

Implementation Vendor Managed Inventory in Electronic Manufacturing

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Abstract: *A supply chain (SC) is described as a chain in which raw materials are obtained, products are manufactured in one or more factories, transported to a distribution warehouse, supplied to retailers, and eventually reach the customer's hand. Supply Chain Management (SCM) is the strategic coordination of key activities and strategies across functions inside a specific business as well as across its supply chain partners in order to improve the long-term performance of the individual organisations and the supply chain as a whole. Supply chain management has been increasingly significant in the industrial world in recent years. Inventory management is one of the most critical concerns in the supply chain that may have a significant impact on the chain's performance. Demand in the upstream portion of the chain is dependent on orders produced in the downstream part of the chain, and because of market uncertainties, inventory management has become a highly difficult issue. According to the traditional supply chain structure, each member of the chain has their own inventory policy to enhance organisational performance. Due to a lack of information sharing among members, upstream members are uninformed of actual client demand. Now, with the VMI method to information exchange in the supply chain, the supplier has access to the customer's inventory and demand information. The research results show that by using the VMI approach, can enhanced the inventory alignment, enhancing overall financial performance and improved business performance.*

Keywords: Vendor Managed Inventory, Electronic Manufacturing, Supply Chain Management

1. Introduction

1.1 Research Background

In the electronic manufacturing industry, efficient inventory management is crucial for success (Priniotakis, G., & Argyropoulos, P. ;2018). Vendor Managed Inventory (VMI) has emerged as a practical solution that aims to improve inventory alignment (Radzuan, K;2018) , optimize financial performance, and enhance business operations. This study will explore the impact of implementing VMI practices on operational efficiency in electronics manufacturing, as well as provide valuable insights for enhancing the end-to-end supply chain experience for customers.

Supply chain management is a crucial part of modern business operations. It involves overseeing the entire journey of a product, from creation to delivery. It can be complex due to

the many activities, processes, and people involved. The goal is to ensure smooth movement of goods, reduce costs, satisfy customers, and gain a competitive edge.

Efficiency, cost reduction, and meeting customer expectations are key principles in supply chain management. Each step, from acquiring raw materials to production, storage, transportation, and delivery, must be carefully planned and executed to minimize waste, save time, optimize inventory, and ensure timely customer satisfaction.

To address these challenges, various strategies and initiatives have been developed. Quick Response (QR) aims to minimize lead times by improving communication and collaboration between suppliers and retailers. Synchronised Consumer Response (SCR) focuses on coordinating demand and supply to prevent stockouts and excess inventory. Efficient Consumer Response (ECR) optimizes the entire supply chain to reduce costs and improve product availability. Rapid Replenishment (RR) emphasizes agile inventory management to meet customer demands promptly. Collaborative Planning, Forecasting, and Replenishment (CPFR) involves suppliers and retailers working together to plan and share information for coordinated supply chain activities.

While each system has its own advantages and limitations, effective supply chain management requires a comprehensive and interconnected approach. Organizations should consider the interdependencies and interactions between different stages of the supply chain. Technology, data analytics, and real-time information sharing can enhance visibility and responsiveness. By taking a holistic view, organizations can identify inefficiencies, improve processes, manage risks, and continuously enhance the supply chain.

Additionally, integrating sustainability and social responsibility is increasingly important in supply chain management. Organizations recognize the need to reduce their environmental impact, promote ethical conduct, and ensure fair treatment of workers throughout the supply chain. This involves evaluating supplier sustainability, adopting eco-friendly logistics practices, and advocating for transparency and accountability in supply chain operations.

1.2 Problem Statement

The electronic manufacturing company is facing significant challenges in managing consumable materials within their current inventory management system. These materials, such as gloves, hair nets, and earplugs, play a crucial role in ensuring smooth operations but are not integrated into the final product. However, the existing system is causing problems, including production delays, inefficient resource utilization, and increased operational costs.

One major issue is production delays caused by the current inventory management system's inability to accurately forecast demand for consumable materials. This leads to stockouts or inadequate quantities when needed, disrupting workflow and delaying customer orders. These delays not only affect customer satisfaction but also impact on the company's financial performance and market position.

The inefficient management of consumable materials results in wastage of resources. To mitigate demand uncertainties, the company may stock excessive inventory, which can lead to expired or obsolete goods over time. Ineffective handling and storage procedures further contribute to waste and increased operational expenses.

The existing inventory management system also leads to escalated operational costs. Inaccurate demand forecasting, excessive stock levels, stockouts, and material wastage result in higher carrying costs, tied-up working capital, and increased expenses for storage and handling. These additional expenses reduce profitability and hinder the company's ability to allocate resources to other important areas, limiting overall expansion and competitiveness.

To overcome these challenges, the company recognizes the need for an enhanced inventory management system tailored to efficiently handle consumable materials. The goal is to improve demand forecasting accuracy, enhance inventory visibility, strengthen vendor relationships, and optimize replenishment processes. Implementing such a system would allow for effective control and management of consumable material inventory, leading to reduced lead times, minimized waste, and decreased operational expenses.

