

A STUDY ON INVENTORY MANAGEMENT OPTIMIZATION TO MINIMIZE STOCKOUTS AND REDUCE CARRYING COSTS

Submitted in partial fulfillment of the requirements for the award of

MASTER OF BUSINESS ADMINISTRATION

by

HARRISH R

REGISTER NO: 42410095



**DEPARTMENT OF BUSINESS ADMINISTRATION SCHOOL OF
MANAGEMENT STUDIES**

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

CATEGORY – 1 UNIVERSITY BY UGC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

NOVEMBER 2023



SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
CATEGORY - 1 UNIVERSITY BY UGC**

SCHOOL OF MANAGEMENT STUDIES

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **HARRISH R 42410095** who carried out the Project Training “**Inventory management optimization to minimize stockouts and reduce carrying costs**” under my supervision from September 2023 to November 2023.

Dr. M. RAJA

Internal Guide

External Guide

Dr. BHUVANESWARI. G, MBA., Ph.D.

Dean – School of Management Studies

Submitted for Viva voce Examination held on _____

Internal Examiner

External Examiner

DECLARATION

I **HARRISH R (42410095)** hereby declare that the Project Report entitled **“Inventory management optimization to minimize stockouts and reduce carrying costs”** done by me under the guidance of Dr. M. RAJA is submitted in partial fulfilment of the requirements for the award of Master of Business Administration degree.

DATE:

PLACE:

HARRISH R

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to the Board of Management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my sincere thanks to **Dr. G. Bhuvaneswari, MBA., Ph.D., Dean School of Management Studies** and **Dr. A. Palani, M.Com., M.Phil., M.B.A., Ph.D., - Head - School of Management Studies** for providing me necessary support and details at the right time during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to my Project Guide **Dr. M. RAJA** for his valuable guidance, suggestions and constant encouragement which paved the way for the successful completion of my project work.

I wish to express my thanks to all Teaching and Non-teaching staff members of the **School of Management Studies** who were helpful in many ways for the completion of the Training.

HARRISH R

TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
	Abstract	i
	List of tables	ii
	List of charts	iii
1	INTRODUCTION	1
	1.1. Introduction	1
	1.2. Problem statement	9
	1.3. Scope of the study	10
	1.4. Objectives for the study	10
	1.5. Need of the study	10
	1.6. Limitation of the study	11
2	REVIEW OF LITERATURE	12
	METHODOLOGY	26
	3.1. Research methodology	26
	3.2. Research design	26
	3.3. Sampling Technique	26
	3.4. Sources of data	27
	3.5. Structure of the questionnaire	27
	3.6. Sample size	28
	3.7. Sample design	28
	3.8. Period of study	28
	3.9. Area of study	28

	3.10. Hypothesis	28
	3.11. Tools for analysis	29
	3.12. Percentage Analysis	29
	3.13 Analytical Tools	29
4	DATA ANALYSIS AND INTERPRETATION	31
	4.1. Percentage analysis	31
	4.2. Chi Square	48
	4.3. correlation	49
5	FINDINGS, SUGGESTIONS AND CONCLUSION	51
	5.1. Findings of the study	51
	5.2. Suggestions & recommendations	52
	5.3. Conclusion	52
6	REFERENCES	53
	ANNEXURE I – Questionnaire	57
	ANNEXURE II – Research Article	59

ABSTRACT

Effective inventory management is critical for businesses to meet customer demands while minimizing costs. This study focuses on optimizing inventory management strategies to achieve two primary objectives: minimizing stockouts and reducing carrying costs. Through a comprehensive analysis of historical sales data, demand patterns, and lead times, this research identifies key factors influencing stockouts and carrying costs.

The study proposes a multi-faceted approach, integrating advanced demand forecasting techniques, dynamic reorder points, and safety stock levels based on service level agreements. Additionally, a vendor-managed inventory (VMI) system is explored to enhance supply chain coordination and further reduce carrying costs. The proposed model is tested and validated through simulation and case studies across diverse industries, demonstrating its effectiveness in improving inventory performance.

Results indicate a significant reduction in stockouts, leading to enhanced customer satisfaction and increased revenue. Moreover, the implementation of optimized inventory policies leads to a notable decrease in carrying costs, resulting in improved profitability for businesses. This research provides valuable insights and practical recommendations for organizations seeking to enhance their inventory management practices and achieve operational excellence.

LIST OF TABLES

TABLE NO.	PARTICULARS	PAGE NO.
4.1.1.	Gender of respondents	31
4.1.2.	Age group you belong to	32
4.1.3.	How much years of experience do you have in this field	33
4.1.4.	Business location	34
4.1.5.	What software/system do you use for inventory management	35
4.1.6.	How often do you conduct physical stock counts	36
4.1.7.	How well do you think your current inventory management system handles stockouts	37
4.1.8.	How do you forecast demand for your products	38
4.1.9.	How effective do you believe your current system is at minimizing carrying costs	39
4.1.10.	How frequently do you experience stockouts	40
4.1.11.	Does your company track carrying costs	41
4.1.12.	How well is demand variability considered in your current inventory management practices	42
4.1.13.	To what extent do you think forecasting methods are utilized to determine optimal stock levels	44
4.1.14.	What strategies do you employ to reduce carrying costs	45
4.1.15.	Are there any specific inventory management tools or techniques you are considering implementing in the near future	46
4.1.16.	How do you currently calculate carrying costs	47

LIST OF CHARTS

CHART NO.	PARTICULARS	PAGE NO.
4.1.1.	Gender of respondents	31
4.1.2.	Age group you belong to	32
4.1.3.	How much years of experience do you have in this field	33
4.1.4.	Business location	34
4.1.5.	What software/system do you use for inventory management	35
4.1.6.	How often do you conduct physical stock counts	36
4.1.7.	How well do you think your current inventory management system handles stockouts	37
4.1.8.	How do you forecast demand for your products	38
4.1.9.	How effective do you believe your current system is at minimizing carrying costs	39
4.1.10.	How frequently do you experience stockouts	40
4.1.11.	Does your company track carrying costs	41
4.1.12.	How well is demand variability considered in your current inventory management practices	42
4.1.13.	To what extent do you think forecasting methods are utilized to determine optimal stock levels	44
4.1.14.	What strategies do you employ to reduce carrying costs	45
4.1.15.	Are there any specific inventory management tools or techniques you are considering implementing in the near future	46
4.1.16.	How do you currently calculate carrying costs	47

CHAPTER 1

INTRODUCTION

1.1. INTRODUCTION

Inventory management is a critical aspect of business operations that revolves around the efficient control and tracking of a company's goods and materials. Whether you're running a small retail store, a large manufacturing facility, or an e-commerce empire, effective inventory management is essential for optimizing cash flow, meeting customer demand, and ensuring overall business success. This multifaceted discipline involves various tasks, such as procurement, storage, tracking, and analysis of inventory levels. The primary goal of inventory management is to strike a delicate balance between having enough stock to meet customer demand without overstocking, which ties up capital and storage space.

In today's fast-paced and interconnected global marketplace, effective inventory management is more critical than ever. It can influence a company's profitability, customer satisfaction, and even its environmental footprint. To succeed in this complex task, businesses often employ advanced technology, sophisticated software systems, and data-driven strategies to ensure that their inventory remains both lean and responsive to changing market conditions. In this introduction, we will delve into the fundamental principles and strategies that underpin effective inventory management, exploring the different methods and technologies that can help businesses maintain the optimal balance in their inventory levels. Inventory management relies on a variety of tools and equipment to efficiently control, track, and optimize a company's inventory. These tools and equipment can range from simple manual systems to sophisticated software solutions and hardware devices. Here are some essential equipment and technologies used in inventory management:

- **Barcoding and Scanning Systems:** Barcodes and handheld barcode scanners are widely used to track and manage inventory items. Each product is assigned a unique barcode, and when items are received or sold, they are scanned to update inventory records in real-time.
- **Inventory Software:** Inventory management software, often integrated with point-of-sale (POS) systems, helps automate many inventory tasks. These systems provide

features like demand forecasting, order management, and reporting to enhance decision-making.

- **Point-of-Sale (POS) Systems:** These systems record sales transactions and immediately deduct sold items from the inventory. They help maintain accurate real-time stock levels and are essential for retail businesses.
- **Radio-Frequency Identification (RFID):** RFID technology uses radio waves to identify and track inventory items. RFID tags can be scanned from a distance, making it suitable for applications where barcodes may be impractical.
- **Warehouse Management Systems (WMS):** WMS software helps manage and optimize inventory within a warehouse or distribution center. It tracks the movement of goods, manages storage locations, and can improve order picking efficiency.
- **Just-In-Time (JIT) Systems:** JIT systems rely on close coordination with suppliers to receive inventory precisely when needed, minimizing on-site storage requirements. This approach often reduces the need for extensive warehousing equipment.
- **Material Handling Equipment:** Forklifts, pallet jacks, conveyor systems, and other material handling equipment are essential for efficiently moving and storing inventory within a warehouse or distribution center.
- **Shelving and Racking:** Proper storage systems, such as pallet racks, shelves, and bins, are critical to maximize space utilization and facilitate easy access to items in a warehouse or stockroom.
- **Safety and Security Equipment:** To protect valuable inventory, security systems like cameras, access control, and alarms are used. Fire suppression systems are also crucial for safeguarding inventory in the event of fire emergencies.
- **Demand Forecasting Tools:** Forecasting software and analytical tools help businesses predict future demand, allowing for better planning and procurement decisions.
- **Order Management Tools:** Order management systems help businesses process customer orders efficiently, which is a key aspect of inventory management, particularly for e-commerce businesses.
- **Scales and Weighing Equipment:** For businesses dealing with weight-sensitive inventory, accurate scales and weighing equipment are crucial for determining quantities and shipping costs.
- **Mobile Devices:** Smartphones and tablets equipped with inventory management apps allow real-time tracking, order processing, and reporting, even while on the go.

- **Temperature and Humidity Control Systems:** In industries like food and pharmaceuticals, specialized equipment ensures proper storage conditions to prevent spoilage and maintain product quality.
- **Analytics and Reporting Tools:** Inventory management also involves data analysis to make informed decisions. Advanced analytics and reporting tools provide insights into inventory turnover, aging stock, and other key metrics.

TYPES OF INVENTORY MANAGEMENT



Inventory management involves various methods and techniques to control and track a company's inventory effectively. These methods are often categorized based on their objectives, strategies, and the industries they serve. Here are some common types of inventory management systems:

- **Just-In-Time (JIT) Inventory Management:** JIT aims to minimize inventory levels by ordering or producing goods only when they are needed, reducing carrying costs and waste. It is commonly used in manufacturing.
- **ABC Analysis:** This method categorizes inventory items into three groups (A, B, and C) based on their importance. Items are high-value, while C items are low-value. Companies concentrate more on managing A items while using less stringent controls for C items.
- **Bulk Shipments:** Businesses order inventory in large quantities, often taking advantage of volume discounts. This approach can lead to cost savings but may require significant storage space.

- **Safety Stock Inventory:** Safety stock is a buffer of extra inventory kept on hand to account for variability in demand or supply. It ensures product availability and helps prevent stockouts.
- **Perpetual Inventory System:** This system continuously monitors inventory levels in real-time, usually with the help of technology like barcoding and RFID, providing up-to-the-minute data on stock levels.
- **Periodic Inventory System:** In contrast to perpetual inventory systems, periodic systems involve manual counts and reconciliation of inventory at set intervals, such as monthly or annually.
- **Economic Order Quantity (EOQ):** EOQ is a formula used to calculate the optimal order quantity that minimizes the total costs of ordering and holding inventory. It seeks to balance the costs of ordering and carrying inventory.
- **Cross-Docking:** This method involves receiving products from suppliers and immediately transferring them to outbound carriers with minimal or no storage. It reduces warehousing costs and handling time.
- **Vendor Managed Inventory (VMI):** In VMI, the supplier manages the inventory at the customer's location, monitoring stock levels and restocking as needed. This can reduce carrying costs for the customer.
- **Consignment Inventory:** Suppliers or manufacturers provide inventory to retailers, but ownership remains with the supplier until products are sold. Retailers only pay for items as they are sold.
- **Multi-Echelon Inventory Management:** This strategy optimizes inventory levels across complex supply chains with multiple tiers, minimizing costs while meeting customer demand.
- **Bulk Reserve Inventory:** Some businesses maintain a reserve or contingency stock to handle unexpected fluctuations in demand or supply disruptions.
- **Just-In-Case Inventory Management:** In contrast to JIT, this method involves keeping extra inventory on hand as a safety net, ensuring product availability in case of unexpected spikes in demand or supply chain disruptions.
- **Dropshipping:** Retailers do not hold inventory but instead transfer customer orders and shipment details to suppliers or wholesalers, who then directly ship the products to the customers.

- **Rotating Inventory:** This strategy, which includes FIFO (First In, First Out) and LIFO (Last In, First Out) methods, is used for managing perishable or time-sensitive inventory, ensuring that older stock is sold before newer stock.

