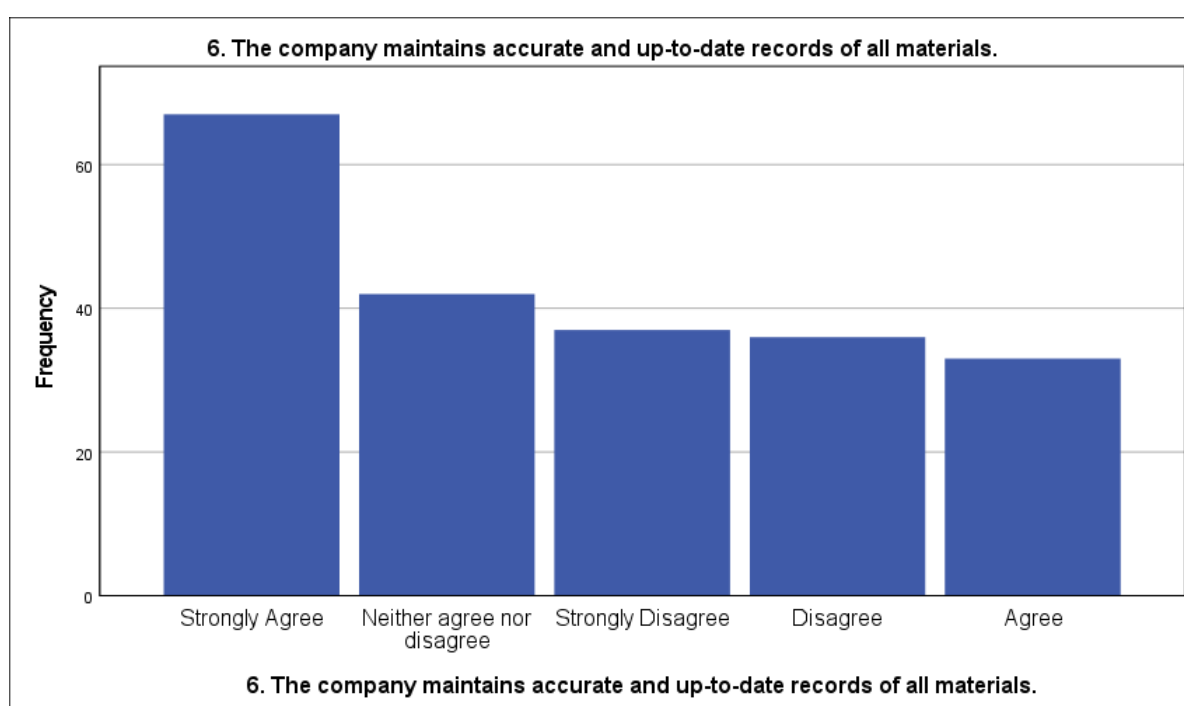


Figure 7: Graphical representation of the company maintains accurate and up-to-date records of all materials

- **Procurement decisions are based on cost, quality, and supplier reliability.**

Regarding whether procurement decisions are based on cost, quality, and supplier reliability, participants' responses showed notable variation. A total of 74 participants (34.4%) strongly agreed and 37 participants (17.2%) agreed,

indicating that over half of respondents perceived procurement decisions positively. Meanwhile, 33 participants (15.3%) neither agreed nor disagreed, reflecting a neutral view. Conversely, 26 participants (12.1%) disagreed and 45 participants (20.9%) strongly disagreed, suggesting that a significant portion of participants perceived shortcomings in the company's procurement practices. Overall, while many participants acknowledged that procurement decisions consider cost, quality, and supplier reliability, the sizable proportion of disagreement highlights potential areas for improvement.

Procurement decisions are based on cost, quality, and supplier reliability.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	74	34.4	34.4	34.4
	Strongly Disagree	45	20.9	20.9	55.3
	Agree	37	17.2	17.2	72.6
	Neither agree nor disagree	33	15.3	15.3	87.9
	Disagree	26	12.1	12.1	100.0
	Total	215	100.0	100.0	

Table 8: Statistical Description of procurement decisions are based on cost, quality, and supplier reliability.

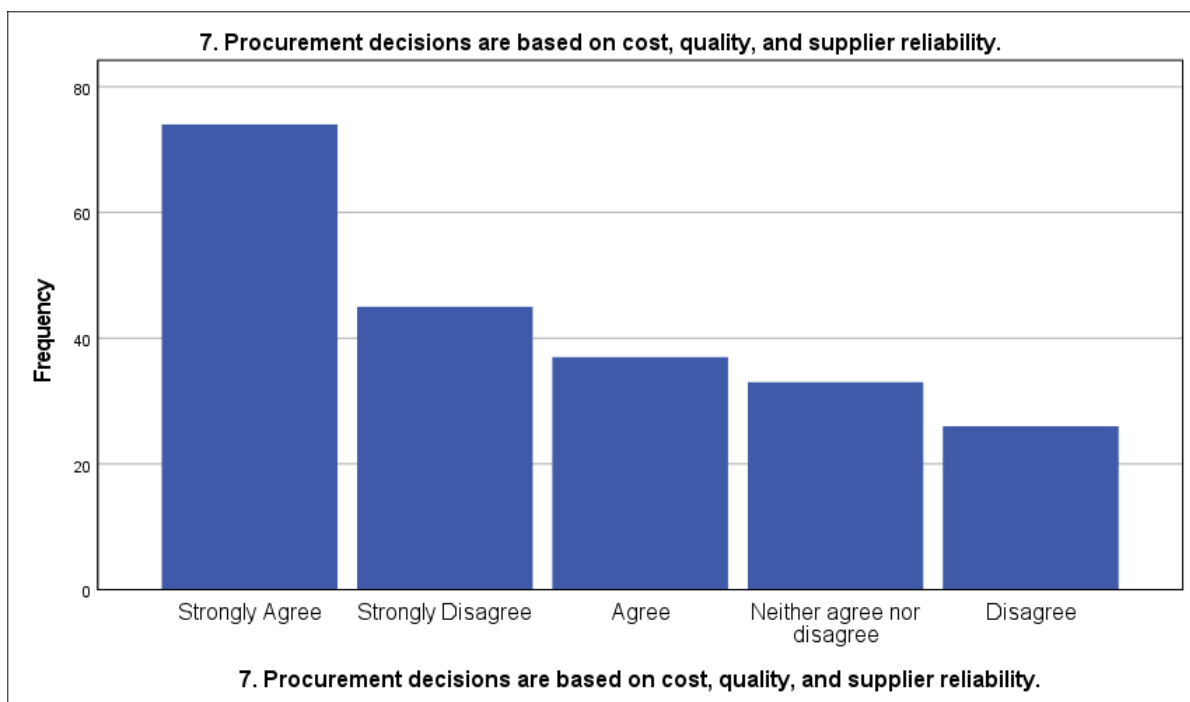


Figure 8: Graphical representation of procurement decisions are based on cost, quality, and supplier reliability

- **There is a clear process for selecting and evaluating suppliers.**

Regarding the clarity of the process for selecting and evaluating suppliers, participants' responses were mixed. A total of 59 participants (27.4%) strongly agreed and 45 participants (20.9%) agreed that a clear process exists, indicating that nearly half of the respondents view the supplier evaluation process positively. Meanwhile, 52 participants (24.2%) neither agreed nor disagreed, reflecting a neutral perception. Conversely, 39 participants (18.1%) disagreed and 20 participants (9.3%) strongly disagreed, suggesting that a notable portion of participants perceive a lack of clarity in supplier selection and evaluation. Overall, while a significant number of participants recognize an established process, the responses indicate potential for enhancing transparency and consistency in supplier management.

There is a clear process for selecting and evaluating suppliers.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	59	27.4	27.4	27.4
	Neither agree nor disagree	52	24.2	24.2	51.6
	Agree	45	20.9	20.9	72.6
	Disagree	39	18.1	18.1	90.7
	Strongly Disagree	20	9.3	9.3	100.0
	Total	215	100.0	100.0	

Table 9: Statistical Description of there is a clear process for selecting and evaluating suppliers.



Figure 9: Graphical representation of there is a clear process for selecting and evaluating suppliers

- **Long-term relationships with suppliers help ensure timely delivery of materials.**

Regarding the impact of long-term relationships with suppliers on ensuring timely delivery of materials, participants' responses were varied. A total of 61 participants (28.4%) strongly agreed and 46 participants (21.4%) agreed that long-term supplier relationships contribute to timely deliveries, indicating that nearly half of the respondents view these relationships positively. Meanwhile, 46 participants (21.4%) neither agreed nor disagreed, reflecting a neutral stance. Conversely, 34 participants (15.8%) disagreed and 28 participants (13.0%) strongly disagreed, showing that a notable portion of participants perceive limitations in relying on long-term supplier relationships. Overall, while many participants acknowledge the benefits of sustained supplier partnerships, there remains room to strengthen supplier relationship management to ensure consistent material delivery.

Long-term relationships with suppliers help ensure timely delivery of materials.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	61	28.4	28.4	28.4
	Neither agree nor disagree	46	21.4	21.4	49.8
	Agree	46	21.4	21.4	71.2
	Disagree	34	15.8	15.8	87.0
	Strongly Disagree	28	13.0	13.0	100.0
	Total	215	100.0	100.0	

Table 10: Statistical Description of Long-term relationships with suppliers help ensure timely delivery of materials.