By implementing an advanced inventory management system, the electronic manufacturing company can improve operational efficiency, cost reduction, production efficiency, and customer satisfaction. A highly effective system (Aziz, A., Zaman, K., & Hanif, U. 2019) with precise demand forecasting, enhanced visibility, and optimized replenishment processes will help address the challenges associated with managing consumable materials.

1.3 Research Aim and Objective

The goal of this study is to improve the inventory management system in an electronic manufacturing company. They face challenges in efficiently managing consumable materials, leading to production disruptions, increased resource consumption, and higher operational expenses. The study will analyze the current system, identify areas for improvement, and implement a more effective and customized inventory management system.

The analysis will focus on demand forecasting, procurement procedures, inventory monitoring, and supplier collaboration. By identifying weaknesses and opportunities for improvement, the study aims to enhance operational effectiveness. The new system will prioritize reducing production delays, optimizing resource utilization, and decreasing operational expenses. Metrics such as inventory turnover, stock levels, and customer satisfaction will be used to evaluate its effectiveness.

The study's findings will contribute to understanding the challenges in managing consumable materials and provide recommendations for better supply chain management strategies. Implementing efficient inventory management practices will improve financial performance and overall business outcomes for the electronic manufacturing company.

The research objective for this study is:

- i. To identify the contributing factors of continuous replenishment (CR) and the absence of supply disruption
- ii. To propose an effective inventory system to avoid supply disruption based on the identified contributing factors
- iii. To verify the effectiveness of the proposed inventory system against existing system

1.4 Scope and Limitation of Study

This study focuses on leveraging information to enhance supply chain management effectiveness. Despite time limitations, the researchers developed a practical communication system to showcase the benefits of information management. The study explores not only

technological aspects but also cultural, organizational, and strategic factors in information utilization within the supply chain.

The communication system proposed in the study serves as an initial step for organizations to improve their supply chain operations. While it may not have advanced features, it offers valuable perspectives and suggestions for organizations seeking to enhance their supply chain management procedures. The study emphasizes the importance of information management in achieving efficient and effective supply chain operations, even in resource-constrained situations. It highlights information management as a strategic necessity for companies aiming to optimize their supply chains.

Overall, the study aims to enhance operational effectiveness in supply chain management through the application of information. The researchers demonstrate the potential impact of information and urge companies to prioritize information management practices for improved efficiency and effectiveness.

2. Literature Review

2.1 Introduction

Traditional supply chain management involves coordinating various activities to deliver products or services efficiently and cost-effectively. These activities include acquiring products, production, logistics, and distribution. The main goals are to improve inventory levels, streamline production, use technology effectively, manage supplier relationships, and maintain product quality.

In the diagram, orders flow through the supply chain from the retailer to the distributor, and finally to the manufacturer. Each participant in the chain follows their own inventory policy to optimize their individual performance. These policies consider factors like production levels, demand, and resource availability. The focus is often on maximizing individual financial gains rather than the overall performance of the entire supply chain.



Figure 1: Schematic of Traditional Business Method
(S.M. Disney and D.R. Towill, 2003)

In the traditional supply chain model, orders are passed sequentially from the retailer to the distributor and manufacturer. However, lack of communication and information sharing can lead to challenges in predicting demand and managing inventory effectively. Each participant in the chain focuses on their own profitability and follows their own inventory policy. Traditional supply chain management has limitations, such as insufficient information on inventory levels, which can result in stockouts or overstocking. Managing supplier relationships can also be challenging, leading to transportation issues, product quality problems, and coordination difficulties.

To address these challenges, vendor managed inventory (VMI) has gained popularity. In VMI, suppliers take responsibility for managing inventory levels at the customer's facilities. This approach improves visibility, reduces costs, and strengthens supplier relationships. Successful

VMI requires trust, communication, and accurate demand prediction from suppliers. VMI offers benefits beyond cost savings. It can enhance product quality, improve supplier relationships, and increase supply chain efficiency. It also reduces the customer's workload and minimizes the risk of stockouts.

The choice between traditional supply chain management and VMI depends on the specific requirements and goals of the customer. While traditional methods may work for some companies, VMI provides a more efficient and cost-effective alternative for others. Factors to consider include cost, inventory visibility, supplier relationships, product quality, and workload.

2.2 Comparison Vendor Managed Inventory and Traditional Supply Chain

Vendor Managed Inventory (VMI) and traditional inventory management are different approaches. In VMI, the vendor takes responsibility for managing and replenishing inventory at the customer's location. This allows customers to focus on their core operations while relying on the vendor's expertise.

VMI offers benefits like real-time data exchange between the vendor and customer, leading to improved demand forecasting and inventory planning. It also reduces inventory levels, as the vendor strategically manages inventory based on sales data and customer engagement. VMI involves risk sharing, as the vendor assumes responsibility for accurate and available inventory, helping mitigate potential challenges for the customer.

In traditional inventory management, customers have the responsibility for inventory control, replenishment, and associated costs. They maintain autonomy and control over their inventory decisions, including storage costs and the risks of obsolescence. In traditional practices, information exchange between the customer and vendor is less frequent and lacks real-time immediacy, which can lead to decision-making delays and affect inventory management efficiency.