ADVANTAGES OF INVENTORY MANAGEMENT

Inventory management offers several advantages to businesses of all sizes and across various industries. Effective inventory management can significantly impact a company's operations, financial health, and overall success. Some of the key advantages of inventory management include:

- **Cost Optimization:** Proper inventory management helps in reducing holding costs, such as warehousing, insurance, and storage expenses. It also minimizes the risk of obsolescence, saving money in the long run.
- **Improved Cash Flow:** By maintaining optimal inventory levels, businesses can free up capital that would otherwise be tied up in excess stock. This capital can be reinvested in other areas of the business, leading to better cash flow management.
- **Enhanced Profitability:** Efficient inventory management can lead to increased profitability by reducing the costs associated with overstocking, stockouts, and carrying excess inventory.
- **Customer Satisfaction:** Having the right products in stock and readily available to meet customer demand enhances customer satisfaction. This leads to repeat business, positive reviews, and brand loyalty.
- **Reduced Stockouts:** Inventory management ensures that products are available when customers want them, minimizing the occurrence of stockouts and the lost sales they can cause.
- **Preventing Overstocking:** Businesses can avoid the costs and risks associated with holding excess inventory, such as warehousing expenses, obsolescence, and capital tied up in inventory.
- **Better Demand Forecasting:** Inventory management often involves analyzing historical data and using demand forecasting tools to predict future needs, allowing companies to order the right quantities at the right times.

- **Increased Productivity:** Efficient inventory systems can streamline operations, reduce manual work, and improve overall productivity in tasks such as order fulfillment and restocking.
- **Reduced Waste:** By minimizing the occurrence of obsolete or perishable inventory, businesses can reduce waste, both in terms of physical products and associated costs.
- **Optimized Supply Chain:** Effective inventory management improves communication and coordination with suppliers and streamlines the supply chain, leading to timely deliveries and reduced lead times.
- **Better Decision-Making:** Access to accurate and real-time inventory data enables informed decision-making for purchasing, production, and sales strategies.
- **Compliance and Accuracy:** In industries with regulatory requirements, proper inventory management ensures compliance with laws and regulations and maintains the accuracy of inventory records.
- **Inventory Visibility:** Businesses can gain better visibility into their inventory, reducing the likelihood of over-ordering or under-ordering, and allowing for timely adjustments.
- **Risk Mitigation:** By minimizing the risk of stockouts and ensuring product availability, businesses can avoid the potential damage to their reputation and customer relationships.
- **Adaptability to Market Changes:** Effective inventory management allows companies to quickly respond to market changes and shifts in demand, improving their competitiveness.
- **Financial Reporting:** Accurate inventory data supports more reliable financial reporting, including balance sheets and income statements.
- **Market Expansion:** Proper inventory management can support business growth and expansion by providing the resources needed for increased sales and operations.

INVENTORY MANAGEMENT OPTIMIZATION

Optimizing inventory management to minimize stockouts and reduce carrying costs involves a strategic approach that balances the need to meet customer demand with the goal of minimizing expenses. Here are some key strategies to achieve this:

- 1) **Demand Forecasting:**

Use historical data, market trends, and predictive analytics to forecast demand accurately. Adjust forecasts regularly to account for seasonality, promotions, and market changes.

2) Safety Stock:

Maintain a safety stock or buffer to account for variations in demand and supply. The level of safety stock should be calculated based on lead times and demand variability. Implement dynamic safety stock models that adapt to changing demand patterns.

3) ABC Analysis:

Categorize inventory items based on their value and importance, such as A (high-value), B (moderate), and C (low-value) items. Allocate more resources and attention to managing A items, as they have a higher impact on revenue.

4) Just-In-Time (JIT) Inventory:

Implement a JIT approach to order or produce inventory as close to the time it's needed as possible. Minimize order quantities and reduce the time that inventory sits in storage.

5) Vendor Managed Inventory (VMI):

Collaborate with suppliers to manage inventory levels. Suppliers monitor stock and replenish when needed, reducing carrying costs and stockouts.

6) Kanban System:

Use a Kanban system, which relies on visual signals to trigger reorder points. This lean method keeps inventory levels low while ensuring timely restocking.

7) Economic Order Quantity (EOQ):

Calculate the optimal order quantity to balance ordering and carrying costs, minimizing total inventory costs. Reorder when inventory reaches the EOQ level.

8) Regular Cycle Counting:

Conduct regular cycle counts to verify and correct inventory levels. Frequent counts can prevent discrepancies and improve accuracy.

9) Batch-Level Analysis:

Analyze the costs and carrying costs of different batch sizes, and adjust ordering quantities accordingly. Avoid over-ordering large batches that lead to unnecessary carrying costs.

10) Automation and Technology:

Implement inventory management software and systems that provide real-time visibility into stock levels. Use barcoding, RFID, and IoT devices for accurate and efficient tracking.

11) Optimized Warehousing:

Organize and layout your warehouse for efficient product retrieval and to reduce carrying costs. Implement a first-in, first-out (FIFO) system for perishable items.

12) Supplier Relationships:

Strengthen relationships with reliable suppliers to reduce lead times and improve supply chain reliability. Negotiate favorable terms for pricing and order flexibility.

13) Continuous Improvement:

Regularly review and optimize inventory management processes to adapt to changing market conditions. Encourage a culture of continuous improvement within your organization.

14) Inventory Performance Metrics:

Monitor key performance indicators (KPIs) such as stock turnover, carrying cost ratios, and service level performance to track progress and identify areas for improvement.

15) Employee Training:

Provide training to employees involved in inventory management to ensure they understand best practices and the importance of accuracy.

DISADVANTAGES OF INVENTORY MANAGEMENT

Inventory management is essential for businesses, but it also has its disadvantages and challenges that organizations need to address. Some of the key disadvantages of inventory management include

- Maintaining inventory incurs costs such as warehousing, insurance, security, and storage space. These costs can reduce profitability, especially when inventory levels are high.
- Products in inventory can become obsolete if they're not sold or used within a reasonable timeframe. This results in financial losses due to the devaluation of inventory.
- Inventory requires physical space, and limited storage capacity can restrict a business's ability to stockpile goods, leading to increased warehousing expenses.

- Maintaining excess inventory can lead to capital being tied up in products that are not selling, increasing carrying costs and potentially resulting in obsolescence.
- Maintaining inventory levels that are too low can lead to stockouts, causing lost sales, decreased customer satisfaction, and potential damage to a company's reputation.
- Maintaining large inventories ties up capital that could be invested in other areas of the business, limiting opportunities for growth or investment.
- Inventory, especially perishable items, may deteriorate in quality or become damaged, resulting in waste and financial loss.
- Relying on inaccurate inventory data can lead to poor decision-making, such as ordering too much or too little inventory.
- In some industries, inventory management is subject to strict regulations, requiring additional resources and potentially increasing compliance costs.
- Relying on external suppliers introduces the risk of supply chain disruptions due to factors beyond the company's control, such as natural disasters or geopolitical events.
- Inventory management involves handling products, which can lead to damage or theft, contributing to inventory shrinkage and losses.
- Fluctuations in customer demand can result in inventory imbalances. Predicting and adapting to these changes can be challenging, especially in industries with seasonality or market volatility.
- Rapid changes in market conditions, such as shifts in consumer preferences or competitive pressures, can result in excess or obsolete inventory.
- Managing a large number of different stock-keeping units (SKUs) can be complex and costly. It requires additional labor and software systems for tracking and management.
- The longer items sit in inventory, the greater the risk of waste, especially for perishable or time-sensitive products.

1.2. PROBLEM STATEMENT

Despite advancements in technology, our current inventory management system faces challenges in maintaining optimal stock levels, leading to frequent stockouts and inflated carrying costs. This project aims to address these issues by implementing a comprehensive inventory management optimization strategy. The goal is to minimize stockouts, enhance order fulfillment efficiency, and reduce carrying costs through the application of advanced

forecasting models, streamlined replenishment processes, and technology integration. The successful implementation of this solution will not only improve customer satisfaction by ensuring product availability but also contribute to significant cost savings for the organization.

1.3. SCOPE OF THE STUDY:

1. Focus on inventory management practices.
2. Examination of stockout reduction strategies.
3. Analysis of methods to minimize carrying costs.
4. Application to various industries or sectors.

1.4. OBJECTIVES OF THE STUDY:

1. Identify current inventory management practices.
2. Develop strategies to minimize stockouts.
3. Implement methods to reduce carrying costs.
4. Evaluate the impact of optimization on overall efficiency.
5. Provide recommendations for improvement.

1.5. NEEDS OF THE STUDY:

1. Address challenges related to stockouts and carrying costs.
2. Enhance operational efficiency in inventory management.
3. Improve decision-making processes.
4. Support businesses in maintaining optimal inventory levels.
5. Contribute to cost reduction and profit maximization.

1.6. LIMITATIONS OF THE STUDY:

1. Generalization may be limited to specific industries.
2. External factors (market changes, economic conditions) not fully controllable.
3. Data availability and reliability may vary.
4. Implementation challenges in diverse organizational settings.
5. Time and resource constraints for an exhaustive analysis.
6. The study may not account for future technological advancements.

CHAPTER 2

REVIEW OF LITERATURE

DONG FU-GUI, LIU HUI-MEI, LU BING-DE(2012), 'AGENT-BASED SIMULATION MODEL OF SINGLE POINT INVENTORY SYSTEM'

This study explores optimal inventory management using AnyLogic software. It compares (R, S) and (Q, R) strategies, finding (R, S) to be more cost-effective. The research provides insights for businesses aiming to balance costs and service levels effectively.

MERVE SAHINA, FAHRETTIN ELDEMIRC , ALI TURKYILMAZ (2012),'INVENTORY COST MINIMIZATION OF SPARE PARTS IN AVIATION INDUSTRY'

In the competitive aviation industry, cost reduction is crucial. This study addresses the challenge of managing irregular demand through advanced forecasting techniques. Conventional methods often lead to cost inefficiencies. The research evaluates non-smooth demand forecasting methods and highlights the need for further refinement.

SAID SHARIF(2021),'CLOUD-BASED SUPPLY CHAIN MANAGEMENT: OPTIMIZING LOGISTICS AND OPERATIONS'

Cloud-based supply chain management revolutionizes logistics in the digital era. It offers flexibility, scalability, and efficiency through real-time data visibility, inventory control, demand forecasting, and analytics. This paper examines its applications, citing case studies and trends. It also outlines the benefits, challenges, and potential future impact of cloud-based solutions on global logistics.

KARABI DUTTA CHOUDHURY, SUMIT SAHA AND MANTU DAS(2011),' AN INVENTORY MODEL WITH LOT SIZE DEPENDENT CARRYING / HOLDING COST'

This study revises the classical inventory model by accounting for variable carrying costs dependent on lot size. It introduces an algorithm to determine the optimal order quantity and provides practical examples. This approach offers a more realistic framework for inventory management in situations where costs fluctuate with quantity.

E. TOPAN, M.C. VAN DER HEIJDEN(2019), 'OPERATIONAL LEVEL PLANNING OF A MULTI-ITEM TWO-ECHELON SPARE PARTS INVENTORY SYSTEM WITH REACTIVE AND PROACTIVE INTERVENTIONS'

This study analyzes spare parts planning in a multi-item, two-echelon distribution system with real-time supply data. It considers various operational interventions and proposes an integrated approach to minimize downtime and shipment costs. Testing on real-world data shows significant downtime reduction with minimal cost increase. Proactive emergency shipments are particularly effective. The approach efficiently handles practical-sized problems. Additionally, a heuristic based on a greedy algorithm is proposed.

DOROTHY OBALLAH, DR. ESTHER WAIGANJO, ELIZABETH WANGU WACHIURI(2015), 'EFFECT OF INVENTORY MANAGEMENT PRACTICES ON ORGANIZATIONAL PERFORMANCE IN PUBLIC HEALTH INSTITUTIONS IN KENYA: A CASE STUDY OF KENYATTA NATIONAL HOSPITAL'

This study assesses how inventory management practices influence organizational performance in Kenyan public health institutions, focusing on Kenyatta National Hospital. Findings indicate that inventory investment and accurate records positively affect performance, while shrinkage has a negative impact. Recommendations include reducing shrinkage and maintaining accurate records for improved performance. Managing inventory investment is also crucial.

INAYA IZZATI, DIDA DIAH DAMAYANTI(2023), 'DEVELOPMENT OF INVENTORY MODEL TO REDUCE TOTAL INVENTORY COSTS AT RSUD MENTAWAI'

This study addresses cost-effective inventory management in healthcare, emphasizing the importance of balancing availability and financial considerations. By applying the EOQ method, the research successfully reduces total inventory costs by 12%, offering a valuable solution for healthcare institutions.

OPONDO CAROLINE ADHIAMBO, DR. KAMAARA MARY(2023), 'INVENTORY MANAGEMENT STRATEGIES AND PROCUREMENT PERFORMANCE OF LARGE MANUFACTURING COMPANIES IN NAIROBI COUNTY, KENYA'

This study investigates the influence of inventory management strategies on procurement performance in large manufacturing firms in Nairobi County, Kenya. Findings reveal that both Economic Order Quantity (EOQ) and Activity Based Costing positively and significantly affect procurement performance. The study emphasizes the importance of incorporating EOQ calculations in procurement processes to optimize inventory management and reduce costs.