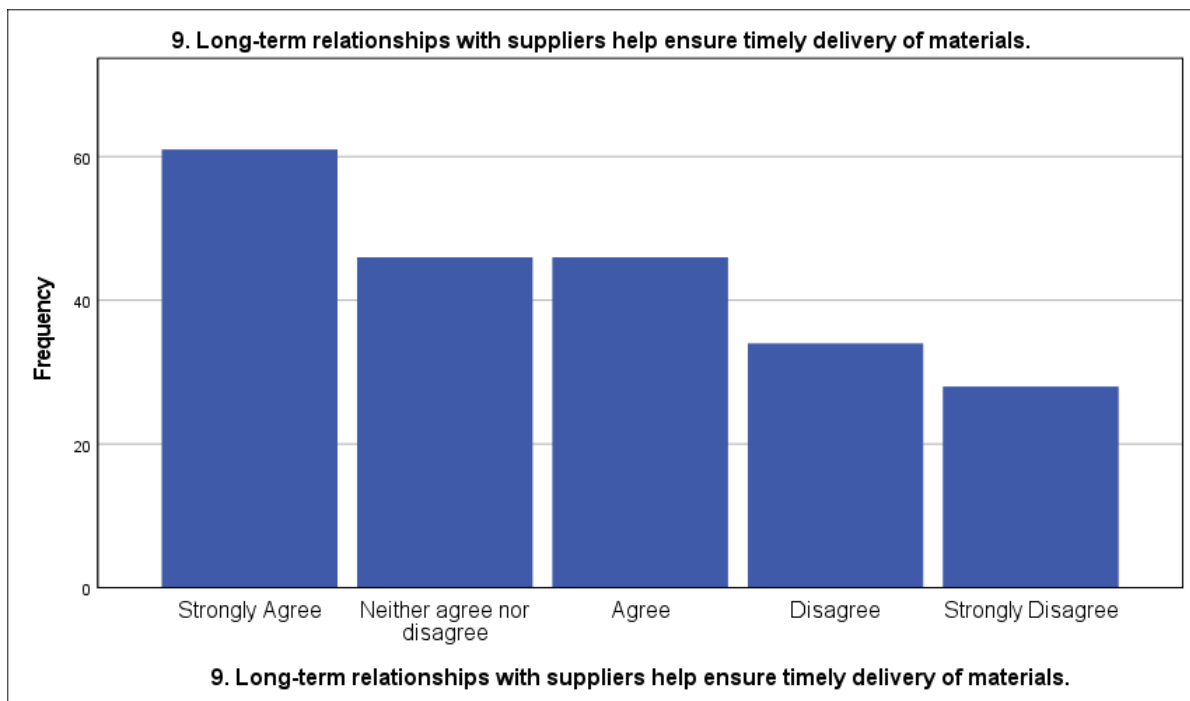


Figure 10: Graphical representation of Long-term relationships with suppliers help ensure timely delivery of materials

- **The company uses technology (e.g., ERP systems) to track and manage material flow.**

Regarding the use of technology, such as ERP systems, to track and manage material flow, participants' responses showed considerable variation. A total of 66 participants (30.7%) strongly agreed and 38 participants (17.7%) agreed that the company effectively uses technology, indicating that nearly half of respondents perceive technology as a key tool in material management. Meanwhile, 26 participants (12.1%) neither agreed nor disagreed, reflecting a

neutral perspective. Conversely, 42 participants (19.5%) disagreed and 43 participants (20.0%) strongly disagreed, suggesting that a significant portion of participants see limitations in the company's use of technological tools. Overall, while many participants recognize the role of technology in managing material flow, the responses indicate that further improvements or increased adoption may be needed.

The company uses technology (e.g., ERP systems) to track and manage material flow.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	66	30.7	30.7	30.7
	Strongly Disagree	43	20.0	20.0	50.7
	Disagree	42	19.5	19.5	70.2
	Agree	38	17.7	17.7	87.9
	Neither agree nor disagree	26	12.1	12.1	100.0
	Total	215	100.0	100.0	

Table 11: Statistical Description of the company uses technology (e.g., ERP systems) to track and manage material flow.

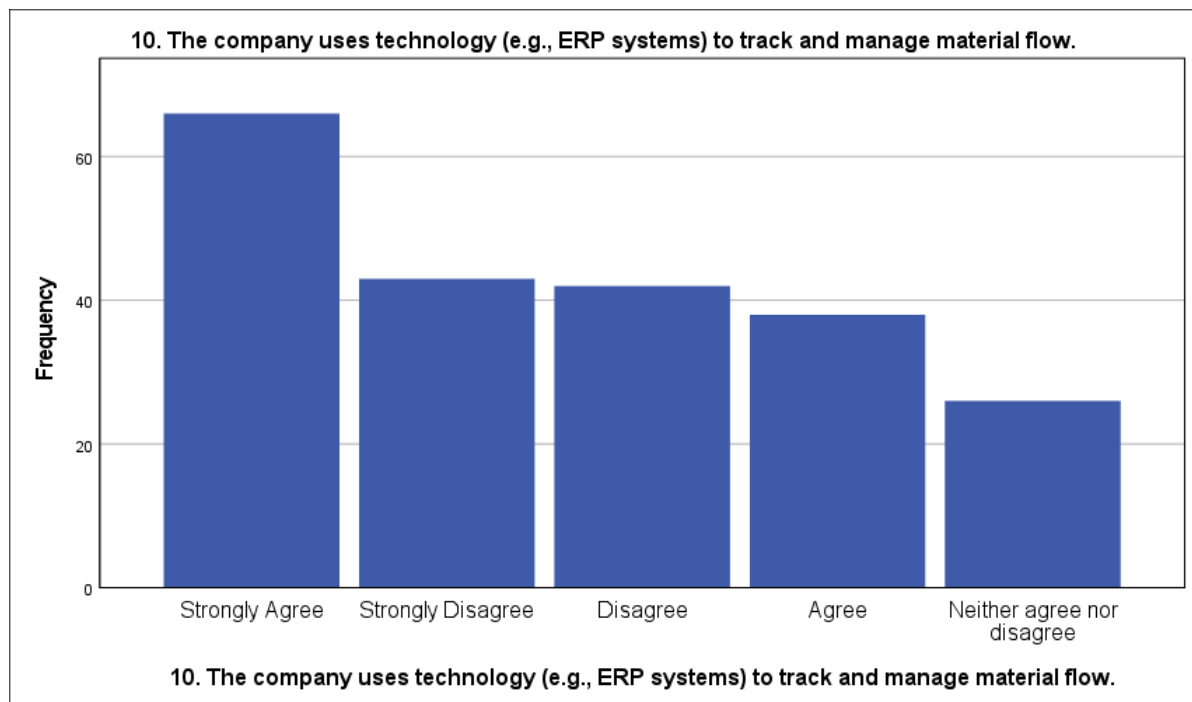


Figure 11: Graphical representation of the company uses technology (e.g., ERP systems) to track and manage material flow

- **Storage facilities are organized to ensure easy access and minimal material loss.**

Regarding the organization of storage facilities to ensure easy access and minimize material loss, participants' responses were mixed. A total of 63 participants (29.3%) strongly agreed and 24 participants (11.2%) agreed that the facilities are well-organized, suggesting that just over 40% of respondents view storage practices positively. Meanwhile, 44 participants (20.5%) neither agreed nor disagreed, reflecting a neutral perspective. Conversely, 34 participants (15.8%) disagreed and 50 participants (23.3%) strongly disagreed, indicating that a significant portion of participants perceive shortcomings in storage organization. Overall, while some participants recognize effective storage management, the responses highlight areas for potential improvement to enhance accessibility and reduce material loss.

Storage facilities are organized to ensure easy access and minimal material loss.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	63	29.3	29.3	29.3
	Strongly Disagree	50	23.3	23.3	52.6
	Neither agree nor disagree	44	20.5	20.5	73.0
	Disagree	34	15.8	15.8	88.8
	Agree	24	11.2	11.2	100.0
	Total	215	100.0	100.0	

Table 12: Statistical Description of storage facilities are organized to ensure easy access and minimal material loss.

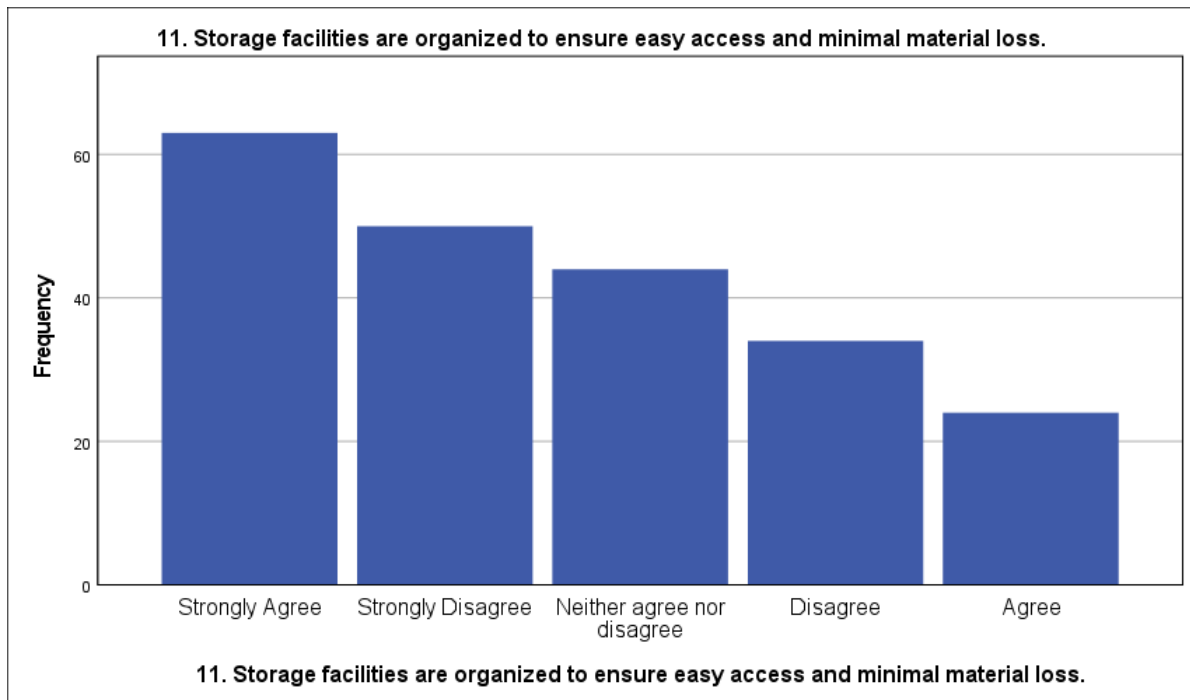


Figure 12: Graphical representation of storage facilities are organized to ensure easy access and minimal material loss

- **Safety and quality standards are consistently applied in material handling and storage.**

Regarding the consistent application of safety and quality standards in material handling and storage, participants' responses were varied. A total of 54 participants (25.1%) strongly agreed and 47 participants (21.9%) agreed that these standards are consistently applied, indicating that nearly half of respondents perceive adherence to safety and quality practices positively. Meanwhile, 45 participants (20.9%) neither agreed nor disagreed, reflecting a neutral view. Conversely, 39 participants (18.1%) disagreed and 30 participants (14.0%) strongly disagreed, suggesting that a notable portion of participants perceive gaps in implementing safety and quality standards. Overall, while many participants recognize the company's efforts in maintaining safety and quality, the responses highlight the need for continuous monitoring and improvement.