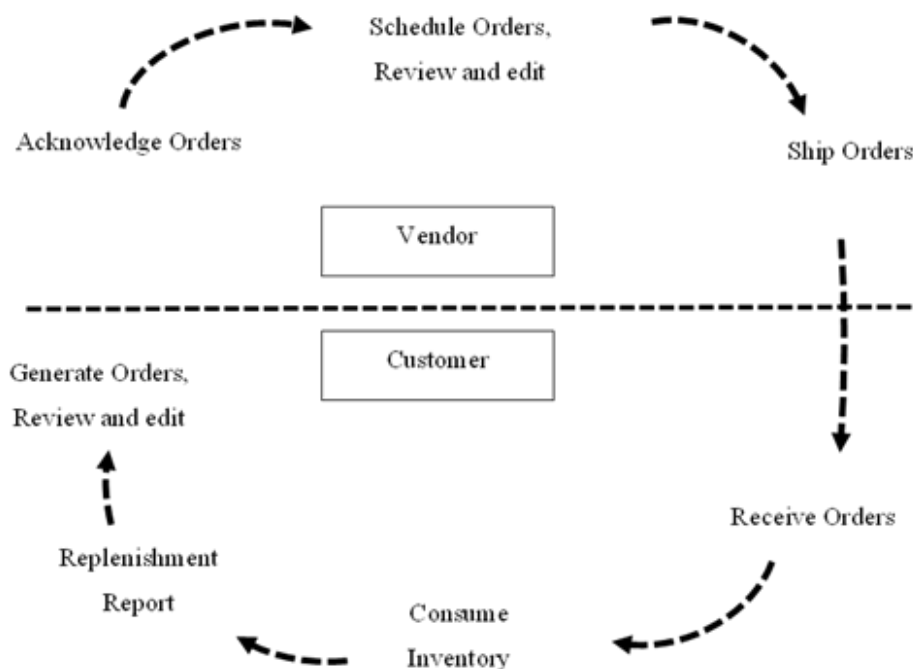


Figure 2: Schematic of Vendor Managed Inventory

2.3 Component VMI

Vendor Managed Inventory (VMI) involves components such as demand visibility, limited inventory control, and inventory location. Sharing data is crucial for addressing inventory control limitations and improving inventory accessibility. Close proximity to the inventory location is important for reducing inventory management expenses. Changes in product life cycle stages should be considered in VMI. Suppliers need to consider both VMI aspects and the characteristics of the items provided to customers. This study aims to develop VMI for suppliers and customers, enhancing business competitiveness. The resources and success of a firm, like VMI, are not easily replicated, ensuring their sustainability.

2.3.1 Inventory Location

Vendor Managed Inventory (VMI) plays a crucial role in supply chain management, especially for electronic manufacturing companies. There are two primary options for VMI inventory placement: at the customer's premises or in a communal warehouse. If the inventory is located at the customer's premises, the vendor is responsible for managing and replenishing it based on the customer's needs. This option is chosen when the customer wants more control over inventory and has storage capabilities.

On the other hand, if the inventory is placed in a communal warehouse, the vendor has direct access and takes full responsibility for managing it. This option is preferred when the product has limited shelf life or requires specific storage conditions. The choice of location depends on factors like product nature, delivery frequency, storage requirements, and the vendor-customer relationship.

Electronic manufacturing companies should consider inventory storage costs, geographical distance between vendor and customer, and delivery time when deciding the VMI location. Efficient management of consumable items is crucial to avoid supply disruptions, maintain product quality, and optimize operational efficiency. The expenses associated with a shared warehouse may be higher than storing inventory at the customer's location, so cost considerations should be taken into account.

The strategic placement of VMI within the supply chain system is important for electronic manufacturing companies. Selecting the most suitable location requires careful assessment of alternatives to ensure alignment with both customer and vendor requirements.

2.3.2 Inventory Ownership

Inventory ownership in Vendor Managed Inventory (VMI) refers to who is responsible for managing and financially handling the inventory. There are two options: customer ownership and supplier ownership. Customer ownership means the customer retains ownership while the supplier manages inventory based on agreed-upon forecasts. Supplier ownership means the supplier takes ownership and manages inventory decisions.

Choosing the right ownership model is important for efficient supply chain management. Implementing a centralized inventory system can optimize operations and improve customer satisfaction. For an electronic manufacturing company, selecting the appropriate ownership model is crucial to effectively manage inventory and reduce expenses in the supply chain.

2.3.3 Replenishment Decision

The replenishment decision in Vendor Managed Inventory (VMI) is crucial for supply chain management. It involves determining the right inventory quantity to meet customer demand while minimizing holding costs. Factors such as customer demand patterns, lead times, safety stock levels, and carrying costs influence the replenishment decision (Lin, J. T., Wang, F. K., & Wu, C. ;2014)

Analyzing customer demand patterns helps identify expected sales volume and optimal safety stock levels. Lead times determine the time needed for the vendor to acquire new inventory after placing an order. Safety stock levels act as a buffer against demand uncertainty and lead times to prevent stockouts. Carrying costs include expenses like storage, insurance, and opportunity costs. When the supplier has control over replenishment decisions, they can determine inventory quantity and delivery schedule, leading to benefits like consolidated dispatch and optimized manufacturing and distribution. They can prioritize customer orders to avoid out-of-stock expenses.