BO LI, QINGKAI JI C , ANTONIO ARREOLA-RISA,(2020)' OPTIMIZING A PRODUCTION-INVENTORY SYSTEM UNDER A COST TARGET'

This paper delves into risk management for production-inventory systems aiming to meet cost targets. It introduces two criteria—Probability of Loss and Expected Loss—and analyzes models with stochastic demand and production. The study provides optimal inventory decisions for minimizing both criteria, offering valuable insights for managers navigating risk in inventory management.

MR. MRINMOY BISWAS(2022), ' UNDERSTANDING THE BASIS OF STRATEGIC PLANNING'

This abstract highlight the importance of strategic planning for businesses to navigate complexity and achieve long-term goals. It emphasizes the need for a thorough analysis of internal and external environments, as well as the establishment of a clear vision and purpose. These components provide direction for decision-making and resource allocation in line with organizational objectives.

NORAI DA AZURA MD DAROM, HAWA HISHAMUDDIN, RIZAUDDIN RAMLI, ZULKIFLI MAT NOPIAH , RUHUL A SARKER(2018),’ - AN INTEGRATED VENDOR-BUYER MODEL SUBJECT TO SUPPLY DISRUPTION WITH TRANSPORTATION COST’

This paper proposes a combined approach for handling supply chain disruptions, integrating proactive and reactive strategies. It introduces an optimization model to determine optimal safety stock levels and recovery schedules for a two-stage supply chain system. The study emphasizes the influence of holding costs on safety stock levels, while highlighting the minimal impact of short disruption times. The research contributes valuable insights to the field of supply chain disruption recovery and safety stock inventory decisions.

MONICA LINAWATI(2018),’ MEDICINE AND CONSUMER GOODS SUPPLY MANAGEMENT DESIGN TO REDUCE STOCKOUT AND DAYS OF INVENTORY IN PT. XYZ’

This study examines inventory management for medicines and consumer goods, focusing on the impact of stockouts and overstock. Using ABC analysis, products are classified, and Class A items are forecasted. Interviews identify key causes of stockouts, including communication gaps with marketing and planning discrepancies. The study emphasizes the need for improved coordination and communication among teams involved in inventory management.

DIKS, E. B., & KOK, DE, A. G. (1996), ‘OPTIMAL CONTROL OF A DIVERGENT N-ECHELON INVENTORY SYSTEM’

This study establishes that employing an order-up-to-policy at every facility in a divergent multi-echelon inventory system minimizes expected costs per period. This optimal replenishment policy is determined through system decomposition, simplifying complex control problems. The approach strikes a balance between excess stock and insufficient inventory, akin to the classical newsboy problem.

**PANTAS MARIHOT LAWRENTSIUS1*, FAJAR AYU
PINAGARA(2017), 'MATERIALS INVENTORY MANAGEMENT TO REDUCE
HOLDING COST AND BACKLOG'**

This study, using system dynamics, analyzes material inventory management for PT XYZ's X Type 1 automobile production. It aims to reduce holding costs and backlog. Findings suggest that adjusting safety stock coverage and lead time can effectively achieve this, with lead time dependent on demand conditions.

**ELORM DELA-BROWN (2019), 'DEVELOPING A COST-EFFECTIVE STOCK
CONTROL SYSTEM FOR THE ASHESI SHOP'**

To combat frequent stockouts and revenue loss, the Ashesi souvenir shop proposes a solution. This includes implementing a cost-effective stock control system and utilizing SDE and HML models for optimal ordering decisions. Additionally, an integrated Point of Sale (POS) system will be introduced to streamline operations. Implementation will be strategically scheduled during the off-season to minimize disruptions. This comprehensive approach aims to significantly enhance inventory management and boost profitability.

**KAMALAPUR & LYTH: 'IMPACT OF STOCKOUT COMPENSATION IN E-
COMMERCE DROP-SHIPPING SUPPLY CHAIN OPERATIONS AND SUPPLY
CHAIN MANAGEMENT'**

This study employs simulation modelling to analyse the impact of stockout compensation strategies in e-commerce drop-shipping supply chains. Results show modest profit differences in most scenarios, but significant advantages for E-SC under specific conditions. Additionally, pursuing S-SC allows a slight increase in wholesale price to offset compensation costs for the supplier.

**MOHAMED-ALY OULD-LOULY, ALEXANDRE DOLGUI, 'A DYNAMIC SINGLE-
STAGE MULTI-ITEM INVENTORY CONTROL MODEL'**

This study focuses on assembly systems with various components and constant customer demand. It introduces a Markov chain model for performance assessment and optimization.

The goal is to minimize component holding costs while meeting specified service levels for customer demands. The paper provides lower bounds and dominance properties for the optimization process.

DR. ANIL KUMAR GUPTA (2015) ‘OVERVIEW OF INVENTORY MANAGEMENT IN ORGANIZATIONS: A THEORETICAL PERSPECTIVE’

Effective inventory management is vital for minimizing losses, ensuring a continuous supply of goods, and controlling costs within organizations. This study provides a conceptual review of the theoretical aspects of inventory management, highlighting its significance in organizational decision-making.

DILUPA NAKANDALA, HENRY LAU & PAUL K.C. SHUM (2017): A LATERAL TRANSSHIPMENT MODEL FOR PERISHABLE INVENTORY MANAGEMENT, INTERNATIONAL JOURNAL OF PRODUCTION RESEARCH

This study emphasizes the importance of optimal inventory management in reducing logistics costs, with lateral transshipment (LT) emerging as a key strategy. The proposed LT model includes spoilage costs for perishable products, effectively balancing key cost components. Case study results affirm that, even with higher spoilage costs, LT remains the preferred strategy for cost minimization, provided decision rules are met.

ABDULELAH S. AL MESFER (2023), ‘FORECAST-DRIVEN INVENTORY MANAGEMENT FOR THE FAST-MOVING CONSUMER GOODS INDUSTRY’

This thesis focuses on devising an effective inventory control policy for a third-party logistics provider in the Fast-Moving Consumer Goods (FMCG) industry. Various time series models and machine learning techniques are employed to accurately forecast demand. XGBoost emerges as the most accurate model. A continuous review (s,Q) policy is proposed to minimize holding costs. Future research may explore additional models and external factors integration.

L-C LIN1 * AND K-L HOU2 (2005), 'AN INVENTORY SYSTEM WITH INVESTMENT TO REDUCE YIELD VARIABILITY AND SET-UP COST'

This study explores reducing set-up costs and yield variability through capital investment in an inventory system with random yield. It aims to determine optimal investment and ordering policies for minimizing total annual costs. The paper introduces an iterative solution approach, with numerical examples demonstrating potential cost savings and managerial implications for practical implementation.

JOSE L. GONZALEZ AND DANIEL GONZÁLEZ(2010), 'ANALYSIS OF AN ECONOMIC ORDER QUANTITY AND REORDER POINT INVENTORY CONTROL MODEL FOR COMPANY XYZ'

Company XYZ faces stockouts due to ineffective forecasting, resulting in significant losses. This study recommends implementing EOQ, Reorder Point, and improved forecasting techniques. Cost analysis indicates a potential 61% reduction, saving \$8,300 per quarter. Implementing these measures is crucial for maintaining competitiveness.

STEPHEN ARO-GORDON AND JAIDEEP GUPTE, 'REVIEW OF MODERN INVENTORY MANAGEMENT TECHNIQUES'

This paper comprehensively reviews twelve pivotal inventory management techniques, synthesizing recent literature and expert input. It emphasizes cost management in today's competitive business environment. The paper underscores the potential for practitioners to enhance service delivery and reduce carrying costs through strategic adoption of modern inventory management approaches. It also discusses implications for management training and suggests avenues for future research.

M. BRAGLIAIY AND L. ZAVANELLAZ (2003), 'MODELLING AN INDUSTRIAL STRATEGY FOR INVENTORY MANAGEMENT IN SUPPLY CHAINS: THE 'CONSIGNMENT STOCK'

This study explores the effectiveness of Consignment Stock (CS) in supply chain management, specifically within the automotive manufacturing context. Analytical modeling is applied to a

single-vendor, single-buyer scenario. The research suggests that CS can be a profitable approach for stock management in uncertain environments characterized by varying delivery lead times and market demand.

**SUNNY E. EKAKITIE, ANTHONY A. KIFORDU, (CA), CHUX NWAEBUNI (2022),
'OPTIMIZING PROFIT MAXIMIZATION THROUGH EFFECTIVE INVENTORY
CONTROL PRACTICE OF MANUFACTURING FIRMS IN NIGERIA'**

This study examines the influence of inventory control methods on profit optimization in a competitive environment. Analyzing four key practices, it establishes a positive and significant relationship between these techniques and profit maximization. The study underscores the critical role of an effective inventory control system in achieving a balance between material availability and cost management, ultimately enabling firms to consistently maximize profits.

DAEWON SUN, 'INVENTORY MANAGEMENT IN E-BUSINESS'

This research introduces a compensation policy called the "Compensation model" to optimize inventory management, particularly in online retailing. It explores two types of compensation: flat rate and time-dependent. The study reveals that the stockless policy is only optimal with positive compensation under specific conditions. Sufficient conditions for optimal inventory policies are derived, providing valuable insights for inventory management strategies.

**SUBRATA MITRA (2009), 'ANALYSIS OF A TWO-ECHELON INVENTORY
SYSTEM WITH RETURNS'**

This paper addresses inventory management in the context of product returns, which has gained importance due to environmental regulations and increased awareness. Unlike previous research, it considers a two-echelon system with returns, relaxing simplified assumptions. The study presents deterministic and stochastic models under continuous review, supported by numerical examples.

TALATU MUHAMMAD BARWA(2015), INVENTORY CONTROL AS AN EFFECTIVE DECISION-MAKING MODEL AND IMPLEMENTATIONS FOR COMPANY'S GROWTH. INTERNATIONAL JOURNAL OF ECONOMICS, FINANCE AND MANAGEMENT SCIENCES.

This study examines inventory control decision-making and its impact on company growth, relying on secondary data. It highlights its significance for businesses' survival and growth in competitive environments. The research provides theoretical insights and practical examples of successful inventory control implementation.

AMY HING-LING LAU, HON-SHIANG LAU, DAVID F. PYKE (2002), 'DEGENERACIES IN ORDER-QUANTITY, REORDER-POINT INVENTORY MODELS'

The study highlights how common inventory management formulations can become impractical or overly simplified due to certain parameters, offering insights for inventory managers.

MANUEL LAGUNA(1998), 'A HEURISTIC FOR PRODUCTION SCHEDULING AND INVENTORY CONTROL IN THE PRESENCE OF SEQUENCE-DEPENDENT SETUP TIMES'

This study tackles a production and inventory control problem with sequence-dependent setup times. It introduces a heuristic approach and utilizes a mixed-integer program formulation. The heuristic combines tabu search, linear programming, and traveling salesperson methods for near-optimal solutions.

JACEK ZABAWA AND BOZENA MIELCZAREK, 'TOOLS OF MONTE CARLO SIMULATION IN INVENTORY MANAGEMENT PROBLEMS'

The paper introduces a simulation model for supply chain management, implemented with general-purpose tools and simulation software. It compares results from Microsoft Excel and Extend software in Monte Carlo experiments to determine the optimal inventory cost.

GU, JINGYAO; ZHANG, GUOQING; AND LI, KEVIN. (2015). EFFICIENT AIRCRAFT SPARE PARTS INVENTORY MANAGEMENT UNDER DEMAND UNCERTAINTY.

The paper introduces two non-linear programming models for spare parts inventory management in the airline industry. These models aim to reduce maintenance costs by considering impending demands based on installed parts failure distribution. Both models prove effective in cost reduction.

HAC PRIYANTHA(2023), “FROM VALUE CREATION TO VALUE NETWORK: THE ROLE OF INTEGRATED LOGISTICS”

The SMAC approach (Social, Mobile, Analytics, and Cloud) enhances operational efficiency. It positively impacts supply chain management by enabling real-time communication, trend identification, and cost calculation. Despite benefits, challenges like data security and implementation costs exist. Overall, SMAC significantly improves supply chain effectiveness.

MENG QI, YUANYUAN SHI, YONGZHI QI, CHENXIN MA, RONG YUAN, DI WU, ZUOJUN (MAX) SHEN, ‘A PRACTICAL END-TO-END INVENTORY MANAGEMENT MODEL WITH DEEP LEARNING’

The study introduces a one-step end-to-end (E2E) framework for data-driven inventory replenishment using deep learning. It outperforms traditional methods, directly suggesting replenishment quantities from input data. Real-world experiments demonstrate substantial cost reductions.