Safety and quality standards are consistently applied in material handling and storage.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	54	25.1	25.1	25.1
	Agree	47	21.9	21.9	47.0
	Neither agree nor disagree	45	20.9	20.9	67.9
	Disagree	39	18.1	18.1	86.0
	Strongly Disagree	30	14.0	14.0	100.0
	Total	215	100.0	100.0	

Table 13: Statistical Description of safety and quality standards are consistently applied in material handling and storage.

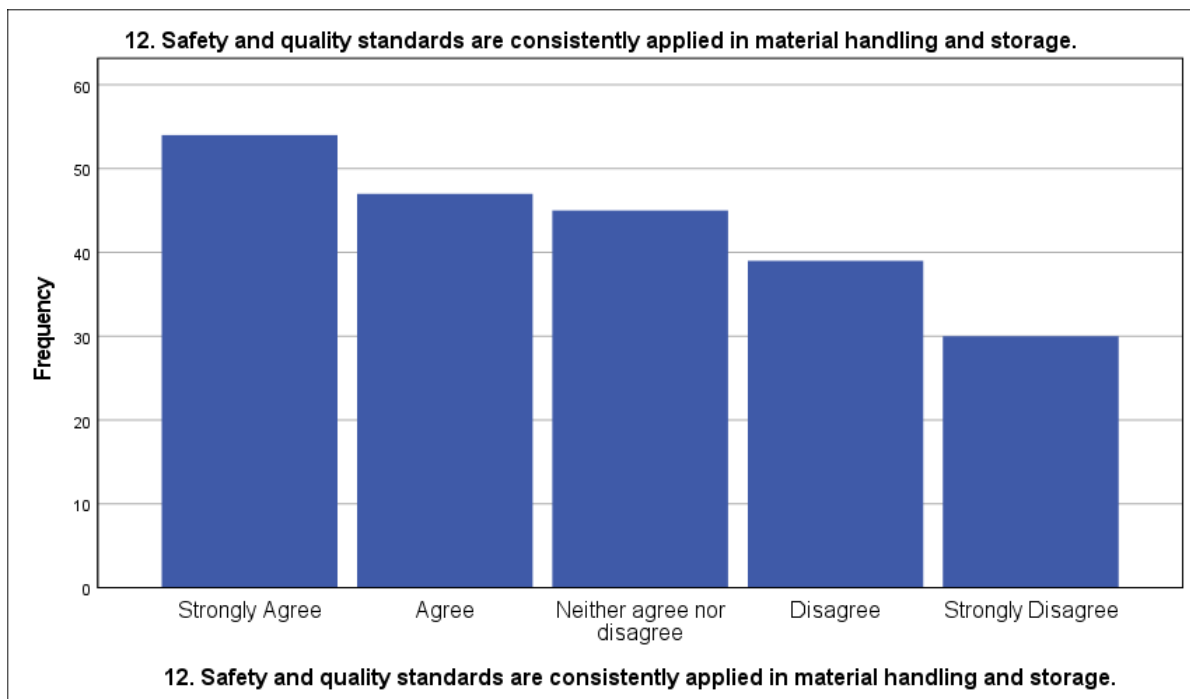


Figure 13: Graphical representation of safety and quality standards are consistently applied in material handling and storage

- Communication between procurement, warehousing, and production departments is efficient.

Regarding the efficiency of communication between the procurement, warehousing, and production departments, participants' responses were varied. A total of 60 participants (27.9%) strongly agreed and 48 participants (22.3%) agreed that communication is efficient, indicating that just over half of the respondents perceive interdepartmental communication positively. Meanwhile, 44 participants (20.5%) neither agreed nor disagreed, reflecting a neutral view.

Conversely, 30 participants (14.0%) disagreed and 33 participants (15.3%) strongly disagreed, suggesting that a significant portion of participants perceive challenges in communication between departments. Overall, while many participants recognize effective communication, the responses highlight areas where coordination and information flow could be improved.

Communication between procurement, warehousing, and production departments is efficient.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	60	27.9	27.9	27.9
	Agree	48	22.3	22.3	50.2
	Neither agree nor disagree	44	20.5	20.5	70.7
	Strongly Disagree	33	15.3	15.3	86.0
	Disagree	30	14.0	14.0	100.0
	Total	215	100.0	100.0	

Table 14: Statistical Description of communication between procurement, warehousing, and production departments is efficient.

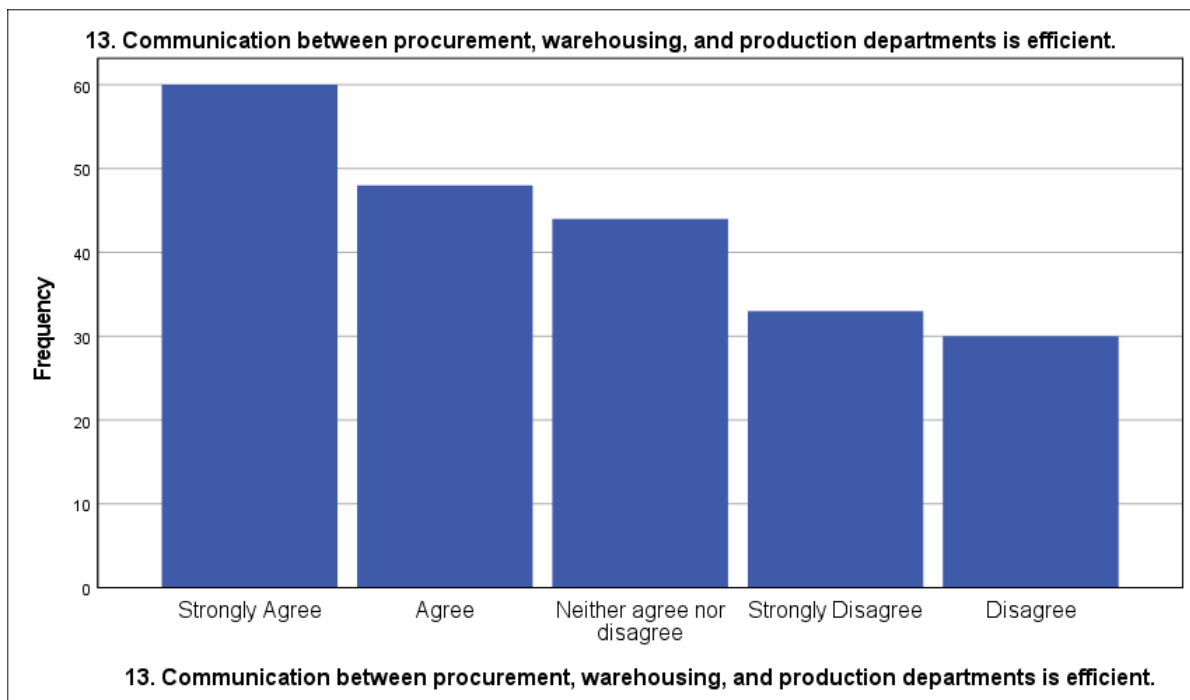


Figure 14: Graphical representation of communication between procurement, warehousing, and production departments is efficient

- **Material management practices help reduce operational delays.**

Regarding the impact of material management practices on reducing operational delays, participants' responses were generally positive but mixed. A total of 56 participants (26.0%) strongly agreed and another 56 participants (26.0%) agreed that effective material management helps minimize delays, indicating that just over half of respondents perceive a positive effect. Meanwhile, 40 participants (18.6%) neither agreed nor disagreed, reflecting a neutral view. Conversely, 25 participants (11.6%) disagreed and 38 participants (17.7%) strongly disagreed, suggesting that a notable portion of participants perceive limitations in the effectiveness of current material management practices in reducing delays. Overall, while many participants recognize the benefits of material management, the responses indicate room for further improvement to optimize operational efficiency.

Material management practices help reduce operational delays.					
		Frequenc y	Percent	Valid Percent	Cumulative Percent
Valid	Agree	56	26.0	26.0	26.0
	Strongly Agree	56	26.0	26.0	52.1
	Neither agree nor disagree	40	18.6	18.6	70.7
	Strongly Disagree	38	17.7	17.7	88.4
	Disagree	25	11.6	11.6	100.0
	Total	215	100.0	100.0	

Table 15: Statistical Description of material management practices help reduce operational delays.