Balancing holding costs and stockouts is a challenge in VMI replenishment decisions. High safety stock levels increase carrying costs, while low levels increase the risk of stockouts and customer dissatisfaction. Developing a replenishment strategy that considers all relevant factors and minimizes total system costs is crucial.

2.3.4 Level of Demand Visibility

Demand visibility in Vendor Managed Inventory (VMI) refers to the exchange of demand-related information between the customer and the supplier. This information is crucial for the supplier to manage their inventory effectively. Customer-provided data can include sales, stock levels, production schedules, orders, and returns. By sharing this information, customers enable suppliers to understand market demand and make informed inventory decisions.

Having high demand visibility offers benefits to customers, such as ensuring inventory availability, reducing the risk of stockouts, and improving overall supply chain efficiency. This leads to increased customer satisfaction and fosters a strong relationship between the customer and the supplier. Therefore, it is important to carefully assess and manage demand visibility in a VMI program. Sharing relevant demand information benefits both the supplier and the customer, resulting in a more efficient and effective supply chain (Nawi, M. N. M. (2015)

2.3.5 Inventory Control Limit

In Vendor Managed Inventory (VMI), suppliers play a crucial role in establishing control limits for inventory management (Nawi, M. N. M. ;2015). These limits help maintain consistent inventory levels and prevent inventory fluctuations that can lead to operational inefficiencies, higher costs, and decreased customer satisfaction.

Setting a lower threshold for maximum inventory levels can reduce costs associated with surplus inventory and improve turnover rates. On the other hand, maintaining a minimum inventory level ensures availability for customers and reduces the risk of stockouts. Implementing penalty costs for stockouts incentivizes suppliers to maintain a balance in inventory levels and reduce overall quantities.

In a VMI program, customers share various demand-related information with suppliers, including sales data, inventory levels, orders, returns, and production schedules. This

information enables suppliers to make informed decisions about inventory replenishment, reducing the chances of stockouts and excessive inventory levels.

3. Research Methodology

3.1 Research Design

This study aims to comprehensively examine the proposed inventory system and its effectiveness compared to the current system. The research design includes research objectives, research questions, data collection tools, and deliverables. Quantitative data collection methods will be used to gather systematic and structured data for analysis and comparison. A mixed-methods approach, combining quantitative and qualitative methodologies, will be employed for thorough data analysis. Relevant scholarly journals, archival materials, and internal reports will be examined.

The analysis will focus on assessing the degree of alignment achievable in service optimization and inventory stabilization. A cost-benefit analysis will be conducted to compare the proposed system with the current system, considering factors like replenishment time and inventory costs. A time study will be performed to compare task durations between the two systems. The study aims to evaluate the potential benefits of the proposed system and its effectiveness in inventory management and cost reduction. By utilizing rigorous quantitative and qualitative methodologies, this research intends to provide valuable insights into the proposed inventory system and its efficacy compared to the current system.

Table 1: Research Design

Research Objective	Research Question	Instrument/Data Collection	Sample	Data Analysis
To identify the contributing factors of continuous replenishment (CR) and the absence of supply disruption	What are the contributing factors of continuous replenishment (CR) and absence supply disruption?	<ul style="list-style-type: none"> Literature Review Document Review SIPOC 	<ul style="list-style-type: none"> Journal End User Report 	<ul style="list-style-type: none"> Quantitative / Qualitative
To propose an effective inventory system to avoid supply disruption based on the identified contributing factors	What is the effective inventory system that considers the contributing CR and supply disruption?	<ul style="list-style-type: none"> Literature Review VoC 	<ul style="list-style-type: none"> Journal Primary Data 	<ul style="list-style-type: none"> Quantitative
To verify the effectiveness of the proposed inventory system against existing system	How does the effectiveness of the proposed inventory system as compared to the existing system	<ul style="list-style-type: none"> Replenishment time & Inventory cost 	<ul style="list-style-type: none"> Journal 	<ul style="list-style-type: none"> Cost breakdown analysis and time study

3.2 Research Flowchart

The research project will follow a systematic flowchart to ensure the achievement of objectives and a smooth research process. The flowchart outlines the stages and milestones of the research, providing a visual representation of the process.

The first stage involves conducting a comprehensive review of existing literature to gain a thorough understanding of inventory management strategies, particularly vendor managed inventory (VMI) and traditional methods. Key topics such as fulfillment rate, ordering methods, and inventory availability will be examined. The next stage focuses on data collection and analysis. Internal documents, reports, and records will be examined to assess the

effectiveness of the current inventory management procedures. Mathematical models will be used to calculate the necessary inventory quantity and evaluate the alignment of inventory and supply.

The final stage involves data analysis and a comparison of VMI and traditional methods. A cost breakdown analysis and time study analysis will be conducted using collected data. The aim is to compare the financial implications and operational advantages of implementing VMI. To ensure reliability and validity, suitable data collection methods like observation, document analysis, and document review will be employed. Statistical techniques, mathematical models, and other analytical tools will be used for data analysis and drawing meaningful insights. The flowchart serves as a guide for the research project, ensuring a sequential execution of each phase and the attainment of research objectives. By following this systematic framework, the study aims to provide valuable insights into the effectiveness of VMI compared to traditional methods, helping organizations make informed decisions about their inventory management strategies.