BHARATH G1, PROF. PRATHAP BN(2023), ‘INTERNATIONAL RESEARCH JOURNAL OF MODERNIZATION IN ENGINEERING TECHNOLOGY AND SCIENCE’

This research paper emphasizes the effectiveness of ABC and VED analysis in inventory management. It showcases their impact on cost control and decision-making. Through case

studies and literature review, it highlights their value in diverse supply chain contexts, ultimately leading to enhanced operational efficiency and customer satisfaction.

EVANGELOS THEODOROU AND EVANGELOS SPILIOTIS, ‘BETTER FORECASTS OR MORE APPROPRIATE STOCK CONTROL POLICIES’

Accurate forecasting is crucial for inventory management, but operational constraints play a significant role. Research suggests that a 1% reduction in forecast error can lead to substantial inventory cost savings. However, some less accurate methods can also be effective, emphasizing the importance of a balanced approach.

RAMA THUMMALAPALLI(2010), ‘A METHODOLOGY TO EVALUATE OBSOLETE OBSOLETE INVENTORY IN HEALTH CARE’

This research addresses inventory management challenges, emphasizing the need for accurate levels. It proposes a decision-making framework for warehouse closure based on cost analysis. The model, validated through a case study, recommends transitioning to a one-echelon JIT-based supply chain for reduced excessive inventory.

ATHANASIOS GKONOS(2023), “WAREHOUSE INVENTORY MANAGEMENT SYSTEMS USING MONTE CARLO ANALYSIS”

This dissertation explores inventory management using stochastic analysis, Monte Carlo simulation, and Economic Order Quantity (EOQ). It includes a comprehensive literature review and empirical analysis on specific stock-keeping units. The study emphasizes the significance of accurate demand forecasting and efficient inventory control for supply chain optimization.

RADITYA RAMADHAN FAJARUDDIN¹ , ABDUL HARIS LAHUDDIN² , SENTOT WAHJOE GOERITNO³ (2023), ‘APPLYING INVENTORY MANAGEMENT THEORY TO IMPROVE SUPPLY CHAIN MANAGEMENT (SCM) IN PT.

This research highlights the pivotal role of Supply Chain Management, specifically Inventory Management and CPFR, in optimizing small businesses. Implementing strategies like Safety

Stock and Cycle Counting improves operational efficiency. The study centers on enhancing Supply Chain Management at PT. Rosyada Herba Natura, aiming for cost reductions and transparent supplier relations.

CLEOPHAS ATTOR, ABDUL BASHIRU JIBRIL(2022), ‘A LITERATURE REVIEW OF BRAND PERSONALITY ATTRIBUTES ON CUSTOMER BUYING DECISION IN THE 21ST CENTURY MARKET’

This study offers a thorough review of brand personality's impact on consumer buying decisions. It critically assesses existing literature, emphasizing key dimensions like sincerity, excitement, competence, sophistication, and ruggedness. The findings underline brand personality's substantial influence on consumer behavior, contingent on individual, product, and market variables. This review advances understanding in contemporary brand theory, providing practical insights for brand management.

Z“UMB“UL ATAN, LAWRENCE V. SNYDER, (2012), INVENTORY STRATEGIES TO MANAGE SUPPLY DISRUPTIONS. IN GURNANI, H., A. MEHROTRA, AND S. RAY, SUPPLY CHAIN DISRUPTIONS: THEORY AND PRACTICE OF MANAGING RISK

This chapter examines how companies use inventory to mitigate disruptions in supply chains. It highlights the trade-off between holding additional inventory and the potential costs of facing unprotected disruptions. The discussion covers various tactics for managing disruption risks, with a focus on the role of inventory. The chapter also underscores the importance of finding the optimal replenishment policy in disrupted environments.

GEORGE NENES A, SOFIA PANAGIOTIDOU B , ROMMERT DEKKER C, INTERNATIONAL JOURNAL PRODUCTION ECONOMICS

The paper addresses the trade-off between purchasing new products and remanufacturing returns, given uncertainties in quantity and quality. It aims to identify the most effective policy, considering factors like cost minimization or profit maximization, through rigorous numerical analysis for practical application.

S. L. ADEYEMI* AND A. O. SALAMI*(2010), 'A TOOL OF OPTIMIZING RESOURCES IN A MANUFACTURING INDUSTRY A CASE STUDY OF COCA-COLA BOTTLING COMPANY, ILORIN PLANT'

The study focuses on optimizing inventory management at Nigeria Bottling Company, Ilorin Plant, given the substantial capital invested in inventories. Utilizing variance analysis, EOQ Model, and Chi-square method, it offers insights to enhance material procurement strategies. The research concludes with recommendations for efficient handling of quantity, quality, and timing of materials.

ALIN CONSTANTIN RĂDĂȘANU, 'INVENTORY MANAGEMENT, SERVICE LEVEL AND SAFETY STOCK'

Inventory management seeks to balance investment value with high service levels, ultimately boosting financial performance. Despite perceived demand unpredictability, service level metrics and safety stock are pivotal in preventing stockouts. Optimizing safety stock levels leads to cost savings and enhanced inventory turnover for companies.

AMIR HASSAN ZADEH, RAMESH SHARDA, NARGES KASIR(2015),' INVENTORY RECORD INACCURACY DUE TO THEFT IN PRODUCTION-INVENTORY SYSTEMS'

The paper tackles Inventory Record Inaccuracy's (IRI) impact on operational efficiency and lean principles in the supply chain. It introduces an analytical model optimizing safety stock and reorder quantity, considering inventory holding, production, ordering, and lost sales costs, and evaluates barcode and RFID technologies for replenishment decisions.

WEI-YU KEVIN CHIANG A, GEORGE E. MONAHAN(2003),' MANAGING INVENTORIES IN A TWO-ECHELON DUAL-CHANNEL SUPPLY CHAIN'

This study presents a dual-channel inventory model with manufacturer and retail store stocks, serving traditional retail and online channels. It assesses supply chain flexibility, finding that

the dual-channel approach offers significant cost advantages over retail-only and direct-only strategies in many cases.

RUSSARIN JIRARUTTRAKUL, SROBOL SMUTKUPT, WASANA MARKSIN, LIANG LIU, AND CHANASIT THANATHAWEE(2021),’ APPLYING AN EOQ MODEL TO REDUCE AN INVENTORY COST’

This study applies the EOQ model to reduce high inventory costs at ABC Company, a Thai beer importer, achieving a 50% cost reduction and promising enhanced inventory management for improved customer satisfaction.

DR. K. KALAIARASI, DR. R. GOPINATH(2020),’ FUZZY INVENTORY EOQ OPTIMIZATION MATHEMATICAL MODEL’

Using the Lagrange approach with fuzzy trapezoidal numbers, this research optimizes the Economic Order Quantity (EOQ) to minimize total cost, vital in supply chain management. The method proves effective in enhancing inventory management through mathematical precision.

JAKOB BENGTSSON, ALEXANDER LARSSON, JOHAN MARKLUND(2022),’ COMPARING SINGLE- AND MULTI-ECHELON METHODS FOR INVENTORY CONTROL OF SPARE PARTS AT VOLVO’

This thesis centers on optimizing spare parts distribution at Volvo Group using a multi-echelon inventory control model, crucial for global operations and customer satisfaction. It addresses the trade-off between inventory holding costs and service levels in supply chain management.

MOHAMED ALY O. LOULY, ALEXANDRE DOLGUI, FAICEL HNAIEN(2008),’ OPTIMAL SUPPLY PLANNING IN MRP ENVIRONMENTS FOR ASSEMBLY SYSTEMS WITH RANDOM COMPONENT PROCUREMENT TIMES’

This paper tackles supply planning in assembly systems with uncertain lead times, crucial for timely customer satisfaction and cost control. It introduces an exact model for MRP parameterization under random lead times, aiming to minimize average component holding and backlogging costs using a mathematical approach with a Branch and Bound algorithm.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 METHODOLOGY:

Research methodology is mainly needed for the purpose of framing the research process and the designs and tools that are to be used for the project purpose. Designing a methodology for inventory management optimization to minimize stockouts and reduce carrying costs involves a systematic approach. Conduct a thorough review of the existing inventory management system. This includes analyzing historical data, stock levels, order patterns, and identifying any prevalent issues such as stockouts, overstocking, or inefficient order quantities. Gather relevant data on demand patterns, lead times, order quantities, supplier performance, and other factors influencing inventory management. Utilize historical sales data, customer demand forecasts, and any available information on seasonality or market trends.

3.2 RESEARCH DESIGN:

Qualitative Research Design

Qualitative research involves gathering and examining non-numerical data, which includes observational data, focus group transcripts, and interview transcripts. These types of data are frequently utilized to investigate detailed subjects or gain perspective on the experiences of individuals or groups.

3.3 SAMPLING TECHNIQUE:

Probability sampling

Every person in the population has an equal chance of getting chosen when using probability sampling. Since it yields the most representative samples, this kind of sampling is frequently employed in research investigations. Cluster sampling is selected under probability sampling.

Cluster sampling is a method, in which the participant groups are chosen from the population.

3.4 SOURCES OF DATA:

A place where data is generated or stored is called a data source. There are two categories of data sources, primary and secondary data. A combination of primary and secondary data is used for research purposes.

- **Primary data sources**

Primary data are those from which fresh information is initially gathered. A variety of methods, including surveys, interviews, focus groups, experiments, and observations, can be used to gather primary data. A questionnaire is being used to collect primary data for the research purposes.

- **Secondary data sources**

Secondary data are those that include information that has previously been gathered by another party. A range of sources, including government data, industry reports, scholarly publications, news articles, and online articles, can be used to gather secondary data.

3.5. STRUCTURE OF QUESTIONNAIRE:

Questionnaire was divided into two sections. First part was designed to know the general information about inventory management optimization to minimize stockouts and reduce carrying costs and the second part contained the respondent's opinions about various inventory management optimization to minimize stockouts and reduce carrying costs

Basic Introduction

- Personal Details
- Research related Questions
- Perception Questions
- Likert Scaling Questions
- Suggestion Question

3.6. SAMPLE SIZE:

The sample size for this research project is 107

3.7. SAMPLE DESIGN:

The process of choosing a subset of a population to represent the entire population is known as sample design. It is an essential stage in any research project since it can greatly affect the validity and dependability of the findings. Probability sampling and non-probability sampling are the two categories of sample design. Cluster sampling under probability sampling is being utilized in the study.

SAMPLING

- Sampling Design : Probability Sampling
- Sampling Techniques : Cluster Sampling
- Sample Unit : Employees
- Sample Size : 107 Respondents

3.8. PERIOD OF STUDY:

The period of the study is to determine the research process is carried out for 3 months.

3.9. AREA OF THE STUDY:

The targeted people are the employees under manufacturing industries.

3.10. HYPOTHESIS:

HYPOTHESIS 1

- H0: The frequency of conducting physical stock counts is independent of gender.
- H1: The frequency of conducting physical stock counts is not independent of gender.

HYPOTHESIS 2

- **H0:** The method used to forecast demand for products is independent of the frequency of stockouts.
- **H1:** The method used to forecast demand for products is not independent of the frequency of stockouts.

3.11. TOOLS FOR ANALYSIS:

A questionnaire was created to get the response from the sample required to achieve the research objective. Following are the tools used for data analysis.

3.12. PERCENTAGE ANALYSIS:

Analyzing data by representing it as a percentage of a total is known as percentage analysis. It is an effective tool for comparing many data points and discovering similarities. When it is essential to know how many of the participants gave a specific answer, percentage analysis is appropriate.

3.13. ANALYTICAL TOOLS:

SPSS tool is used to test hypothesis.

CORRELATION

Correlation is a statistical technique that shows how strongly two variables are related to each other or the degree of association between the two. For example, if we have the weight and height data of taller and shorter people, with the correlation between them, we can find out how these two variables are related.

CHI-SQUARE

The chi-square test is a statistical analysis tool used to determine whether there is a significant relationship between two categorical variables. It is a non-parametric test, meaning it does not

make any assumptions about the underlying distribution of the data. The chi-square test is based on the comparison of observed frequencies to expected frequencies. The observed frequencies are the actual counts of the data, while the expected frequencies are the counts we would expect to see if there were no relationship between the two variables.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

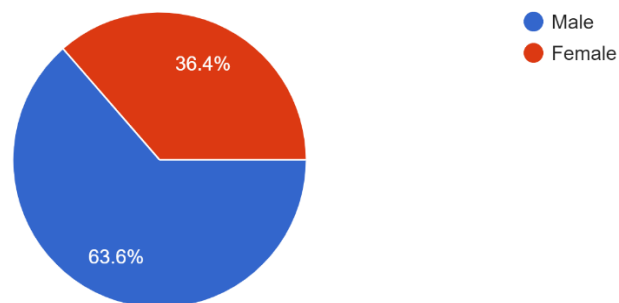
4.1. PERCENTAGE ANALYSIS

4.1.1. GENDER OF RESPONDENTS

S.NO	GENDER	NO. OF RESPONDENTS	PERCENTAGE ANALYSIS
1	MALE	68	63.60%
2	FEMALE	39	36.40%
TOTAL		107	100.00%

CHART

Gender:
107 responses



INTERPRETATION

63.6% of respondents were given by male employees and 36.4% were given by female Employees.