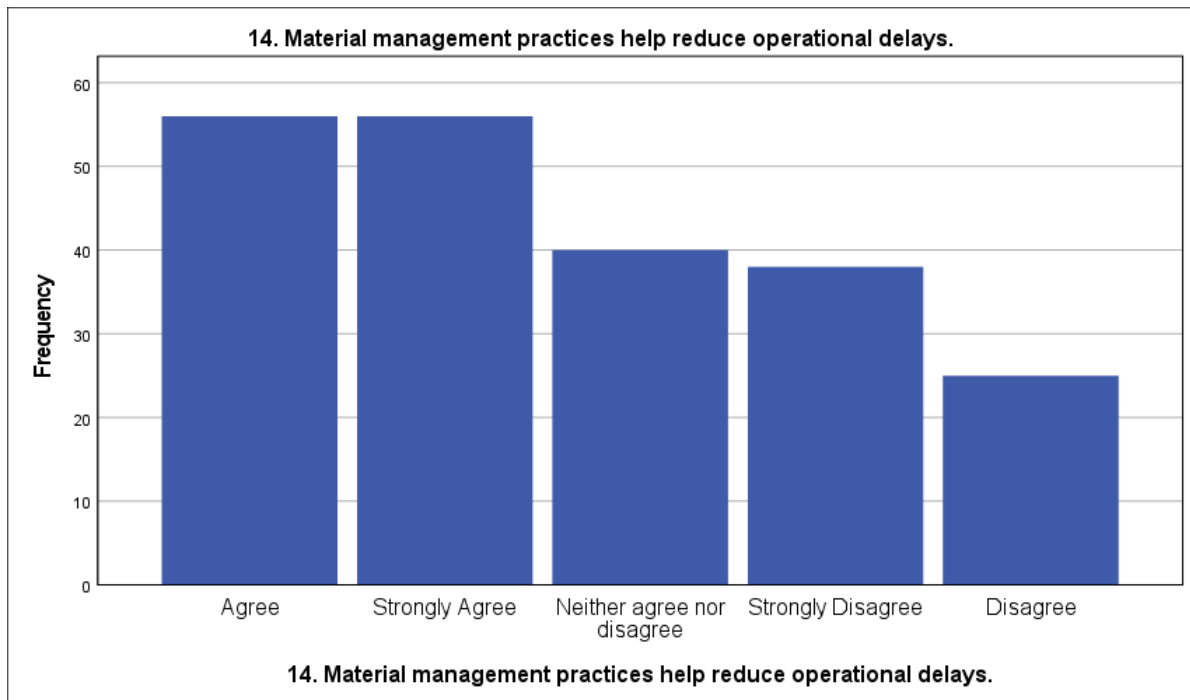


Figure 15: Graphical representation of material management practices help reduce operational delays

Effective material planning contributes to lower operational costs.

Regarding the contribution of effective material planning to lowering operational costs, participants' responses showed a mixed perspective. A total of 75 participants (34.9%) strongly agreed and 37 participants (17.2%) agreed that material planning positively impacts operational costs, indicating that over half of respondents recognize its benefits. Meanwhile, 29 participants (13.5%) neither agreed nor disagreed, reflecting a neutral stance. Conversely, 28 participants (13.0%) disagreed and 46 participants (21.4%) strongly disagreed, suggesting that a significant portion of participants perceive limitations in the company's material planning practices. Overall, while many participants acknowledge that effective material planning can reduce costs, the responses highlight opportunities to enhance planning processes to achieve greater operational efficiency.

Effective material planning contributes to lower operational costs.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	75	34.9	34.9	34.9
	Strongly Disagree	46	21.4	21.4	56.3
	Agree	37	17.2	17.2	73.5
	Neither agree nor disagree	29	13.5	13.5	87.0
	Disagree	28	13.0	13.0	100.0
	Total	215	100.0	100.0	

Table 16: Statistical Description of Effective material planning contributes to lower operational costs.

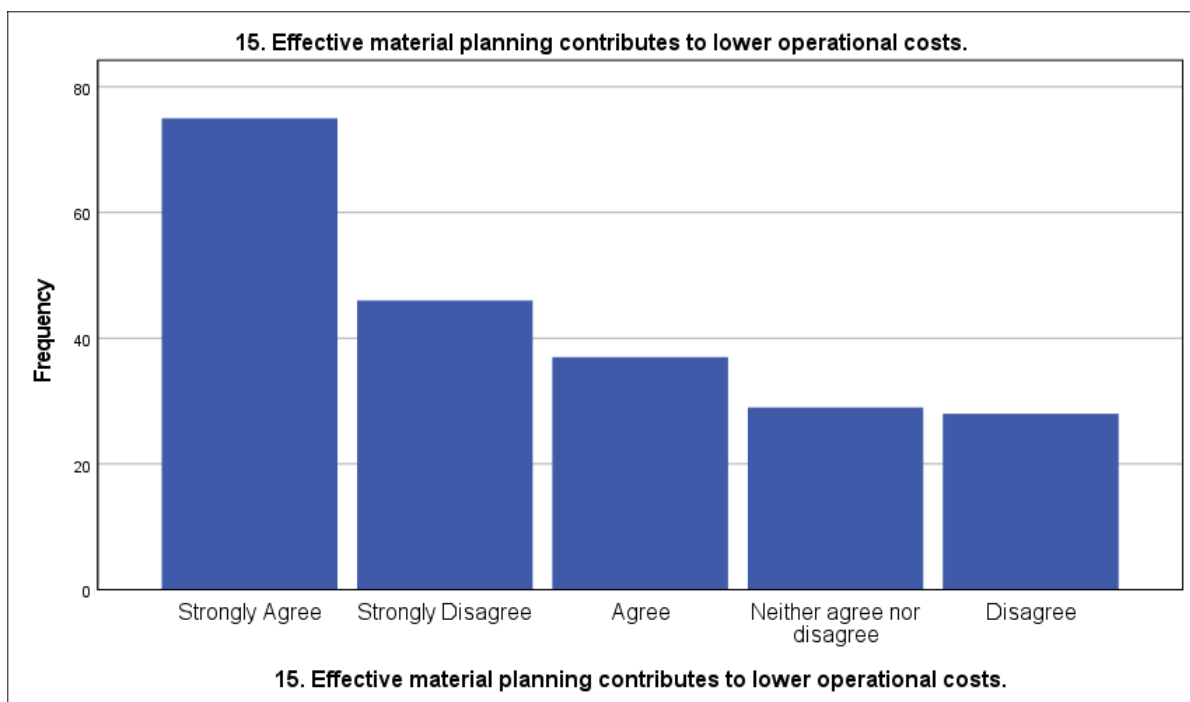


Figure 16: Graphical representation of Effective material planning contributes to lower operational costs

- **Efficient inventory control enhances the overall productivity of the company.**

Regarding the effect of efficient inventory control on overall company productivity, participants' responses were generally positive but mixed. A total of 54 participants (25.1%) strongly agreed and 59 participants (27.4%) agreed that efficient inventory control enhances productivity, indicating that just over half of respondents perceive a beneficial effect. Meanwhile, 46 participants (21.4%) neither agreed nor disagreed, reflecting a neutral perspective. Conversely, 29 participants (13.5%) disagreed and 27 participants (12.6%) strongly disagreed.

strongly disagreed, suggesting that a notable portion of participants perceive limitations in the effectiveness of current inventory control practices. Overall, while many participants recognize the role of efficient inventory management in improving productivity, the responses highlight opportunities to further optimize inventory practices.

Efficient inventory control enhances the overall productivity of the company.					
		Frequenc y	Percent	Valid Percent	Cumulative Percent
Valid	Agree	59	27.4	27.4	27.4
	Strongly Agree	54	25.1	25.1	52.6
	Neither agree nor disagree	46	21.4	21.4	74.0
	Disagree	29	13.5	13.5	87.4
	Strongly Disagree	27	12.6	12.6	100.0
	Total	215	100.0	100.0	

Table 17: Statistical Description of efficient inventory control enhances the overall productivity of the company.

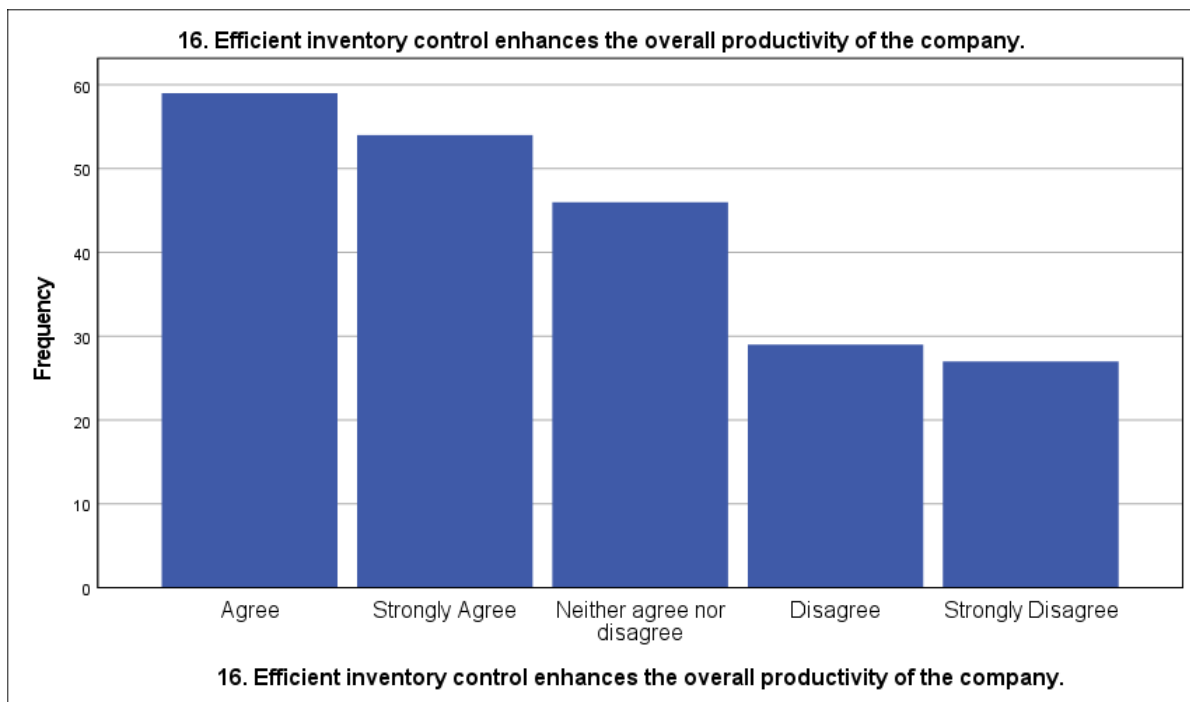


Figure 17: Graphical representation of efficient inventory control enhances the overall productivity of the company

- **Reliable supplier management positively impacts production continuity.**

Regarding the impact of reliable supplier management on production continuity, participants' responses indicated a generally positive perception with some reservations. A total of 62 participants (28.8%) strongly agreed and 50 participants (23.3%) agreed that effective supplier management contributes to uninterrupted production, suggesting that over half of respondents recognize its benefits. Meanwhile, 45 participants (20.9%) neither agreed nor disagreed, reflecting a neutral stance. Conversely, 28 participants (13.0%) disagreed and 30 participants (14.0%) strongly disagreed, indicating that a notable portion of participants perceive gaps in supplier management that could affect production. Overall, while many participants acknowledge the importance of reliable suppliers for maintaining production continuity, the responses highlight areas for potential improvement in supplier relationship management.