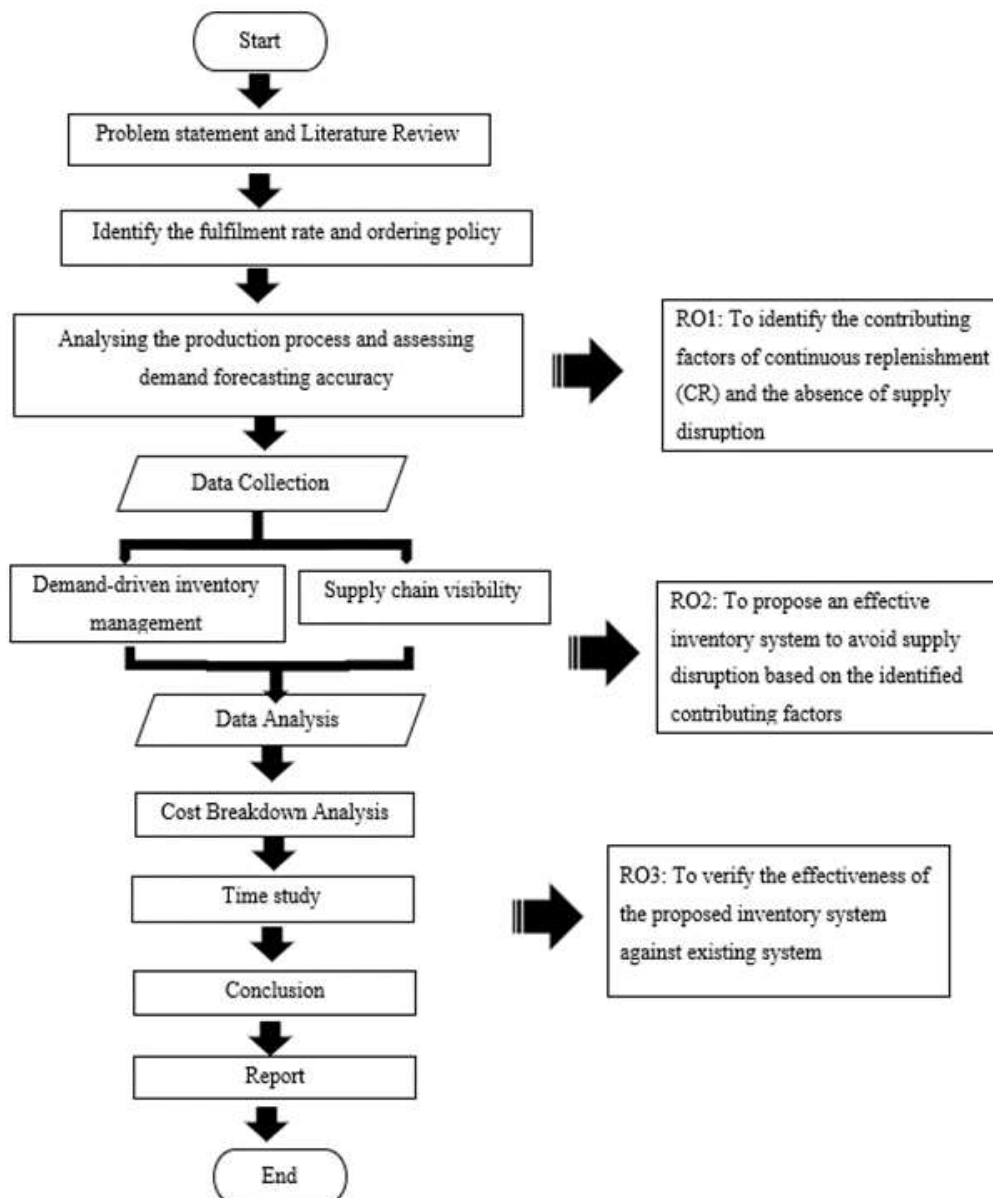


Figure 3: Research Flowchart

3.3 SIPOC and Voice of Customer

Two valuable tools commonly used in the field of study and evaluation are SIPOC (Suppliers, Inputs, Process, Outputs, Customers) and VOC (Voice of the Customer). SIPOC is a process mapping tool that helps understand and visually represent the key elements of a process: suppliers, inputs, process steps, outputs, and customers. On the other hand, VOC involves gathering direct feedback from customers to gain a better understanding of their needs, preferences, and expectations.

3.3.1 SIPOC

Process mapping is a valuable research methodology for identifying factors contributing to continuous replenishment and minimizing supply disruptions. SIPOC (Suppliers, Inputs, Process, Outputs, Customers) is an effective tool for process mapping. It helps researchers understand and analyze the different components of a process. The Suppliers component focuses on evaluating suppliers' capabilities and performance. The Inputs component identifies the necessary resources and materials for the process. The Process component visualizes the sequence of steps and activities. The Outputs component examines the outcomes and deliverables of the process. The Customers component considers the recipients of the outputs and their needs. By using SIPOC, researchers can optimize the process, enhance customer satisfaction, and improve supply chain performance.