INFERENCE

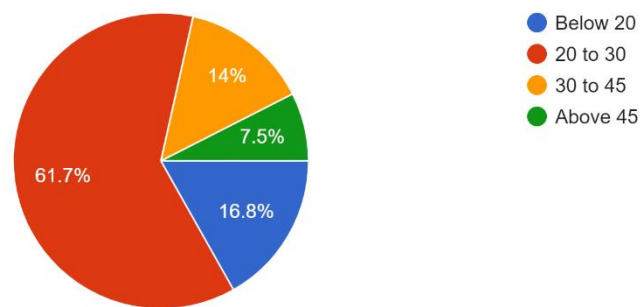
Majority i.e., 63.6% of the response were given by male employees.

4.1.2. AGE GROUP YOU BELONG TO

S.NO	AGE GROUP YOU BELONG TO	NO. OF RESPONDENTS	PERCENTAGE ANALYSIS
1	BELOW 20	18	16.8%
2	20 TO 30	66	61.7%
3	30 TO 45	15	14%
4	ABOVE 45	8	7.5%

CHART

Age group you belong to
107 responses



INTERPRETATION

The respondents., 16.8% of employees were between the age group of Below 20, 61.7% of the employees were between the age group of 20 to 30, 14% of the employees were between the age group of 30 to 45, and 7.5% of the employees were above 45 years.

INFERENCE

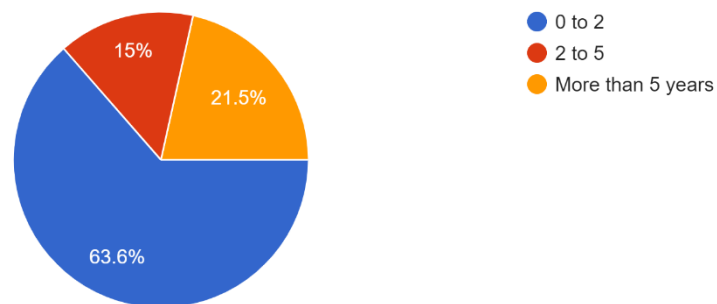
Most responses, i.e., 61.7%, were given by employees in the age group of 20 to 30.

4.1.3. HOW MUCH YEARS OF EXPERIENCE DO YOU HAVE IN THIS FIELD

S.NO	HOW MUCH YEARS OF EXPERIENCE DO YOU HAVE IN THIS FIELD	NO. OF RESPONDENTS	PERCENTAGE ANALYSIS
1	0 TO 2	68	63.6%
2	2 TO 5	16	15%
3	MORE THAN 5 YEARS	23	21.5%

CHART

How much years of experience do you have in this field
107 responses



INTERPRETATION

The respondents., 63.6% of employees with years of experience between 0 to 2, 15% of the employees with years of experience between 2 to 5, 21.5% employees with years of experience above 15 years.

INFERENCE

Most responses, i.e., 63.6%, were given by employees with years of experience between 0 to 2.

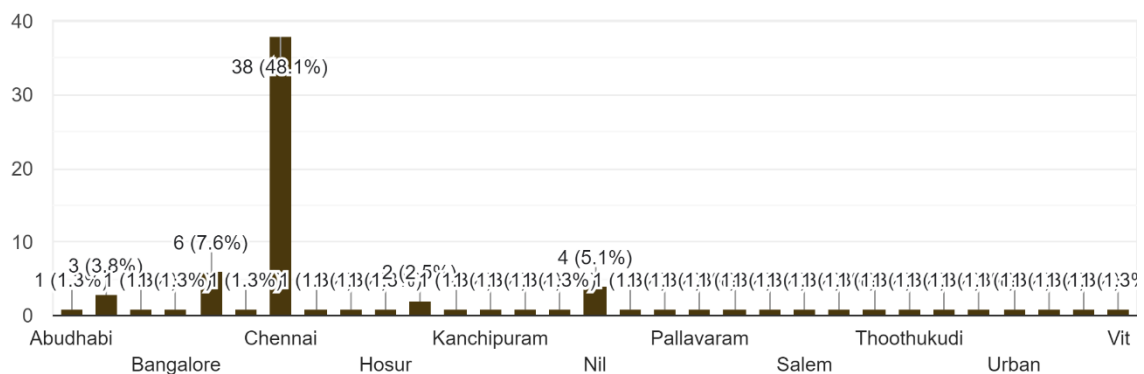
4.1.4. BUSINESS LOCATION

S.NO	BUSINESS LOCATION	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	CHENNAI	38	48.1%
2	BANGALORE	6	7.6%
3	OTHERS	35	44.3%

CHART

Business Location:

79 responses



INTERPRETATION

The respondents, 48.1% of employees Business location is Chennai, 7.6% of the employees Business location is Bangalore, 43.3% of employees Business location is others.

INFERENCE

Most responses, i.e., 48.1%, were given by employees Business location is Chennai.

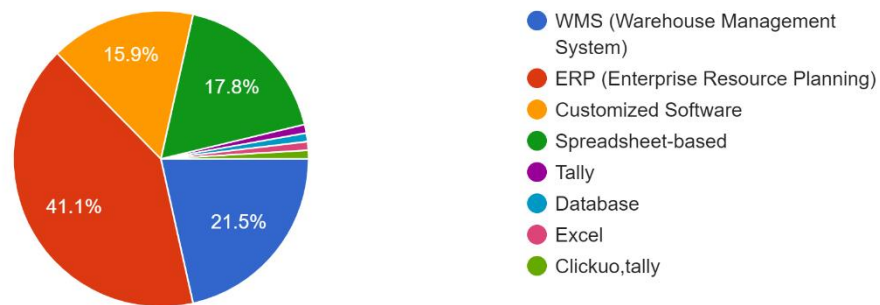
4.1.5. WHAT SOFTWARE/SYSTEM DO YOU USE FOR INVENTORY MANAGEMENT

S.NO	WHAT SOFTWARE/SYSTEM DO YOU USE FOR INVENTORY MANAGEMENT	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	WMS (Warehouse Management System)	23	21.5%
2	ERP (Enterprise Resource Planning)	44	41.1%
3	Customized Software	17	15.9%
4	Spreadsheet-based	19	17.8%
5	Others	4	3.7%

CHART

What software/system do you use for inventory management?

107 responses



INTERPRETATION

The respondents, 21.5% uses WMS (Warehouse Management System), 41.1% use ERP (Enterprise Resource Planning), 15.9% use Customized Software, 17.8% use Spreadsheet-based, 3.7% use others.

INFERENCE

Most responses, i.e., 41.1% use ERP (Enterprise Resource Planning) for Inventory management.

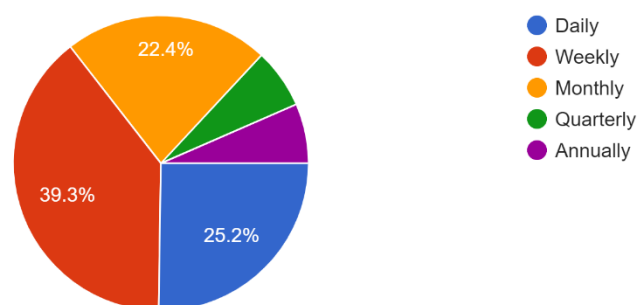
4.1.6. HOW OFTEN DO YOU CONDUCT PHYSICAL STOCK COUNTS

S.NO	HOW OFTEN DO YOU CONDUCT PHYSICAL STOCK COUNTS	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	DAILY	27	25.2%
2	WEEKLY	42	39.3%
3	MONTHLY	24	22.4%
4	QUARTERLY	7	6.5%
5	ANNUALLY	7	6.5%

CHART

How often do you conduct physical stock counts?

107 responses



INTERPRETATION

The respondents, 39.3% will conduct physical stock counts weekly, 25.2% will conduct physical stock counts daily, 22.4% will conduct physical stock counts monthly, 6.5% will

conduct physical stock counts quarterly and 6.5% will conduct physical stock counts annually.

INFERENCE

Most responses, i.e., 39.3% will conduct physical stock counts weekly.

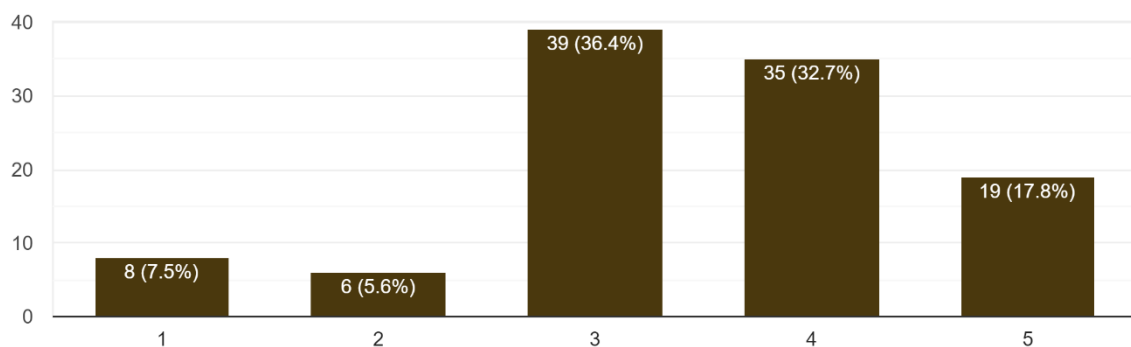
4.1.7. HOW WELL DO YOU THINK YOUR CURRENT INVENTORY MANAGEMENT SYSTEM HANDLES STOCKOUTS

S.NO	HOW WELL DO YOU THINK YOUR CURRENT INVENTORY MANAGEMENT SYSTEM HANDLES STOCKOUTS	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	Strongly Disagree	8	7.5%
2	Disagree	6	5.6%
3	Neutral	39	36.4%
4	Agree	35	32.7%
5	Strongly Agree	19	17.8%

CHART

How well do you think your current inventory management system handles stockouts?

107 responses



INTERPRETATION

The respondents, 7.5% were strongly dis-agreed current inventory management system handles stockouts, 5.6% were Dis-agreed current inventory management system handles stockouts, 36.4% were Neutral, 32.7% were Agreed and 17.8% were strongly agreed.

INFERENCE

Most responses, i.e., 36.4% are Neutral and says that their current inventory management system handles stockouts.

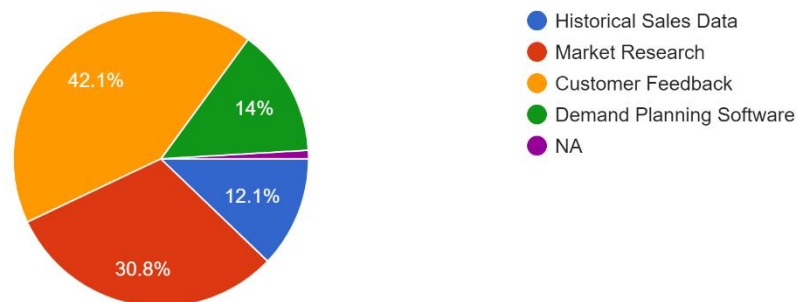
4.1.8. HOW DO YOU FORECAST DEMAND FOR YOUR PRODUCTS

S.NO	HOW DO YOU FORECAST DEMAND FOR YOUR PRODUCTS	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	Historical Sales Data	13	12.1%
2	Market Research	33	30.8%
3	Customer Feedback	45	42.1%
4	Demand Planning Software	15	14%

CHART

How do you forecast demand for your products?

107 responses



INTERPRETATION

The respondents, 12.1% forecast demand for products through Historical sales data, 30.8% forecast demand for products through Market research, 42.1% forecast demand for products through Customer Feedback, 14% forecast demand for products through Demand planning software.

INFERENCE

Most responses, i.e., 42.1% forecast demand for their products through Customer feedback.

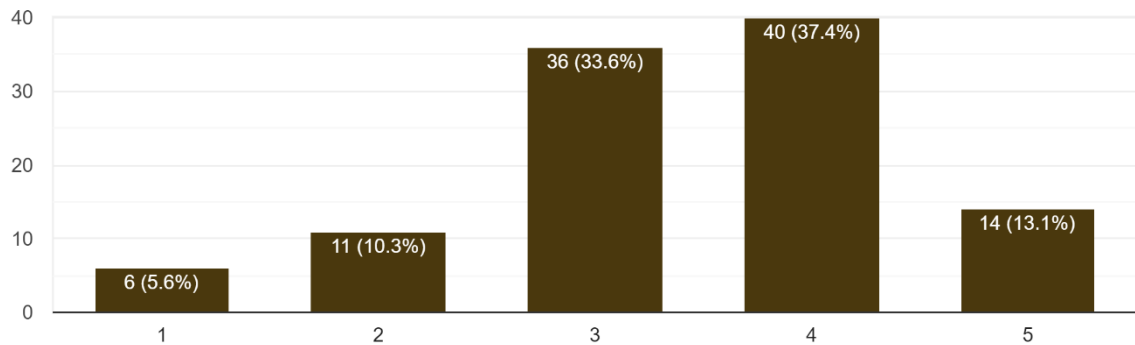
4.1.9. HOW EFFECTIVE DO YOU BELIEVE YOUR CURRENT SYSTEM IS AT MINIMIZING CARRYING COSTS

S.NO	HOW EFFECTIVE DO YOU BELIEVE YOUR CURRENT SYSTEM IS AT MINIMIZING CARRYING COSTS	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	Strongly Disagree	6	5.6%
2	Disagree	11	10.3%
3	Neutral	36	33.6%
4	Agree	40	37.4%
5	Strongly Agree	14	13.1%

CHART

How effective do you believe your current system is at minimizing carrying costs?