Reliable supplier management positively impacts production continuity.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	62	28.8	28.8	28.8
	Agree	50	23.3	23.3	52.1
	Neither agree nor disagree	45	20.9	20.9	73.0
	Strongly Disagree	30	14.0	14.0	87.0
	Disagree	28	13.0	13.0	100.0
	Total	215	100.0	100.0	

Table 18 : Statistical Description of reliable supplier management positively impacts production continuity.

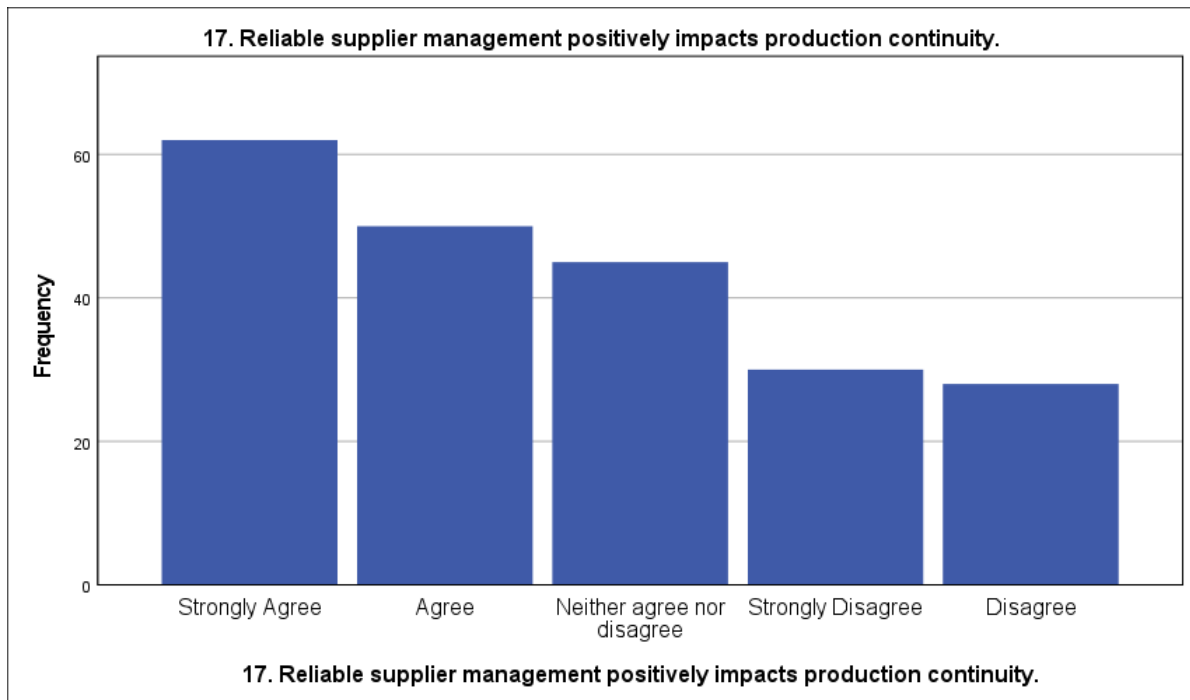


Figure 18: Graphical representation of reliable supplier management positively impacts production continuity

- **Material management systems improve the company's responsiveness to customer needs.**

Regarding the impact of material management systems on the company's responsiveness to customer needs, participants' responses were generally positive but mixed. A total of 71 participants (33.0%) strongly agreed and 38 participants (17.7%) agreed that material management systems improve responsiveness, indicating that just over half of respondents perceive a beneficial effect. Meanwhile, 29 participants (13.5%) neither agreed nor disagreed, reflecting a neutral perspective. Conversely, 37 participants (17.2%) disagreed and 40 participants (18.6%) strongly disagreed, suggesting that a significant portion of participants perceive limitations in the current material management systems' ability to enhance customer responsiveness. Overall, while many participants recognize the positive role of material management systems, the responses highlight areas for further improvement to better meet customer needs.

Material management systems improve the company's responsiveness to customer needs.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	71	33.0	33.0	33.0
	Strongly Disagree	40	18.6	18.6	51.6
	Agree	38	17.7	17.7	69.3
	Disagree	37	17.2	17.2	86.5
	Neither agree nor disagree	29	13.5	13.5	100.0
	Total	215	100.0	100.0	

Table 19: Statistical Description of material management systems improve the company's responsiveness to customer needs.

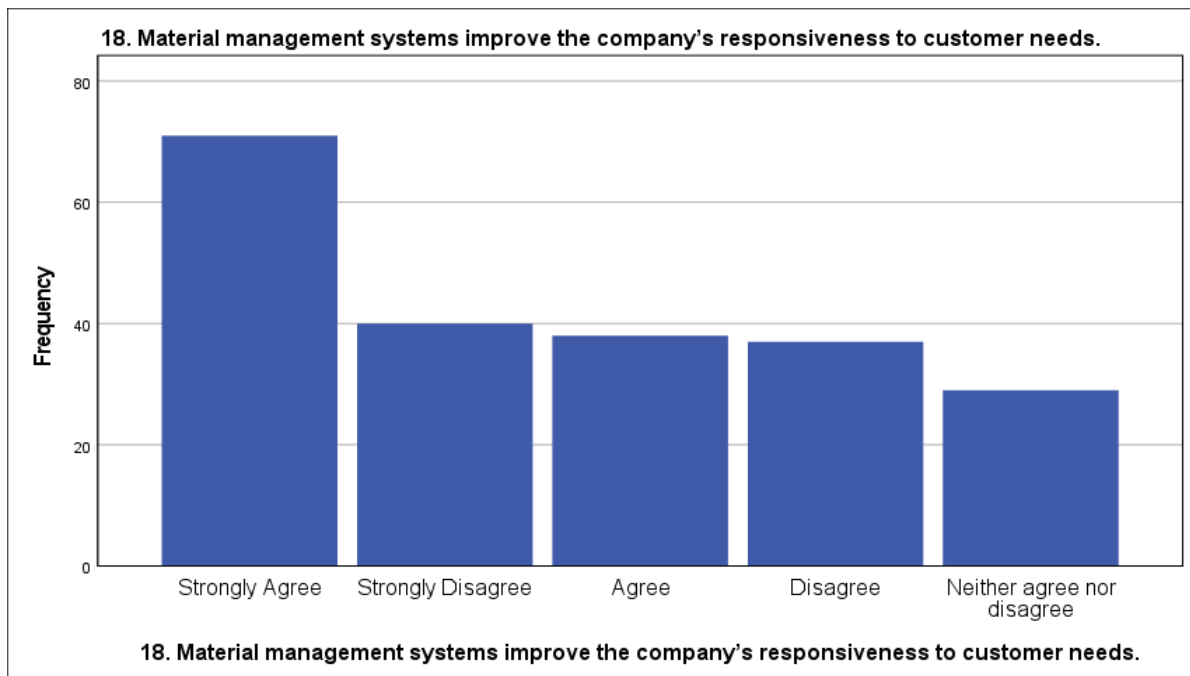


Figure 19: Graphical representation of material management systems improve the company's responsiveness to customer needs

- **Proper material utilization reduces waste and improves resource efficiency.**

Regarding the effect of proper material utilization on reducing waste and improving resource efficiency, participants' responses were mixed. A total of 72 participants (33.5%) strongly agreed and 37 participants (17.2%) agreed that proper material utilization enhances efficiency, indicating that just over half of respondents recognize its benefits. Meanwhile, 23 participants (10.7%) neither agreed nor disagreed, reflecting a neutral view. Conversely, 27 participants (12.6%) disagreed and 56 participants (26.0%) strongly disagreed, suggesting

that a notable portion of participants perceive challenges or gaps in current material utilization practices. Overall, while many participants acknowledge the positive impact of proper material use, the responses highlight opportunities for improving resource efficiency and minimizing waste.

Proper material utilization reduces waste and improves resource efficiency.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	72	33.5	33.5	33.5
	Strongly Disagree	56	26.0	26.0	59.5
	Agree	37	17.2	17.2	76.7
	Disagree	27	12.6	12.6	89.3
	Neither agree nor disagree	23	10.7	10.7	100.0
	Total	215	100.0	100.0	

Table 20: Statistical Description of proper material utilization reduces waste and improves resource efficiency.