SIPOC provides a clear visual depiction of the process flow, aiding in understanding and decision-making (Mishra, P., & Sharma, R. K. ;2014). SIPOC helps identify deficiencies and inefficiencies, allowing for focused improvement efforts. It facilitates communication and collaboration among stakeholders, leading to streamlined operations. SIPOC also helps identify interdependencies and potential risks, enabling proactive risk management. Its customer-centric approach aligns processes with customer needs, improving satisfaction and relationships. SIPOC supports process optimization by identifying non-value-added steps and waste. It establishes standardization and comprehensive documentation, ensuring consistency and providing a basis for continuous improvement. Overall, SIPOC enhances comprehension, drives efficiency, and supports ongoing improvement efforts.

3.4 Voice of Customer (VOC)

The Voice of the Customer (VOC) is crucial for organizations to understand and meet customer requirements in the supply chain. Collecting VOC data through surveys, interviews, and direct interactions helps organizations gather insights on customer preferences, quality expectations, and specific requirements. Analyzing VOC data allows organizations to identify areas for improvement and align supply chain practices with customer expectations (Zondag, M. M., & Ferrin, B. ;2014). By addressing customer feedback, organizations can enhance customer satisfaction, operational efficiency, and brand reputation. VOC analysis also helps organizations devise strategies to mitigate supply disruptions, optimize inventory management, and strengthen supplier collaboration. Continuously monitoring and adapting to customer preferences enables organizations to stay competitive and achieve long-term success. In summary, VOC is vital for understanding customer demands, enhancing satisfaction, and aligning supply chain practices with customer expectations.

4. Result and Interpretations

4.1 SIPOC Analysis and its Implications

The SIPOC framework (Suppliers, Inputs, Process, Outputs, Customers) is a valuable tool used in traditional supply chains to understand and visually represent the essential components of the supply chain process. Each element of SIPOC plays a crucial role in ensuring the smooth flow of materials and information, leading to operational efficiency and customer satisfaction.

Suppliers are responsible for providing the necessary materials, components, or services for production. They play a vital role in maintaining a consistent supply of resources to meet customer needs and production requirements.

Inputs are the essential elements of the supply chain process. They include demand forecasts, inventory reports, and procurement activities based on production plans and customer orders. Reorder points help trigger new purchase orders when inventory levels reach a specific threshold, ensuring proactive inventory management.

The process component represents the sequential stages of the supply chain, including determining inventory requirements, generating purchase orders, verifying and transporting materials, and maintaining accurate inventory records. Replenishment monitoring ensures continuous surveillance of inventory levels and timely procurement.

The outputs are the consumable materials obtained from suppliers, which are used in the production department to execute manufacturing operations and fulfill customer orders. Customers are not only the production department but also the broader network of the supply chain. Effective communication and collaboration among suppliers, internal departments, and other stakeholders are essential to maintain a harmonized supply chain and meet customer demands.

The SIPOC framework provides a comprehensive understanding of the supply chain process, enabling organizations to identify areas for improvement, optimize inventory management, and enhance overall performance. It promotes efficient collaboration among stakeholders, leading to better coordination and alignment to meet customer needs and achieve operational excellence.

4.2 VOC analysis

The Voice of the Customer (VOC) is vital for understanding and responding to customer needs in the traditional supply chain. VOC analysis provides insights into customer requirements, such as the need for continuous replenishment, effective communication, supply chain visibility, and flexibility in order fulfillment.

Customers expect a seamless supply chain process with timely replenishment to avoid stockouts. Efficient inventory management and replenishment strategies are crucial to meet these expectations and ensure a smooth product flow.

Effective communication and collaboration throughout the supply chain are important to customers. Suppliers are expected to proactively address issues and maintain transparent communication channels. Building strong relationships and trust within the supply chain network leads to enhanced customer satisfaction.

Supply chain visibility is another customer demand. Customers value transparency and real-time updates on order status and overall supply chain operations. Investing in technologies and systems that provide visibility allows customers to make informed decisions and optimize their processes.

Flexibility in order fulfillment is highly valued by customers. They expect suppliers to accommodate different order quantities, customization requests, and specific delivery schedules. Flexibility in meeting customer requirements establishes a competitive advantage and fosters stronger relationships.

To meet these customer demands, organizations must address critical-to-quality factors. Timely delivery, product quality, order accuracy, and responsive customer service are essential. Efficient logistics, stringent quality control, robust order management systems, and prompt issue resolution contribute to meeting customer expectations.

By listening to the Voice of the Customer and prioritizing customer requirements, organizations can align their supply chain processes and enhance customer satisfaction. A customer-centric approach allows organizations to consistently provide exceptional experiences, build trust, and gain a competitive edge in the market.

4.3 Result and Discussion

The electronic manufacturing company faced challenges in aligning their inventory with customer demand. The data showed fluctuating inventory levels and their impact on fulfillment rates, highlighting the need for an improved inventory management system. The fulfillment rate represents the percentage of customer demand that was met based on available stock.

Prior to the implementation phase, the supply chain exhibited noticeable fluctuations in the alignment of requirements with on-hand stock. These disparities resulted in surplus or deficit situations, highlighting mismatches between demand and availability. Such discrepancies raised concerns about the efficient fulfillment of demand while optimizing stock levels.