107 responses



INTERPRETATION

The respondents, 5.6% were strongly dis-agreed that their current system is minimizing carrying cost, 10.3% were Dis-agreed that their current system is minimizing carrying **cost**, 33.6% were Neutral, 37.4% were Agreed and 13.1% were strongly agreed.

INFERENCE

Most responses, i.e., 37.4% are agreed that their current system is minimizing carrying cost.

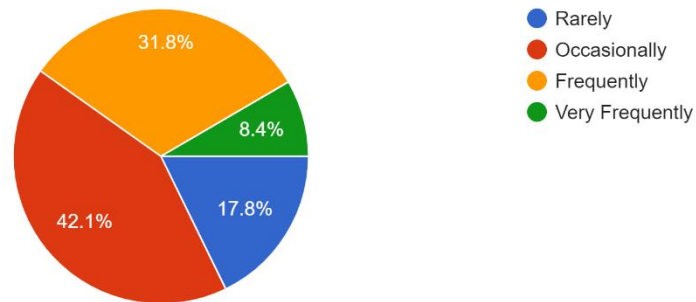
4.1.10. HOW FREQUENTLY DO YOU EXPERIENCE STOCKOUTS

S.NO	HOW FREQUENTLY DO YOU EXPERIENCE STOCKOUTS	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	Rarely	19	17.8%
2	Occasionally	45	42.1%
3	Frequently	34	31.8%
4	Very Frequently	9	8.4%

CHART

How frequently do you experience stockouts?

107 responses



INTERPRETATION

The respondents, 17.8% Rarely experience stockouts, 42.1% Occasionally experience stockouts, 31.8% Frequently experience stockouts, 8.4% Very frequently experience stockouts.

INFERENCE

Most responses, i.e., 42.1% were Occasionally experience stockouts.

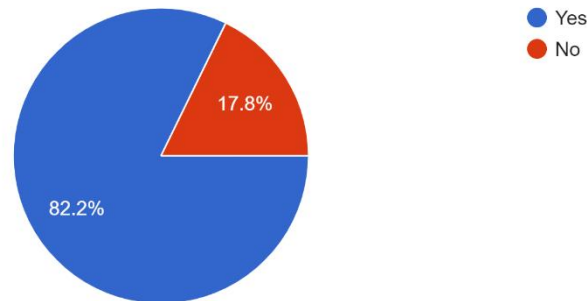
4.1.11. DOES YOUR COMPANY TRACK CARRYING COSTS

S.NO	DOES YOUR COMPANY TRACK CARRYING COSTS	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	Yes	88	82.2%
2	No	19	17.8%

CHART

Does your company track carrying costs?

107 responses



INTERPRETATION

The respondents, 82.2% companies track carrying cost and 17.8% does not track carrying cost.

INFERENCE

Most responses, i.e., 82.2% said 'Yes' for 'Does your company track carrying costs?'

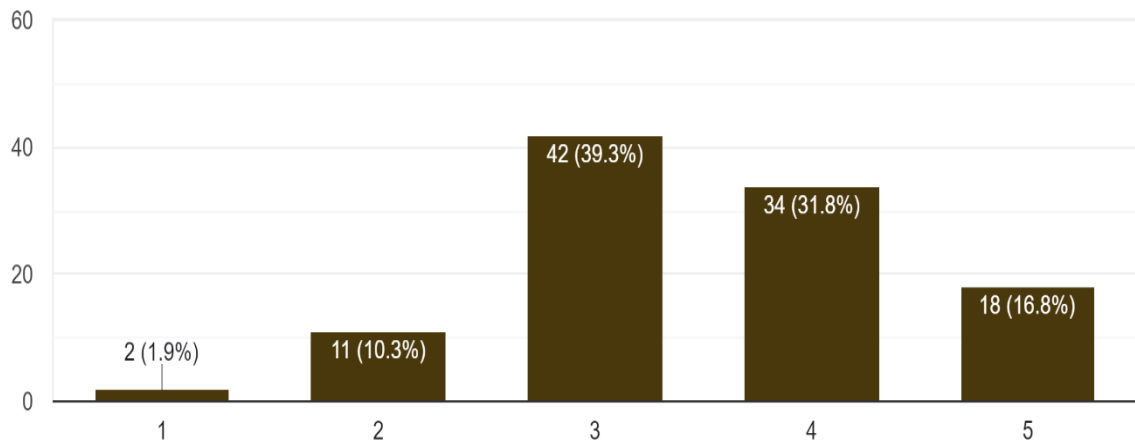
4.1.12. HOW WELL IS DEMAND VARIABILITY CONSIDERED IN YOUR CURRENT INVENTORY MANAGEMENT PRACTICES

S.NO	HOW WELL IS DEMAND VARIABILITY CONSIDERED IN YOUR CURRENT INVENTORY MANAGEMENT PRACTICES	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	Strongly Disagree	2	1.9%
2	Disagree	11	10.3%
3	Neutral	42	39.3%
4	Agree	34	31.8%
5	Strongly Agree	18	16.8%

CHART

How well is demand variability considered in your current inventory management practices?

107 responses



INTERPRETATION

The respondents, 1.9% Strongly Disagree demand variability considered in your current inventory management practices, 10.3% Disagree demand variability considered in your current inventory management practices, 39.3% Neutral for demand variability considered in your current inventory management practices, 31.8% Agree demand variability considered in your current inventory management practices, 16.8% Strongly Agree demand variability considered in your current inventory management practices.

INFERENCE

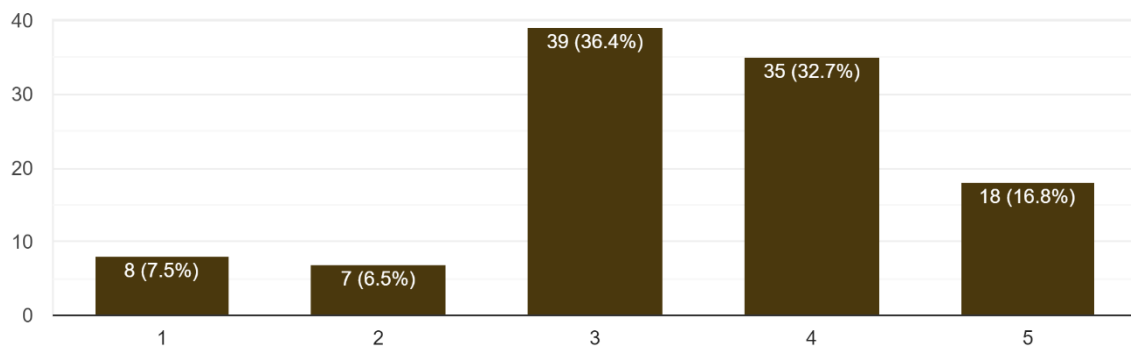
Most responses, i.e., 39.3% Neutral for demand variability considered in your current inventory management practices.

4.1.13. TO WHAT EXTENT DO YOU THINK FORECASTING METHODS ARE UTILIZED TO DETERMINE OPTIMAL STOCK LEVELS

S.NO	TO WHAT EXTENT DO YOU THINK FORECASTING METHODS ARE UTILIZED TO DETERMINE OPTIMAL STOCK LEVELS	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	Strongly Disagree	8	7.5%
2	Disagree	7	6.5%
3	Neutral	39	36.4%
4	Agree	35	32.7%
5	Strongly Agree	18	16.8%

CHART

To what extent do you think forecasting methods are utilized to determine optimal stock levels?
107 responses



INTERPRETATION

The respondents, 7.5% Strongly Disagree forecasting methods are utilized to determine optimal stock levels, 6.5% Disagree forecasting methods are utilized to determine optimal stock levels, 36.4% Neutral for forecasting methods are utilized to determine optimal stock levels, 32.7% Agree forecasting methods are utilized to determine optimal stock

levels, 16.8% Strongly Agree forecasting methods are utilized to determine optimal stock levels.

INFERENCE

Most responses, i.e., 36.4% Neutral for forecasting methods are utilized to determine optimal stock levels

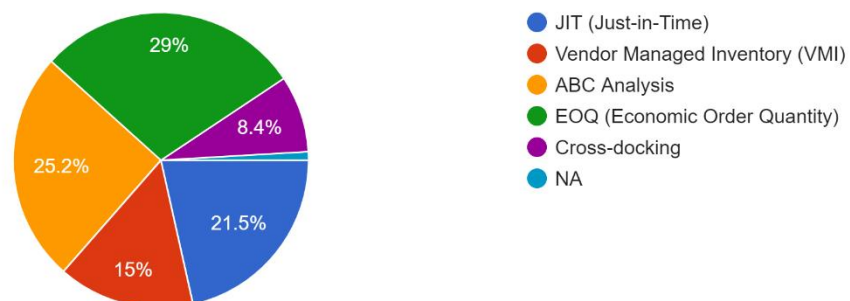
4.1.14. WHAT STRATEGIES DO YOU EMPLOY TO REDUCE CARRYING COSTS

S.NO	WHAT STRATEGIES DO YOU EMPLOY TO REDUCE CARRYING COSTS	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	JIT	23	21.5%
2	VMI	16	15%
3	ABC ANALYSIS	27	25.2%
4	EOQ	31	29%
5	CROSS DOCKING	9	8.4%

CHART

What strategies do you employ to reduce carrying costs?

107 responses



INTERPRETATION

The respondents, 21.5% uses JIT to reduce carrying costs, 15% uses VMI to reduce carrying costs, 25.2% uses ABC to reduce carrying costs, 29% uses EOQ to reduce carrying costs, 8.4% uses Cross-docking to reduce carrying costs.

INFERENCE

Most responses, i.e., 29% uses EOQ to reduce carrying costs.

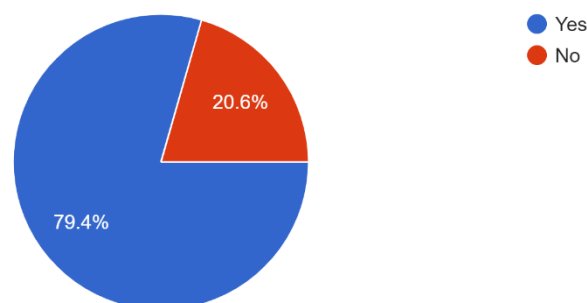
4.1.15. Are there any specific inventory management tools or techniques you are considering implementing in the near future

S.NO	Are there any specific inventory management tools or techniques you are considering implementing in the near future	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	Yes	85	79.4%
2	No	22	20.6%

CHART

Are there any specific inventory management tools or techniques you are considering implementing in the near future?

107 responses



INTERPRETATION

The respondents, 79.4% said Yes for ‘Are there any specific inventory management tools or techniques you are considering implementing in the near future’ and 20.6% % said No for ‘Are there any specific inventory management tools or techniques you are considering implementing in the near future’

INFERENCE

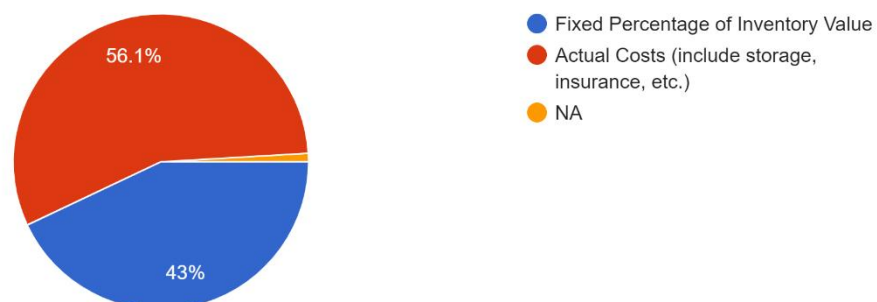
Most responses, i.e., 79.4% said Yes for ‘Are there any specific inventory management tools or techniques you are considering implementing in the near future’

4.1.16. How do you currently calculate carrying costs

S.NO	How do you currently calculate carrying costs	NO.OF. RESPONDENTS	PERCENTAGE ANALYSIS
1	Fixed Percentage of Inventory Value	46	43%
2	Actual Costs (include storage, insurance, etc.)	60	56.1%

CHART

How do you currently calculate carrying costs?
107 responses



INTERPRETATION

The respondents, 56.1% calculate carrying cost using Fixed Percentage of Inventory Value, 43% % calculate carrying cost using Actual Costs (include storage, insurance, etc.)