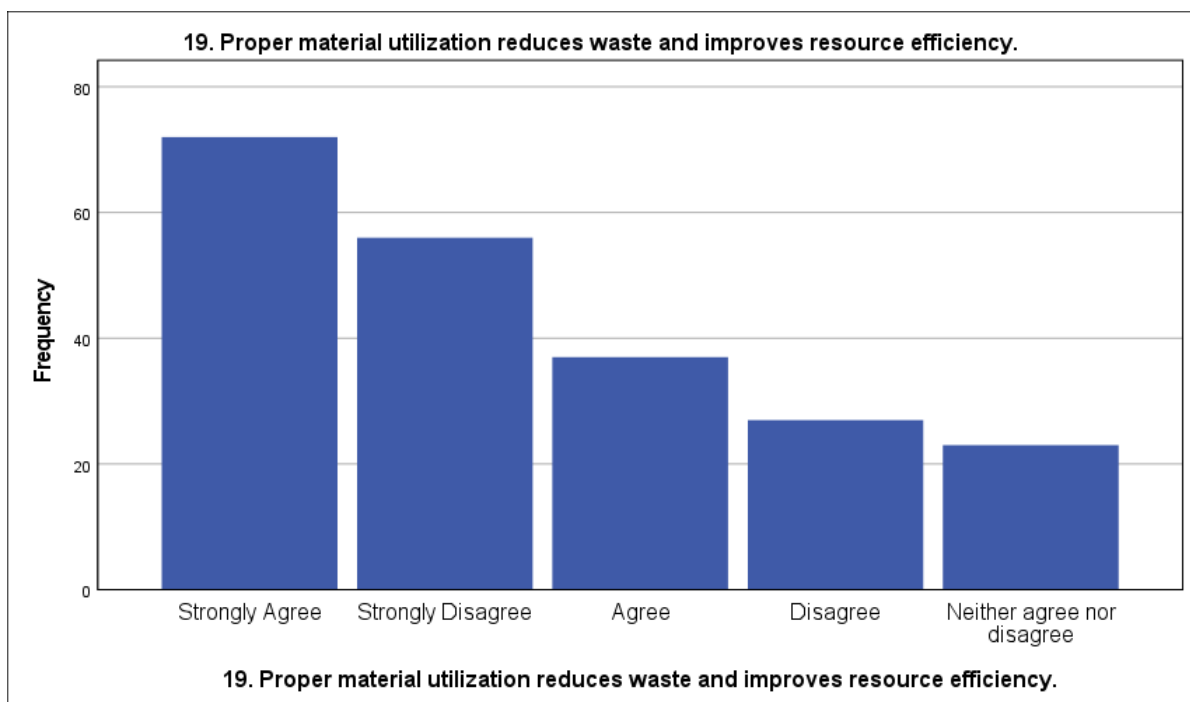


Figure 20: Graphical representation of proper material utilization reduces waste and improves resource efficiency

- **Effective material management practices contribute directly to improving operational efficiency.**

Regarding the contribution of effective material management practices to improving operational efficiency, participants' responses were generally positive

but varied. A total of 52 participants (24.2%) strongly agreed and 50 participants (23.3%) agreed that these practices directly enhance operational efficiency, indicating that nearly half of respondents perceive a clear benefit. Meanwhile, 53 participants (24.7%) neither agreed nor disagreed, reflecting a neutral stance. Conversely, 38 participants (17.7%) disagreed and 22 participants (10.2%) strongly disagreed, suggesting that a significant portion of participants perceive limitations in current material management practices' impact on efficiency. Overall, while many participants recognize the role of effective material management in improving operational performance, the responses indicate that further optimization may be needed to achieve consistent efficiency gains.

Effective material management practices contribute directly to improving operational efficiency.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neither agree nor disagree	53	24.7	24.7	24.7
	Strongly Agree	52	24.2	24.2	48.8
	Agree	50	23.3	23.3	72.1
	Disagree	38	17.7	17.7	89.8
	Strongly Disagree	22	10.2	10.2	100.0
	Total	215	100.0	100.0	

Table21 : Statistical Description of effective material management practices contribute directly to improving operational efficiency.

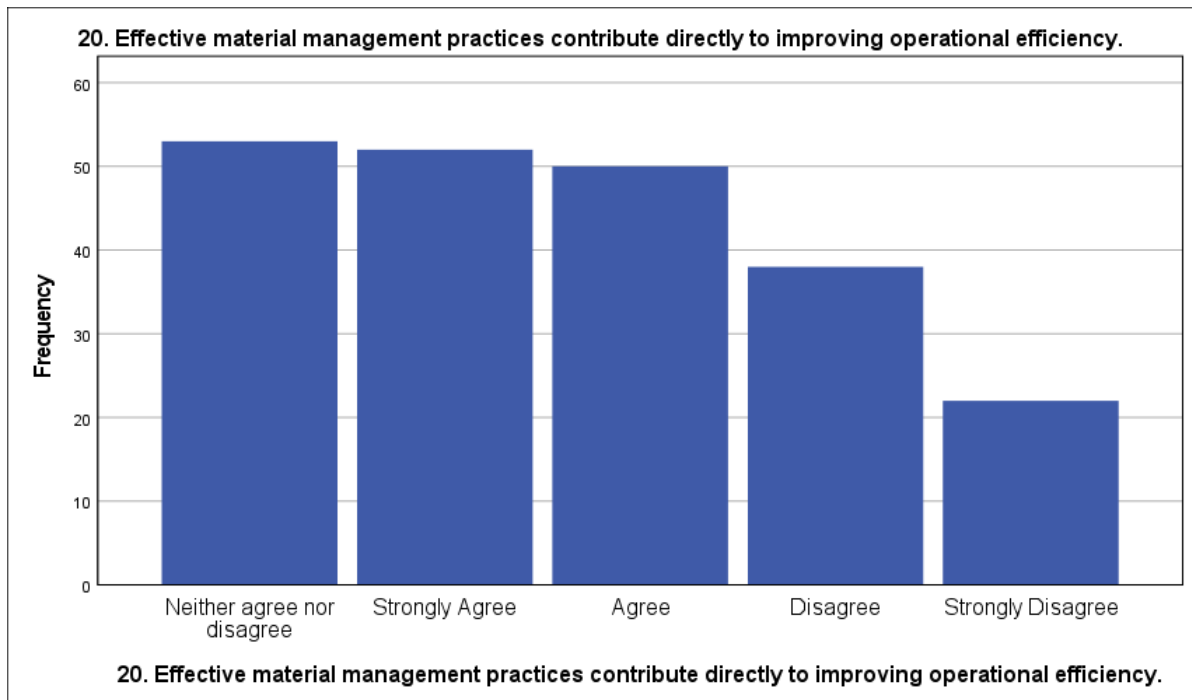


Figure21 : Graphical representation of effective material management practices contribute directly to improving operational efficiency

Data reliability and credibility:

The study collected data from 215 valid respondents, with no cases excluded, ensuring a complete dataset for analysis. This full participation enhances the reliability of the findings, as all survey items were answered by every participant. The use of listwise deletion confirms that only fully completed questionnaires were included in the analysis, which helps maintain the integrity of the results by preventing missing data from biasing the outcomes. The descriptive statistics of the demographic and material management-related questions reflect a diverse sample in terms of age, gender, and educational level, providing a comprehensive perspective on the practices and perceptions at Hitachi Energy Company in the Eastern Region of Saudi Arabia.

The reliability analysis of the 20 survey items yielded a Cronbach's Alpha of 0.906, indicating excellent internal consistency. This high alpha value suggests that the items consistently measure the underlying construct of material management practices and their impact on operational efficiency. In other words, the survey instrument is both reliable and credible, supporting confidence in the findings presented in the study. The combination of a complete dataset and strong reliability statistics strengthens the validity of the conclusions drawn, suggesting that the reported relationships between material management practices and operational efficiency accurately reflect the perceptions and experiences of the respondents.

Case Processing Summary			
		N	%
Cases	Valid	215	100.0
	Excluded ^a	0	.0
	Total	215	100.0

Table22 : Case Processing Summary.

Reliability Statistics	
Cronbach's Alpha	N of Items
.906	20

Table23 : Reliability Statistics.

Similar relationships in cross-tabulation analysis:

.1 The Relationship Between Material Planning and Operational Efficiency at Hitachi Energy Company

The chi-square analysis shows a statistically significant relationship between material planning and operational efficiency at Hitachi Energy Company. The Pearson Chi-Square value of 32.481 (df = 16, $p = 0.009$), along with the Likelihood Ratio (38.789, $p = 0.001$) and Linear-by-Linear Association (22.156, $p = 0.000$), indicates that better material planning practices are associated with higher operational efficiency. Although 36% of cells had expected counts below 5, the overall results suggest a meaningful link between accurate forecasting, effective material allocation, and improved operational outcomes, highlighting the importance of structured material planning in enhancing company performance.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	32.481 ^a	16	.009
Likelihood Ratio	38.789	16	.001
Linear-by-Linear Association	22.156	1	.000
N of Valid Cases	197		

Table 24: The Chi-Square test for the relationship between material planning and operational efficiency at Hitachi Energy Company.

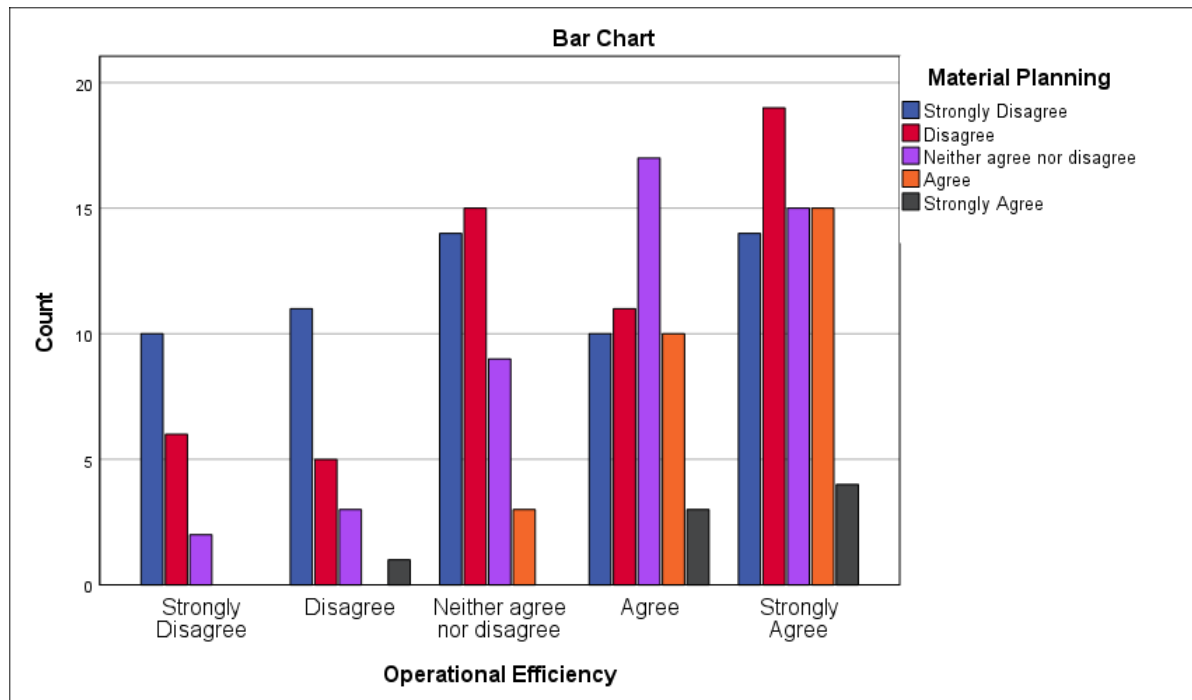


Figure 22: Symmetric measures in cross-table analysis for the relationship between material planning and operational efficiency at Hitachi Energy Company

2. Inventory Control Practices and Their Impact on Operational Efficiency: A Crosstabulation Study

The chi-square analysis indicates a statistically significant relationship between inventory control practices and operational efficiency at Hitachi Energy Company. The Pearson Chi-Square value of 39.198 (df = 16, $p = 0.001$), along with the Likelihood Ratio (48.675, $p = 0.000$) and Linear-by-Linear Association (29.117, $p = 0.000$), shows that effective inventory management is strongly associated with higher operational efficiency. Although 10 cells (40.0%) had expected counts below 5, with a minimum of 1.10, the results still demonstrate a meaningful connection, suggesting that regular stock reviews, organized storage, and accurate record-keeping play a critical role in enhancing productivity and reducing operational disruptions.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	39.198 ^a	16	.001
Likelihood Ratio	48.675	16	.000
Linear-by-Linear Association	29.117	1	.000
N of Valid Cases	197		

Table25 : Chi-Square Tests for Inventory Control Practices and Their Impact on Operational Efficiency: A Crosstabulation Study.