After the successful implementation of the approach, substantial shifts were observed in the requirements-on-hand stock relationship. Most notably, surplus stock significantly decreased, and instances of deficit stock completely vanished. These transformations indicate a tangible synchronization between requirements and available stock, unveiling a more balanced and harmonized inventory management strategy. The harmonious link between requirements and on-hand stock presents several advantages, with paramount importance attributed to the potential reduction of holding costs. Precise alignment between stock and demand allows for the mitigation of expenses associated with excessive inventory storage. Furthermore, this strategy serves as a crucial defense against stock obsolescence, a pervasive challenge in the dynamic landscape of inventory management.

The positive outcomes of this implementation extend beyond operational efficiency, encompassing significant strides in cost-effectiveness. The journey towards achieving a seamlessly aligned requirements-on-hand stock relationship sets the foundation for an agile, lean, and economically prudent inventory management system. This research not only contributes to the academic discourse on supply chain optimization but also offers practical insights with the potential to profoundly impact and enhance inventory management practices across diverse industries.

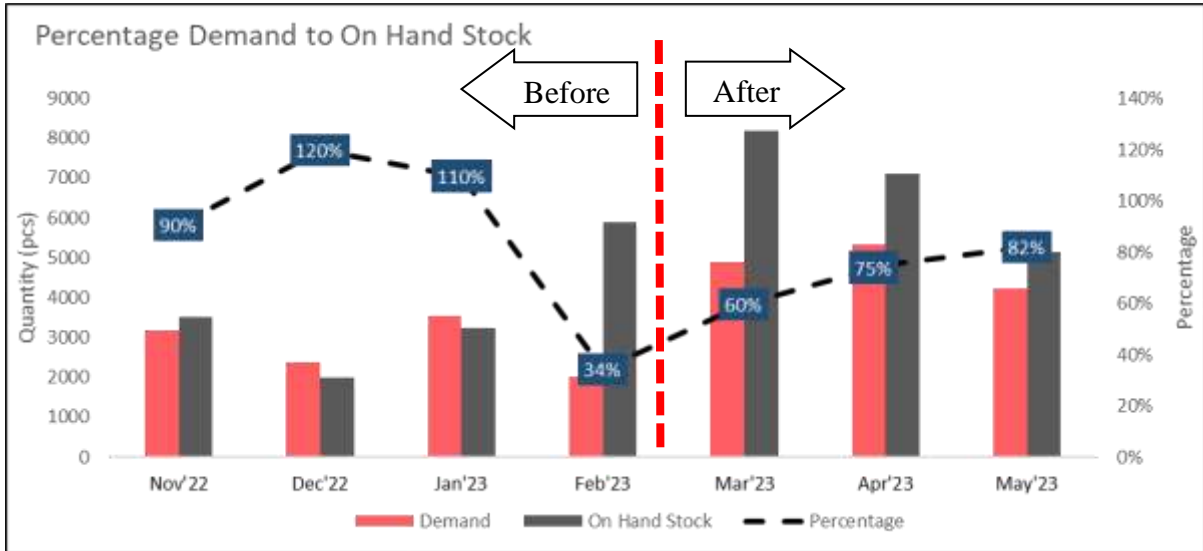


Figure 3: Percentage of Demand to On Hand Stock

4.4 Cost and Time Efficiency through VMI

One of the paramount transformations that VMI introduces is a significant reduction in labor costs when compared to existing systems. This reduction holds immense promise for improving overall cost efficiency, a critical aspect of a company's financial performance. By streamlining labor expenses, VMI contributes directly to enhancing the company's profitability. These reduced labor costs enable the organization to allocate resources more efficiently and make strategic investments in areas that drive growth and innovation.

Moreover, VMI offers a compelling advantage in the form of reduced storage costs. Compared to traditional inventory management systems, VMI minimizes the costs associated with warehousing and storage. This reduction directly translates into the company's ability to optimize its budget and allocate resources with precision. It empowers the organization to make prudent decisions about where to invest and how to allocate funds effectively. In essence, VMI not only optimizes inventory management but also supports strategic financial decision-making.