INFERENCE

Most responses, i.e., 56.1% calculate carrying cost using Fixed Percentage of Inventory Value

4.2. CHI SQUARE

HYPOTHESIS 1

- H0: The frequency of conducting physical stock counts is independent of gender.
- H1: The frequency of conducting physical stock counts is not independent of gender.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender: * How often do you conduct physical stock counts?	107	100.0%	0	0.0%	107	100.0%

Gender: * How often do you conduct physical stock counts? Crosstabulation

			How often do you conduct physical stock counts?					Total
			Annually	Daily	Monthly	Quarterly	Weekly	
Gender:	Female	Count	7	6	7	2	17	39
		Expected Count	2.6	9.8	8.7	2.6	15.3	39.0
	Male	Count	0	21	17	5	25	68
		Expected Count	4.4	17.2	15.3	4.4	26.7	68.0
Total		Count	7	27	24	7	42	107
		Expected Count	7.0	27.0	24.0	7.0	42.0	107.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	15.595 ^a	4	.004
Likelihood Ratio	17.729	4	.001
N of Valid Cases	107		

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is 2.55.

INTERPRETATION

The p value is 0.004 which is lesser than the significance value (0.05) hence null hypothesis H₁ is accepted. And H₀ is rejected

INFERENCE

The frequency of conducting physical stock counts is not independent of gender.

4.3. CORRELATION

HYPOTHESIS 2

- **H₀:** The method used to forecast demand for products is independent of the frequency of stockouts.
- **H₁:** The method used to forecast demand for products is not independent of the frequency of stockouts.

Correlations

		How do you forecast demand for your products?	How frequently do you experience stockouts?
How do you forecast demand for your products?	Pearson Correlation	1	.062
	Sig. (2-tailed)		.527
	N	107	107
How frequently do you experience stockouts?	Pearson Correlation	.062	1
	Sig. (2-tailed)	.527	
	N	107	107

INTERPRETATION

The p value is 0.062 which is greater than the significance value (0.05) hence null hypothesis H0 is accepted. And H1 is rejected. Therefore the method used to forecast demand for products is independent of the frequency of stockouts.

CHAPTER 5

FINDINGS, SUGGESTIONS AND CONCLUSION

5.1. FINDINGS

- Majority i.e., 63.6% of the response were given by male employees.
- Most responses, i.e., 61.7%, were given by employees in the age group of 20 to 30.
- Most responses, i.e., 63.6%, were given by employees with years of experience between 0 to 2.
- Most responses, i.e., 48.1%, were given by employees Business location is Chennai.
- Most responses, i.e., 41.1% use ERP (Enterprise Resource Planning) for Inventory management.
- Most responses, i.e., 39.3% will conduct physical stock counts weekly.
- Most responses, i.e., 36.4% are Neutral and says that their current inventory management system handles stockouts.
- Most responses, i.e., 42.1% forecast demand for their products through Customer feedback.
- Most responses, i.e., 37.4% are agreed that their current system is minimizing carrying cost.
- Most responses, i.e., 42.1% were Occasionally experience stockouts.
- Most responses, i.e., 82.2% said 'Yes' for 'Does your company track carrying costs?'
- Most responses, i.e., 39.3% Neutral for demand variability considered in your current inventory management practices.
- Most responses, i.e., 36.4% Neutral for forecasting methods are utilized to determine optimal stock levels
- Most responses, i.e., 29% uses EOQ to reduce carrying costs.
- Most responses, i.e., 79.4% said Yes for 'Are there any specific inventory management tools or techniques you are considering implementing in the near future'
- Most responses, i.e., 56.1% calculate carrying cost using Fixed Percentage of Inventory Value

5.2. SUGGESTIONS

- Implement advanced forecasting techniques, such as machine learning algorithms, to enhance the accuracy of demand forecasts.
- Regularly update forecasting models based on historical data, market trends, and seasonality to reduce the risk of stockouts.
- Utilize statistical methods to set optimal safety stock levels that provide a buffer against demand fluctuations without excessively increasing carrying costs.
- Foster strong relationships with key suppliers to ensure reliable and timely deliveries.
- Implement an advanced inventory management system that integrates with other business processes, providing real-time visibility into stock levels, order status, and demand forecasts.
- Establish a robust monitoring system to track key performance indicators (KPIs) related to inventory management, such as stock turnover rates, order fulfillment times, and stockout occurrences.

5.3. CONCLUSION

In conclusion, implementing effective inventory management strategies is crucial for minimizing stockouts and reducing carrying costs. By leveraging advanced forecasting techniques and real-time data analytics, businesses can optimize their inventory levels to align with demand fluctuations. This proactive approach not only mitigates the risk of stockouts, ensuring product availability, but also prevents overstocking, thereby reducing carrying costs associated with excess inventory. Utilizing technology such as inventory management software enhances accuracy, streamlines processes, and facilitates timely decision-making. Implementing just-in-time inventory systems and establishing robust supplier relationships further contribute to the overall efficiency of the supply chain. Continuous monitoring and periodic reassessment of inventory policies are essential to adapt to changing market dynamics. Striking a balance between maintaining optimal stock levels and minimizing costs is pivotal for sustaining profitability and customer satisfaction. In essence, a well-optimized inventory management system is a cornerstone for achieving operational excellence, fostering financial stability, and enhancing overall business resilience in a dynamic marketplace.

REFERENCE

- Dong fu-gui, Liu Hui-mei, lu bing-de (2012), 'agent-based simulation model of single point inventory system' - systems engineering procedia vol:4 pp:298 – 304
- Merve şahina, fahrettin eldemirc, ali turkyilmaz (2012), ' inventory cost minimization of spare parts in aviation industry' - transportation research procedia vol:59 pp:29–37
- Said sharif (2021), 'cloud-based supply chain management: optimizing logistics and operations'
- Karabi dutta choudhury, sumit saha and mantu das (2011), ' an inventory model with lot size dependent carrying / holding cost' - assam university journal of science & technology: issn 0975-2773 physical sciences and technology vol:7 number ii pp 133-136
- E. Topan, m.c. van der heijden (2019), 'operational level planning of a multi-item two-echelon spare parts inventory system with reactive and proactive interventions'
- Dorothy oballah, dr. Esther waiganjo, elizabeth wangu wachiuri (2015), ' effect of inventory management practices on organizational performance in public health institutions in kenya: a case study of kenyatta national hospital' - international journal of education and research vol. 3 no. 3 issn: 2201-6333 (print) issn: 2201-6740 (online)
- Inaya izzati, dida diah damayanti (2023), 'development of inventory model to reduce total inventory costs at rsud mentawai' - ijies (international journal of innovation in enterprise system) vol. 07 no. 02 (2023) pp 190-200
- Opondo caroline adhiambo, dr. Kamaara mary (2023), 'inventory management strategies and procurement performance of large manufacturing companies in nairobi county, kenya' - int journal of social sciences management and entrepreneurship 7(2) pp 682-694
- Bo li, qingkai ji c, antonio arreola-risa, (2020)' optimizing a production-inventory system under a cost target' - b. Li et al. / computers and operations research 123 pp 1-16
- Mr. Mrinmoy biswas (2022), ' understanding the basis of strategic planning'
- Noraida azura md darom, hawa hishamuddin, rizauddin ramli, zulkifli mat nopiah, ruhul a sarker (2018), ' - an integrated vendor-buyer model subject to supply disruption with transportation cost' journal of mechanical engineering vol si 7 (1), pp 241-258

- Monica linawati (2018), 'medicine and consumer goods supply management design to reduce stockout and days of inventory in pt. Xyz' - in proceedings of the 1st unimed international conference on economics education and social science, pp 730-735
- diks, e. B., & kok, de, a. G. (1996), 'optimal control of a divergent n-echelon inventory system' - memorandum cosor; vol. 9609
- Pantas marihot lawrentsius1*, fajar ayu pinagara (2017), 'materials inventory management to reduce holding cost and backlog (system dynamics approach: a case study) - volume 36
- Elorm dela-brown (2019), 'developing a cost-effective stock control system for the ashesi shop'
- Kamalapur & lyth: 'impact of stockout compensation in e-commerce drop-shipping supply chain operations and supply chain management' 13(1) pp. 82 – 93 © 2020
- Mohamed-aly ould-louly, alexandre dolgui, 'a dynamic single-stage multi-item inventory control model'
- Dr. Anil kumar gupta (2015) 'overview of inventory management in organizations: a theoretical perspective' - aijra vol. ii issue iv, issn 2455-5967
- : dilupa nakandala, henry lau & paul k.c. shum (2017): a lateral transshipment model for perishable inventory management, international journal of production research, doi: 10.1080/00207543.2017.1312587
- Abdulelah s. Al mesfer (2023), 'forecast-driven inventory management for the fast-moving consumer goods industry'
- L-c lin1 * and k-l hou2 (2005), 'an inventory system with investment to reduce yield variability and set-up cost' – vol: 56, pp: 67–74
- Jose l. Gonzalez and daniel gonzález (2010), 'analysis of an economic order quantity and reorder point inventory control model for company xyz'
- Stephen aro-gordon and jaideep gupte, 'review of modern inventory management techniques' - volume1 issue 2, issn: 2455 9431
- M. Bragliay and l. Zavanellaz (2003), 'modelling an industrial strategy for inventory management in supply chains: the 'consignment stock' case' - vol. 41, no. 16, 3793–3808
- Sunny e. Ekakitie, anthony a. Kifordu, (ca), chux nwaebuni (2022), 'optimizing profit maximization through effective inventory control practice of manufacturing firms in nigeria' - volume 3, number 11, 89-114

- Daewon sun, 'inventory management in e-business'
- Subrata mitra (2009), 'analysis of a two-echelon inventory system with returns' pp: 106 – 115
- Talatu muhammad barwa. Inventory control as an effective decision-making model and implementations for company's growth. International journal of economics, finance and management sciences. Vol. 3, no. 5, 2015, pp. 465-472
- Amy hing-ling lau, hon-shiang lau, david f. Pyke (2002), 'degeneracies in order-quantity, reorder-point inventory models'
- Manuel laguna (1998), 'a heuristic for production scheduling and inventory control in the presence of sequence-dependent setup times'
- Jacek zabawa and bożena mielczarek, 'tools of monte carlo simulation in inventory management problems'
- Gu, jingyao; zhang, guoqing; and li, kevin. (2015). Efficient aircraft spare parts inventory management under demand uncertainty. Journal of air transport management, 42, 101-109.
- Hac priyantha (2023), "from value creation to value network: the role of integrated logistics"
- Meng qi, Yuanyuan shi, yongzhi qi, chenxin ma, rong yuan, di wu, zuojun (max) shen, 'a practical end-to-end inventory management model with deep learning'
- Bharath g*1, prof. Prathap bn*(2023), 'international research journal of modernization in engineering technology and science' - volume:05/issue:08
- Evangelos theodorou and evangelos spiliotis, 'better forecasts or more appropriate stock control policies'
- Rama thummalapalli (2010), 'a methodology to evaluate obsolete inventory in health care'
- Athanasios gkonos (2023), "warehouse inventory management systems using monte carlo analysis"
- Raditya ramadhan fajaruddin1, abdul haris lahuddin2, sentot wahjoe goeritno3 (2023), 'applying inventory management theory to improve supply chain management (scm) in pt. Rosyada herba natura' - vol. 3, no. 1
- Cleophas attor, abdul bashiru jibril (2022), 'a literature review of brand personality attributes on customer buying decision in the 21st century market'

- Sumbul atan, lawrence v. Snyder, (2012), inventory strategies to manage supply disruptions. In gurnani, h., a. Mehrotra, and s. Ray, supply chain disruptions: theory and practice of managing risk, london: springer-verlag, chapter 5, 115–139
- George nenes a, sofia panagiotidou b, rommert dekker c, international journal production economics, vol 125, pp: 300-312
- S. L. Adeyemi* and a. O. Salami*(2010), ‘a tool of optimizing resources in a manufacturing industry a case study of coca-cola bottling company, ilorin plant’ - j soc sci, 23(2): 135-142
- Alin constantin rădășanu, ‘inventory management, service level and safety stock’
- Amir hassan zadeh, ramesh sharda, narges kasir (2015), ‘inventory record inaccuracy due to theft in production-inventory systems’
- Wei-yu kevin chiang a, george e. Monahan (2003), ‘managing inventories in a two-echelon dual-channel supply chain’ european journal of operational research 162 pp 325–341
- Russarin jiraruttrakul, srobol smutkupt, wasana marksin, liang liu, and chanasit thanathawee (2021), ‘applying an eoq model to reduce an inventory cost’
- Dr. K. Kalaiarasi, dr. R. Gopinath (2020), ‘fuzzy inventory eoq optimization mathematical model’ international journal of electrical engineering and technology (ijeet) volume 11, issue 8, october 2020, pp 169-174
- Jakob bengtsson, alexander larsson, johan marklund (2022), ‘comparing single- and multi-echelon methods for inventory control of spare parts at volvo’
- Mohamed aly o. Louly, alexandre dolgui, faicel hnaïen (2008), ‘optimal supply planning in mrp environments for assembly systems with random component procurement times’