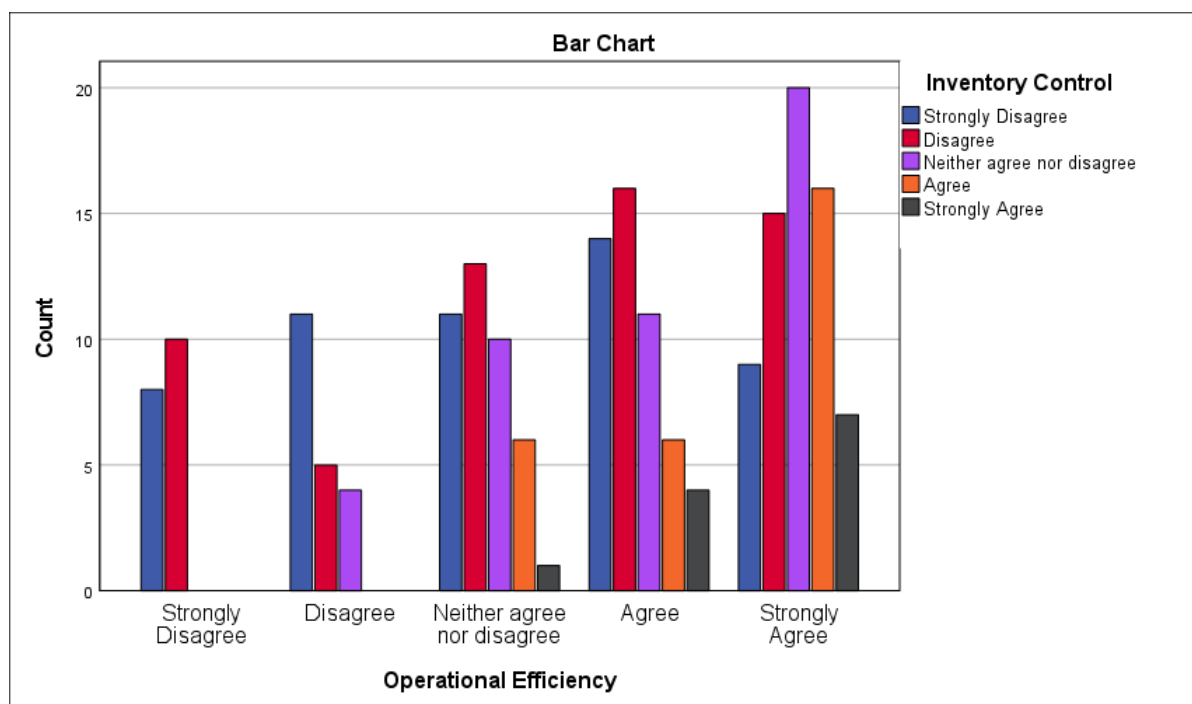


Figure 23: Symmetric measures in cross-table analysis for Inventory Control Practices and Their Impact on Operational Efficiency: A Crosstabulation Study

3. Supplier Relationship Management and Operational Efficiency: Evidence from Hitachi Energy Company

The chi-square analysis demonstrates a statistically significant relationship between supplier relationship management and operational efficiency at Hitachi Energy Company. The Pearson Chi-Square value of 38.139 (df = 16, $p = 0.001$), along with the Likelihood Ratio (42.928, $p = 0.000$) and Linear-by-Linear Association (18.206, $p = 0.000$), indicates that stronger supplier management practices are associated with higher operational efficiency. Although 9 cells

(36.0%) had expected counts below 5, with a minimum expected count of 0.64, the results suggest that maintaining reliable supplier relationships, timely deliveries, and effective supplier evaluation significantly contribute to smoother operations and improved production continuity.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	38.139 ^a	16	.001
Likelihood Ratio	42.928	16	.000
Linear-by-Linear Association	18.206	1	.000
N of Valid Cases	197		

Table 26: Chi-Square Tests for Supplier Relationship Management and Operational Efficiency: Evidence from Hitachi Energy Company.

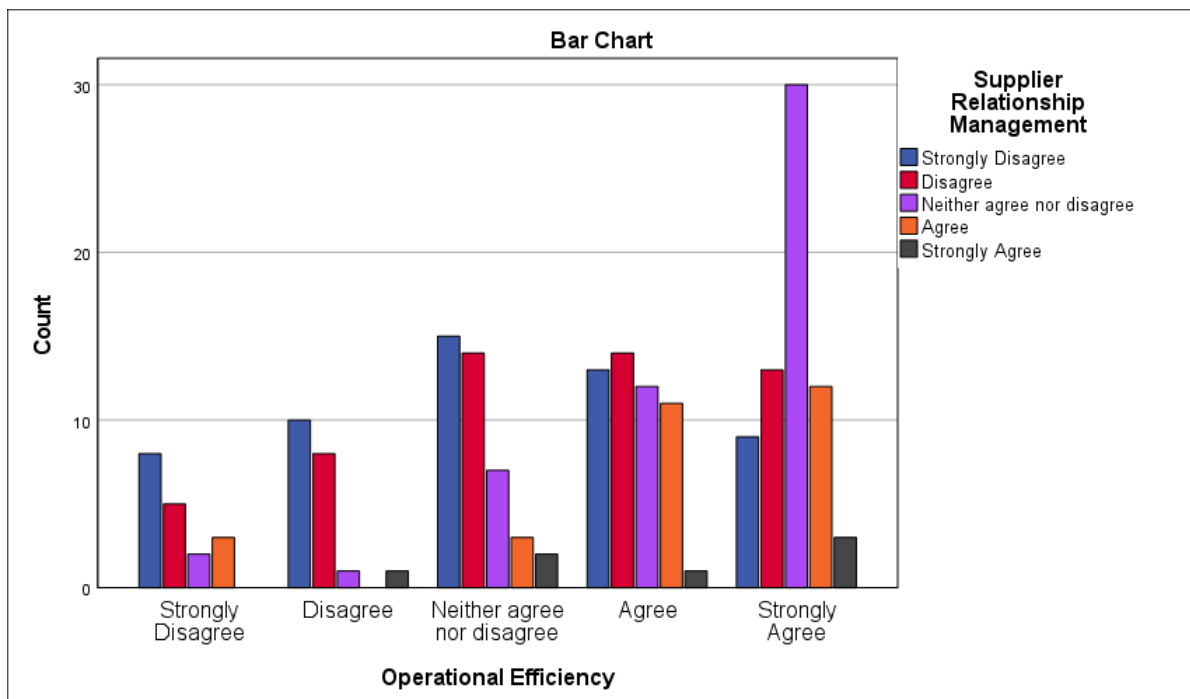


Figure 24: Symmetric measures in cross-table analysis for Supplier Relationship Management and Operational Efficiency: Evidence from Hitachi Energy Company

- One-Way ANOVA:

The One-Way ANOVA results indicate that the combined model of material planning, supplier relationship management, and inventory control significantly predicts operational efficiency at Hitachi Energy Company. The regression model shows a sum of squares of 109.251 with 12 degrees of freedom, producing an F-value of 7.710 and a significance level of 0.000, confirming that the predictors collectively explain a significant portion of the variance in operational efficiency. The Bayes Factor analysis further supports this result, with a Bayes Factor of 2,431,042.146, indicating extremely strong evidence in favor of the model over the null. The model accounts for 33.5% of the variance in operational efficiency ($R^2 = 0.335$, Adjusted $R^2 = 0.291$), demonstrating that effective material management practices—including planning, supplier relationship management, and inventory control—substantially contribute to enhancing operational performance.

ANOVA ^{a,b}					
Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	109.251	12	9.104	7.710	.000
Residual	217.277	184	1.181		
Total	326.528	196			

Table27 : ANOVA^{a,b}.

Bayes Factor Model Summary ^{a,b}				
Bayes Factor ^c	R	R Square	Adjusted R Square	Std. Error of the Estimate
2431042.146	.578	.335	.291	1.09

Table28 : Bayes Factor Model Summary^{a,b}.

Discussion

The results of this study indicate a significant relationship between material management practices and operational efficiency at Hitachi Energy Company in the Eastern Region of Saudi Arabia. Specifically, the findings suggest that effective material management practices—including procurement efficiency, inventory control, storage organization, and supply chain coordination—positively influence key operational efficiency indicators, such as production output, workflow optimization, cost reduction, and reduction in downtime. This aligns with prior research emphasizing that well-structured material management is essential for minimizing resource waste, ensuring timely availability of materials, and enhancing overall productivity. The positive correlation found in this study underscores the critical role of systematic and proactive management of materials in improving operational outcomes.