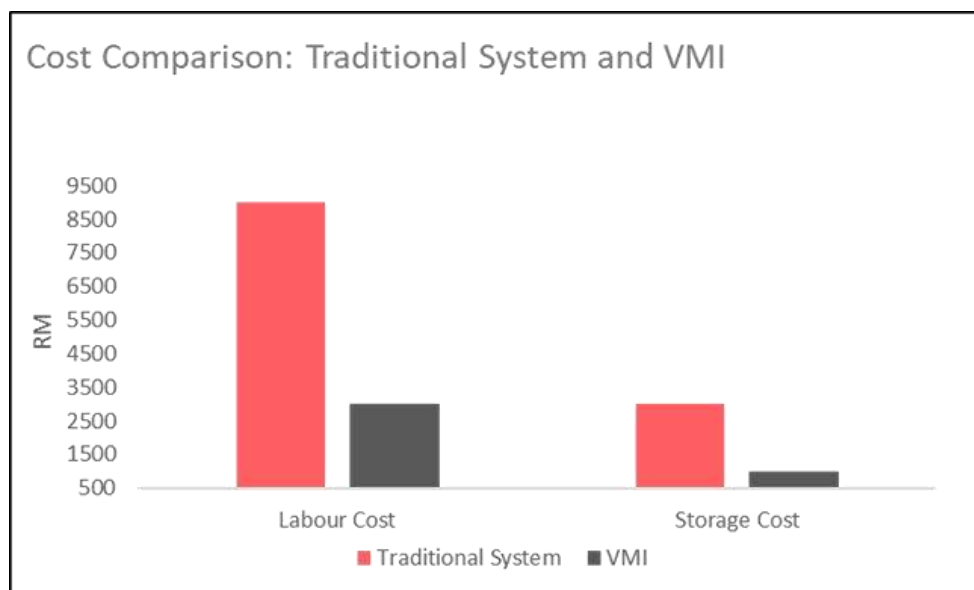


Figure 5: Cost Comparison

Beyond its cost-saving prowess, VMI introduces a fundamental transformation in lead time management. VMI significantly outperforms existing systems by offering shorter lead times, which have a profound impact on the company's ability to respond swiftly to fluctuations in customer demand. This heightened responsiveness becomes a cornerstone for ensuring customer satisfaction and achieving operational excellence. The ability to fulfill orders promptly enhances the company's reputation, strengthens customer loyalty, and ultimately drives revenue growth.

Furthermore, the streamlined processing time inherent in VMI leads to swift order handling and seamless coordination with vendors. This streamlined process significantly reduces the time required for order processing, minimizing delays and contributing to a notable surge in overall operational efficiency. With VMI, the company not only meets customer demands promptly but also streamlines its internal processes, leading to greater productivity and efficiency gains.

This enhancement in order processing efficiency, coupled with VMI's agile approach, empowers the company to manage a higher volume of orders within the same timeframe. This heightened throughput not only demonstrates operational prowess but also yields a host of business advantages. The capacity to handle a greater volume of orders contributes to elevated sales figures, bolsters cash flow, and generates greater revenue – all of which collectively influence business performance positively.

5. Conclusion and recommendation

5.1 Research outcome

In the course of this study, notable outcomes have been achieved in line with the set research objectives. Firstly, a deep understanding has been gained regarding the pivotal factors driving continuous replenishment, ultimately facilitating the optimization of inventory levels, the reduction of stockouts, and the enhancement of overall supply chain operations. Concurrently, the study has been instrumental in the identification and effective mitigation of potential disruptions within the supply chain, leading to marked reductions in delays, bottlenecks, and interruptions in the smooth flow of materials and products.

Secondly, an advanced inventory system has been successfully implemented as a direct consequence of this research. This system has been thoughtfully crafted to streamline various facets of order processing, inventory replenishment, and supplier coordination, resulting in a notable decrease in manual errors, delays, and inefficiencies inherent in the order fulfillment process.

Lastly, the research has provided invaluable insights into the cost drivers inherent in various supply chain management approaches. Notably, it has illuminated the significant advantages offered by Vendor-Managed Inventory (VMI), encompassing reduced inventory holding costs, diminished stockouts, and a more streamlined procurement process. Furthermore, the study has uncovered substantial time savings and operational efficiencies associated with VMI, including shorter lead times, reduced processing times, and the provision of real-time visibility into inventory levels. Collectively, these outcomes represent a substantial contribution to the field of supply chain management, combining theoretical insights with practical solutions poised to elevate supply chain resilience and operational efficiency in a profound manner.

5.2 Recommendation

Organizations are advised to consider using collaboration platforms and advanced technologies to enhance the efficiency of Vendor Managed Inventory (VMI) processes. These solutions provide a centralized platform for seamless communication and instant data exchange between the organization and its suppliers, improving collaboration and information sharing.

Implementing collaboration platforms streamlines order management, inventory tracking, and data sharing. It allows all relevant parties to access real-time information, eliminating delays and improving collaboration throughout the VMI process. These platforms optimize various tasks such as order placement, inventory monitoring, and order fulfillment tracking, enabling informed decision-making and proactive supply chain management.

Collaboration platforms also facilitate real-time data exchange, enhancing demand forecasting and planning. By sharing information on customer demand, inventory levels, and production capabilities, organizations and suppliers can align their operations, reduce lead times, and improve overall supply chain performance. This proactive approach helps mitigate inventory shortages, minimize stockouts, and adapt to changing customer needs.

Moreover, the integration of collaboration platforms and advanced technologies fosters stronger relationships and deeper collaboration with suppliers. Transparent communication builds trust and a shared sense of purpose, leading to efficient problem-solving and a focus on exceptional customer satisfaction.

Incorporating collaboration platforms and advanced technologies into VMI processes transforms supply chain operations. These solutions optimize order management, improve inventory tracking, and enable real-time data exchange. Enhanced collaboration and visibility empower organizations to make informed decisions, reduce lead times, and adapt to market demands. Strengthened relationships with suppliers further drive excellence. By adopting these innovative solutions, organizations position themselves as leaders in supply chain efficiency, customer satisfaction, and overall business success.

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