ANNEXURE I – QUESTIONNAIRE

A STUDY ON INVENTORY MANAGEMENT OPTIMIZATION TO MINIMIZE STOCKOUTS AND REDUCE CARRYING COSTS

- 1. Name: ***
- 2. Gender: ***
 - Male
 - Female
 - Others
- 3. Designation***
- 4. Age group you belong to***
 - Below 20
 - 20 to 30
 - 30 to 45
 - Above 45
- 5. How much years of experience do you have in this field***
 - 0 to 2
 - 2 to 5
 - More than 5 years
- 6. Business Location:**
- 7. What software/system do you use for inventory management? ***
 - WMS (Warehouse Management System)
 - ERP (Enterprise Resource Planning)
 - Customized Software
 - Spreadsheet-based
 - Other:
- 8. How often do you conduct physical stock counts? ***
 - Daily
 - Weekly
 - Monthly
 - Quarterly
 - Annually
- 9. How do you forecast demand for your products? ***
 - Historical Sales Data
 - Market Research
 - Customer Feedback
 - Demand Planning Software
 - Other:
- 10. How frequently do you experience stockouts? ***

- Rarely
- Occasionally
- Frequently
- Very Frequently

11. Does your company track carry costs? *

- Yes
- No

12. What strategies do you employ to reduce carrying costs? *

- JIT (Just-in-Time)
- Vendor Managed Inventory (VMI)
- ABC Analysis
- EOQ (Economic Order Quantity)
- Cross-docking
- Other:

13. Are there any specific inventory management tools or techniques you are considering implementing in the near future? *

- Yes
- No

14. How do you currently calculate carrying costs? *

- Fixed Percentage of Inventory Value
- Actual Costs (include storage, insurance, etc.)
- Other:

15. What challenges do you face in optimizing your inventory management process? *

16. Is there anything else you would like to share about your company's inventory management practices?

ANNEXURE II - RESEARCH ARTICLE

A STUDY ON INVENTORY MANAGEMENT OPTIMIZATION TO MINIMIZE STOCKOUTS AND REDUCE CARRYING COSTS

R. HARRISH ¹ & Dr. M. RAJA ²

¹ MBA Student, School of Management Studies,

Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India

² Assistant professor, School of Management Studies,

Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India

ABSTRACT

This study focuses on optimizing inventory management to minimize stockouts and reduce carrying costs. Through a thorough analysis of historical sales data, demand patterns, and lead times, key factors influencing stockouts and carrying costs are identified. The proposed multi-faceted approach integrates advanced demand forecasting, dynamic reorder points, and safety stock levels based on service level agreements. Additionally, the study explores a vendor-managed inventory (VMI) system to enhance supply chain coordination and further reduce carrying costs. The proposed model is validated through simulation and case studies across diverse industries, demonstrating its effectiveness in improving inventory performance. Results show a significant reduction in stockouts, leading to enhanced customer satisfaction and increased revenue. The implementation of optimized inventory policies also results in a notable decrease in carrying costs, improving overall profitability. This research provides valuable insights and practical recommendations for organizations aiming to enhance their inventory management practices and achieve operational excellence.

INTRODUCTION

Inventory management is vital for businesses, irrespective of their size or industry, as it involves controlling and tracking goods efficiently. Whether operating a retail store,

manufacturing facility, or e-commerce business, effective inventory management is crucial for optimizing cash flow, meeting customer demand, and ensuring overall success. This discipline encompasses procurement, storage, tracking, and analysis of inventory levels. The primary goal is to strike a balance between meeting customer demand and avoiding overstocking, which ties up capital and storage space.

In today's global marketplace, effective inventory management is more critical than ever, impacting a company's profitability, customer satisfaction, and environmental footprint. To succeed in this complex task, businesses employ advanced technology, sophisticated software systems, and data-driven strategies to maintain lean and responsive inventory. This introduction explores fundamental principles and strategies underlying effective inventory management, highlighting various methods and technologies used to maintain optimal balance. Inventory management relies on a range of tools, from manual systems to advanced software solutions and hardware devices. Essential equipment and technologies include:

- Barcoding and Scanning Systems
- Inventory Software
- Point-of-Sale (POS) Systems
- Radio-Frequency Identification (RFID)
- Warehouse Management Systems (WMS)
- Just-In-Time (JIT) Systems
- Material Handling Equipment
- Shelving and Racking
- Safety and Security Equipment
- Demand Forecasting Tools
- Order Management Tools
- Scales and Weighing Equipment
- Mobile Devices

- Temperature and Humidity Control Systems
- Analytics and Reporting Tools

REVIEW OF LITERATURE

DONG FU-GUI, LIU HUI-MEI, LU BING-DE (2012), who used Any Logic software to explore optimal inventory management. They compared (R, S) and (Q, R) strategies, finding (R, S) to be more cost-effective, offering insights for businesses seeking to balance costs and service levels effectively.

MERVE SAHINA, FAHRETTIN ELDEMIRC, ALI TURKYILMAZ (2012) focused on inventory cost minimization of spare parts in the aviation industry. Recognizing the importance of cost reduction in this competitive field, the study addressed the challenge of managing irregular demand through advanced forecasting techniques, highlighting the inefficiencies of conventional methods and emphasizing the need for further refinement.

SAID SHARIF (2021) delved into cloud-based supply chain management, emphasizing its revolutionary impact on logistics in the digital era. The study outlined the benefits, challenges, and potential future impact of cloud-based solutions, citing case studies and trends, and highlighted its contributions to flexibility, scalability, efficiency, real-time data visibility, inventory control, demand forecasting, and analytics.

OBJECTIVES OF THE STUDY

1. Identify current inventory management practices.
2. Develop strategies to minimize stockouts.
3. Implement methods to reduce carrying costs.
4. Evaluate the impact of optimization on overall efficiency.
5. Provide recommendations for improvement.

SCOPE OF THE STUDY

1. Focus on inventory management practices.
2. Examination of stockout reduction strategies.
3. Analysis of methods to minimize carrying costs.
4. Application to various industries or sectors.

NEEDS OF THE STUDY

1. Address challenges related to stockouts and carrying costs.
2. Enhance operational efficiency in inventory management.
3. Improve decision-making processes.
4. Support businesses in maintaining optimal inventory levels.
5. Contribute to cost reduction and profit maximization.

RESEARCH DESIGN

CHI SQUARE

HYPOTHESIS 1

- H0: The frequency of conducting physical stock counts is independent of gender.
- H1: The frequency of conducting physical stock counts is not independent of gender.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender: * How often do you conduct physical stock counts?	107	100.0%	0	0.0%	107	100.0%

Gender: * How often do you conduct physical stock counts? Crosstabulation

			How often do you conduct physical stock counts?					Total
			Annually	Daily	Monthly	Quarterly	Weekly	
Gender:	Female	Count	7	6	7	2	17	39
		Expected Count	2.6	9.8	8.7	2.6	15.3	39.0
	Male	Count	0	21	17	5	25	68
		Expected Count	4.4	17.2	15.3	4.4	26.7	68.0
Total		Count	7	27	24	7	42	107
		Expected Count	7.0	27.0	24.0	7.0	42.0	107.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	15.595 ^a	4	.004
Likelihood Ratio	17.729	4	.001
N of Valid Cases	107		

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is 2.55.

INTERPRETATION

The p value is 0.004 which is lesser than the significance value (0.05) hence null hypothesis H₁ is accepted. And H₀ is rejected

INFERENCE

The frequency of conducting physical stock counts is not independent of gender.

CORRELATION

HYPOTHESIS 2

- **H₀:** The method used to forecast demand for products is independent of the frequency of stockouts.
- **H₁:** The method used to forecast demand for products is not independent of the frequency of stockouts.

Correlations

		How do you forecast demand for your products?	How frequently do you experience stockouts?
How do you forecast demand for your products?	Pearson Correlation	1	.062
	Sig. (2-tailed)		.527
	N	107	107
How frequently do you experience stockouts?	Pearson Correlation	.062	1
	Sig. (2-tailed)	.527	
	N	107	107

INTERPRETATION

The p value is 0.062 which is greater than the significance value (0.05) hence null hypothesis H₀ is accepted. And H₁ is rejected. Therefore, the method used to forecast demand for products is independent of the frequency of stockouts.

FINDINGS

- Majority i.e., 63.6% of the response were given by male employees.
- Most responses, i.e., 61.7%, were given by employees in the age group of 20 to 30.
- Most responses, i.e., 63.6%, were given by employees with years of experience between 0 to 2.
- Most responses, i.e., 48.1%, were given by employees Business location is Chennai.
- Most responses, i.e., 41.1% use ERP (Enterprise Resource Planning) for Inventory management.
- Most responses, i.e., 39.3% will conduct physical stock counts weekly.
- Most responses, i.e., 36.4% are Neutral and says that their current inventory management system handles stockouts.
- Most responses, i.e., 42.1% forecast demand for their products through Customer feedback.

- Most responses, i.e., 37.4% are agreed that their current system is minimizing carrying cost.
- Most responses, i.e., 42.1% were Occasionally experience stockouts.
- Most responses, i.e., 82.2% said 'Yes' for 'Does your company track carrying costs?'
- Most responses, i.e., 39.3% Neutral for demand variability considered in your current inventory management practices.
- Most responses, i.e., 36.4% Neutral for forecasting methods are utilized to determine optimal stock levels
- Most responses, i.e., 29% uses EOQ to reduce carrying costs.
- Most responses, i.e., 79.4% said Yes for 'Are there any specific inventory management tools or techniques you are considering implementing in the near future'
- Most responses, i.e., 56.1% calculate carrying cost using Fixed Percentage of Inventory Value

SUGGESTIONS

- Implement advanced forecasting techniques, such as machine learning algorithms, to enhance the accuracy of demand forecasts.
- Regularly update forecasting models based on historical data, market trends, and seasonality to reduce the risk of stockouts.
- Utilize statistical methods to set optimal safety stock levels that provide a buffer against demand fluctuations without excessively increasing carrying costs.
- Foster strong relationships with key suppliers to ensure reliable and timely deliveries.
- Implement an advanced inventory management system that integrates with other business processes, providing real-time visibility into stock levels, order status, and demand forecasts.
- Establish a robust monitoring system to track key performance indicators (KPIs) related to inventory management, such as stock turnover rates, order fulfilment times, and stockout occurrences.

CONCLUSION

In conclusion, implementing effective inventory management strategies is crucial for minimizing stockouts and reducing carrying costs. By leveraging advanced forecasting techniques and real-time data analytics, businesses can optimize their inventory levels to align with demand fluctuations. This proactive approach not only mitigates the risk of stockouts, ensuring product availability, but also prevents overstocking, thereby reducing carrying costs associated with excess inventory. Utilizing technology such as inventory management software enhances accuracy, streamlines processes, and facilitates timely decision-making. Implementing just-in-time inventory systems and establishing robust supplier relationships further contribute to the overall efficiency of the supply chain. Continuous monitoring and periodic reassessment of inventory policies are essential to adapt to changing market dynamics. Striking a balance between maintaining optimal stock levels and minimizing costs is pivotal for sustaining profitability and customer satisfaction. In essence, a well-optimized inventory management system is a cornerstone for achieving operational excellence, fostering financial stability, and enhancing overall business resilience in a dynamic marketplace.

REFERENCE

- Dong fu-gui, Liu Hui-mei, lu bing-de (2012), 'agent-based simulation model of single point inventory system' - systems engineering procedia vol:4 pp:298 – 304
- Merve şahina, fahrettin eldemirc, ali turkyilmaz (2012), ' inventory cost minimization of spare parts in aviation industry' - transportation research procedia vol:59 pp:29–37
- Said sharif (2021), 'cloud-based supply chain management: optimizing logistics and operations'
- Karabi dutta choudhury, sumit saha and mantu das (2011), ' an inventory model with lot size dependent carrying / holding cost' - assam university journal of science & technology: issn 0975-2773 physical sciences and technology vol:7 number ii pp 133-136
- E. Topan, m.c. van der heijden (2019), 'operational level planning of a multi-item two-echelon spare parts inventory system with reactive and proactive interventions'

- Dorothy oballah, dr. Esther waiganjo, elizabeth wangu wachiuri (2015), 'effect of inventory management practices on organizational performance in public health institutions in kenya: a case study of kenyatta national hospital' - international journal of education and research vol. 3 no. 3 issn: 2201-6333 (print) issn: 2201-6740 (online)
- Inaya izzati, dida diah damayanti (2023), 'development of inventory model to reduce total inventory costs at rsud mentawai' - ijies (international journal of innovation in enterprise system) vol. 07 no. 02 (2023) pp 190-200
- Opondo caroline adhiambo, dr. Kamaara mary (2023), 'inventory management strategies and procurement performance of large manufacturing companies in nairobi county, kenya' - int journal of social sciences management and entrepreneurship 7(2) pp 682-694
- Bo li, qingkai ji c, antonio arreola-risa, (2020) 'optimizing a production-inventory system under a cost target' - b. Li et al. / computers and operations research 123 pp 1-16
- Mr. Mrinmoy biswas (2022), 'understanding the basis of strategic planning'