The discussion also highlights that among the various dimensions of material management practices, inventory control and procurement efficiency had the most pronounced impact on operational performance. Proper inventory management ensures that materials are available when needed without causing excess stock accumulation, which can tie up capital and storage resources. Similarly, efficient procurement processes reduce delays in the supply chain and prevent production bottlenecks, demonstrating that timely and well-coordinated material acquisition is a cornerstone of operational efficiency. These findings suggest that investment in digital inventory systems, supplier relationship management, and process standardization can yield measurable improvements in operational performance.

The study's results indicate that employee knowledge and engagement in material management practices are crucial factors influencing operational outcomes. Departments where staff demonstrated higher adherence to best practices in material handling and supply coordination tended to exhibit better efficiency metrics. This finding highlights the importance of training programs, continuous skills development, and fostering a culture of accountability and process awareness among employees. When staff understand the operational impact of material management practices and are equipped with the right tools, they can actively contribute to reducing errors, minimizing delays, and optimizing workflows.

The discussion considers the broader implications of these results for organizational strategy. The positive impact of material management on operational efficiency suggests that Hitachi Energy should treat material

management not merely as an operational necessity but as a strategic function that supports productivity, cost control, and competitive advantage. Integrating material management practices into strategic planning, performance monitoring, and continuous improvement initiatives can create a feedback loop that enhances decision-making, resource allocation, and overall operational resilience. The findings also point to potential areas for future research, such as examining the long-term impact of digitalization and automation in material management or exploring comparative efficiency across different regions or branches of the company.

The study's results confirm that robust material management practices are a key driver of operational efficiency. By prioritizing procurement, inventory control, employee training, and continuous monitoring, Hitachi Energy can achieve significant improvements in production performance, cost savings, and overall workflow optimization. These insights provide both theoretical support for the link between material management and operational efficiency and practical guidance for enhancing operational effectiveness within the organization.

Conclusion

The findings of this study provide clear evidence that effective material management practices have a significant and positive impact on operational efficiency at Hitachi Energy Company in the Eastern Region of Saudi Arabia. The study confirms that strategic management of materials—including procurement procedures, inventory control, storage organization, and supply chain coordination—plays a critical role in ensuring smooth operational processes, reducing production delays, minimizing costs, and enhancing overall workflow efficiency. Employees' adherence to best practices and the efficiency of departmental systems were shown to directly influence measurable operational outcomes, highlighting the interdependence between well-structured material management and organizational performance.

Among the various components of material management, inventory control and procurement efficiency were identified as particularly influential. Effective inventory management prevents shortages and overstocking, which not only conserves resources but also supports consistent production schedules. Efficient procurement processes ensure timely acquisition of materials, reduce supply chain disruptions, and contribute to overall operational reliability. These findings suggest that investment in modern inventory systems, process standardization, and supplier relationship management can produce tangible improvements in operational performance.

The study emphasizes the importance of employee competence and engagement in material management practices. Staff knowledge, adherence to procedures, and active participation in operational processes were found to significantly enhance efficiency outcomes. This indicates that training programs, capacity-building initiatives, and ongoing employee development are crucial for sustaining high performance in material management and operational efficiency.

The study concludes that material management should be regarded as a strategic function rather than a purely operational activity. When effectively integrated into organizational planning, monitoring, and continuous improvement initiatives, material management practices can serve as a key driver of productivity, cost-effectiveness, and competitive advantage. The study's results provide actionable insights for Hitachi Energy Company, demonstrating that by optimizing procurement, inventory control, and employee involvement, the organization can achieve measurable improvements in

operational efficiency, while also laying the groundwork for long-term sustainable performance.

Recommendations

Based on the findings of this study, several recommendations are proposed to enhance material management practices and, consequently, improve operational efficiency at Hitachi Energy Company in the Eastern Region of Saudi Arabia. First, it is recommended that the company strengthen its inventory management systems by adopting advanced digital tracking tools and automated monitoring processes. This will minimize stock discrepancies, reduce delays in production caused by material shortages, and optimize storage space, contributing to smoother operational workflows. Implementing real-time inventory monitoring can also improve decision-making by providing managers with accurate and timely information regarding material availability and usage trends.

Second, the study highlights the importance of streamlining procurement processes. It is recommended that Hitachi Energy develop standardized procurement protocols, establish clear supplier performance metrics, and negotiate long-term agreements with reliable suppliers to ensure timely and cost-effective material acquisition. Efficient procurement not only reduces operational downtime but also minimizes excess costs, thereby enhancing overall efficiency. Additionally, integrating procurement activities with other operational departments can foster better coordination, reduce redundancies, and ensure alignment with production schedules.

Third, the company should focus on employee training and capacity building in material management. The results indicate that employees' knowledge and skills significantly influence the effectiveness of material handling practices. Regular training programs, workshops, and knowledge-sharing sessions can equip staff with modern management techniques, safety protocols, and best practices in inventory control and supply chain management. By empowering employees with the right tools and expertise, the company can improve process consistency, reduce errors, and enhance operational productivity.

It is recommended that Hitachi Energy adopt a continuous monitoring and evaluation system to assess the impact of material management practices on operational performance. By regularly reviewing key performance indicators

(KPIs) such as production output, downtime frequency, and cost efficiency, management can identify areas for improvement, respond proactively to operational challenges, and implement corrective measures promptly. Establishing a feedback loop between operational teams and management ensures that material management practices remain dynamic, effective, and aligned with the company's strategic objectives.

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Appendices

Questionnaire

Dear Mr. / Ms,..... .

I would like to inform you that I am a student at Midocean University – College of Management, currently pursuing a Master of Business Administration (MBA). I am conducting a research study titled “The Impact of Material Management Practices on Operational Efficiency: An Applied Study on Industrial Facilities in the Eastern Region of Saudi Arabia” as part of the academic requirements for completing my MBA .program

Given the importance of your insights and professional experience, I kindly request your participation in completing this survey. Please be assured that all responses will remain strictly confidential and will be used solely for academic research purposes. Your honest input is highly valuable and will significantly contribute to achieving accurate and .meaningful results in this study

.Thank you very much for your cooperation and support

,Sincerely

Ibraheem Al Reedi

MBA Candidate

College of Management, Midocean University

Questions	Answer				
1- General questions					
1- Age	20-30	30-40	40-50	50-60	60+
2- Gender	Male	Female			
3- Educational Level	Secondary school certificate	Bachelor's degree	Postgraduate degree	Master's	Doctorate
2- Survey questions					
4. The company effectively plans material requirements based on accurate demand forecasts.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
5. Inventory levels are regularly reviewed to prevent shortages or excess stock.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
6. The company maintains accurate and up-to-date records of all materials.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
7. Procurement decisions are based on cost, quality, and supplier reliability.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
8. There is a clear process for selecting and evaluating suppliers.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
9. Long-term relationships with suppliers help ensure timely delivery of materials.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
10. The company uses technology (e.g., ERP systems) to track and manage material flow.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
11. Storage facilities are organized to ensure easy access and minimal material loss.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
12. Safety and quality standards are consistently applied in material handling and storage.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
13. Communication between procurement, warehousing, and production departments is efficient.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
14. Material management practices help reduce operational delays.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
15. Effective material planning contributes to lower operational costs.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
16. Efficient inventory control enhances the overall productivity of the company.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
17. Reliable supplier management positively impacts production continuity.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

18. Material management systems improve the company's responsiveness to customer needs.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
19. Proper material utilization reduces waste and improves resource efficiency.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
20. Effective material management practices contribute directly to improving operational efficiency.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

- <https://docs.google.com/forms/d/e/1FAIpQLSfv9wtHCqbwCKf0EtH1EK3gdPzEEzCbRMmCBj8h8exPwHaEgg/viewform>

الملخص

تهدف هذه الدراسة إلى تحليل أثر ممارسات إدارة المواد على الكفاءة التشغيلية في المنشآت الصناعية، من خلال دراسة تطبيقية على شركة هيتاشي إنرجي في المنطقة الشرقية بالمملكة العربية السعودية. وتبرز أهمية الدراسة في الدور المحوري الذي تلعبه إدارة المواد في تحقيق التميز التشغيلي من خلال التخطيط الفعال للمخزون، وتطبيق الأنظمة الرقمية الحديثة، وتحسين التنسيق عبر سلسلة الإمداد.

اعتمدت الدراسة على المنهج الوصفي التحليلي، وتم جمع البيانات باستخدام استبيان موجه إلى العاملين في إدارات المستودعات واللوجستيات وإدارة المواد. تم تحليل البيانات باستخدام برنامج SPSS من خلال الإحصاءات الوصفية، وتحليل الارتباط، واختبار الفرضيات، وتحليل التباين (ANOVA).

أظهرت النتائج وجود علاقة إيجابية قوية بين ممارسات إدارة المواد والكفاءة التشغيلية، حيث ساهم التخطيط الجيد للمخزون، وتبني تقنية RFID، ودقة صرف المواد في رفع مستوى الإنتاجية وتقليل التكاليف وتحسين جودة العمليات. كما تبين أن التحديات الإدارية والتنظيمية مثل ضعف التنسيق ونقص التدريب والدمج الجزئي للأنظمة الرقمية تؤثر سلباً على الأداء التشغيلي.

خلصت الدراسة إلى أن إدارة المواد تمثل عاملاً استراتيجياً لتحقيق أهداف رؤية المملكة 2030 من خلال دعم النمو الصناعي المستدام وتعزيز التنافسية. وأوصت بضرورة تعزيز التكامل الرقمي، وتطوير قدرات العاملين، وتحسين التعاون بين الإدارات لتحقيق الاستخدام الأمثل للموارد ورفع كفاءة الأداء التشغيلي.

الكلمات المفتاحية: إدارة المواد، الكفاءة التشغيلية، تقنية RFID، سلسلة الإمداد، تخطيط المخزون، رؤية 2030، هيتاشي إنرجي

عنوان البحث

أثر ممارسات إدارة المواد على تحسين الكفاءة التشغيلية في المصانع الصناعية – دراسة تطبيقية على شركة هيتاشي
إنرجي في المنطقة الشرقية

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