INSE 6290 - Quality in Supply Chain Design
(Winter-2023)

LITERATURE REVIEW ON PRODUCT INVENTORY MANAGEMENT

Submitted to:
Dr Anjali Awasthi

Submitted By:

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Course Number: INSE 6290 Instructor: Dr. Anjali Awasthi

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Signature: *Shivaranjanie S* Date: 2023-04-10

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Name: Chandra Sekar Reddy I.D. # 40189233
Signature: *Chandra Sekar R* Date: 2023-04-10

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Name: Ramya Gurumurthy I.D. # 40218557
Signature: *Ramya Gurumurthy* Date: 2023-04-10

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Name: Ishwarya Pandian I.D. # 40204481
Signature: *Ishwarya Pandian* Date: 2023-04-10

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Name: Gokula Rani Vallabhu -40161606
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INTRODUCTION:

Inventory is part of a business's assets that are ready or will be ready for sale. It consists of raw materials, items that are still being produced, and finished commodities. To meet customer expectations, inventory management plans implement, and regulate the effective forward and reverse flow, storage, and movement of products, services, and associated information between the place of origin and the site of consumption. According to the definition, inventory management is "the continuous activity of planning, controlling, and regulating inventory with the purpose of minimizing the investment in inventory while balancing supply and demand. The process involves keeping an eye on the supply, storage, and accessibility of commodities to ensure a sufficient supply without a massive overstock.[1]

The annual volume of articles on inventory management has significantly increased since the middle of the 1990s. Researchers use a range of techniques to carry out such important research. First off, most articles in logistics journals are about traditional inventory control approaches. These studies examine traditional inventory control models in particular situations or include additional variables in traditional models. Another frequently discussed topic is the creation of methods to reduce the volume of inventory that a warehouse must keep on hand. This has to do with reducing safety stock through the consolidation of warehouse locations.

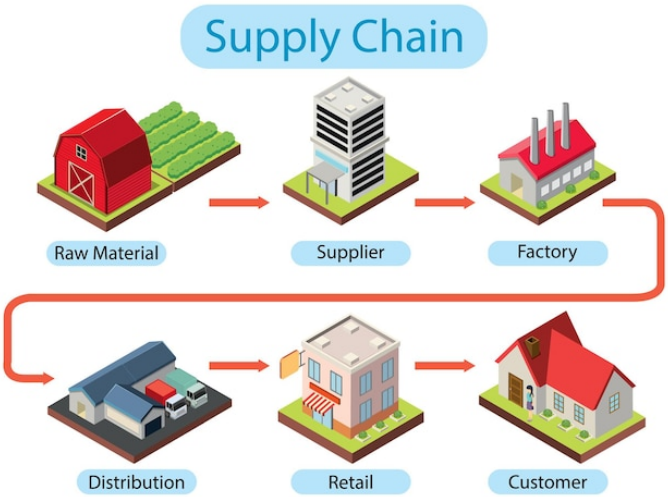


Figure 1. Supply Chain [4]

WHAT IS SUPPLY CHAIN:

A supply chain is a system of organisations, people, activities, data, and resources used to transfer products from a supplier to a buyer. Supply chain operations convert natural resources, raw materials, and components into completed commodities that are delivered to the final customer. The network of companies that take part in the different processes and

activities that produce value and deliver it through upstream and downstream links to the final consumer in the form of goods and services. a collection of material-transfer companies. the coordination of companies that sell products or services, including the last-mile consumers in the supply chain. A collection of three or more entities (either organisations or individuals) that are actively involved in the transmission of knowledge, products, or services from a source to a client. The sole focus of the supply chain, sometimes called supply chain management, is the administration of inventory from a supplier to a client and vice versa.[4]

SUPPLY CHAIN MANAGEMENT:

The complete material flow from suppliers to end users is covered in the supply chain management. to strike a balance between the three goals of strong customer service, cost-effective unit production, and low inventory management, which are generally viewed as being incompatible. the client's needs with the availability of products from suppliers to coordinate. The possibility of a change in the logistics process's locus of control, long-term agreements between two or more supply chain companies, the growth of trust and a commitment to the partnership, the blending of logistics activities involving the sharing of demand and sales data, and other factors are all to be considered. The process of strategically managing the storage and delivery of completed goods, manufactured parts, and raw materials inventories from suppliers to consumers. The stage in the evolution of purchasing, procurement, and other supply chain operations that is most advanced. This integrates tasks like discovering, buying, storing, and distributing things, activities that have existed since the beginning of business at the operational level. [5]

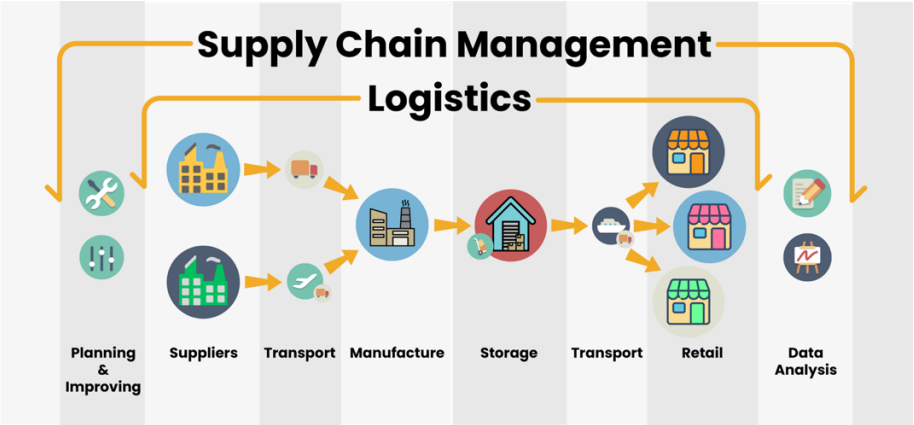


Figure 2. Supply Chain Management[5]

It is a relatively young and rapidly evolving discipline that is altering the way manufacturing and non-manufacturing firms strategically respond to the requirements of their consumers. the management of interactions between suppliers and customers upstream and downstream to improve customer value while decreasing supply chain costs. To improve the long-term performance of the individual companies and the supply chain, the conventional business activities and techniques must be fundamentally and strategically coordinated within a given firm and among businesses in the supply chain. a collection of methods used to efficiently link suppliers, manufacturers, warehouses, and retail establishments so that products are manufactured and provided in the right quantity, at the right time, and in the right places to lower system costs and fulfil service level criteria.

INVENTORY MANAGEMENT:

Inventory management is the management of noncapitalized assets, sometimes referred to as stock goods and inventory. Supply chain management includes inventory management, which regulates the flow of goods from manufacturers to warehouses and from these places to points of sale. Inventory management requires meticulous tracking of every new or returning item as it enters or leaves a warehouse or point of sale.[6]

Figure 3. Inventory Management [6]

Small and large businesses may both track their product movement by using inventory management. The correct products may be delivered in the right number, in the right place, and at the right time by using the right inventory management strategy. Inventory management is a subset of inventory control, which focuses on lowering total inventory costs while improving

the capacity to deliver products to consumers on time. In many countries, the two names can be used interchangeably.

Steps for Inventory Management

To control the flow of goods from purchase to final sale and to verify stock levels, inventory management systems are developed to log items, receive them into inventory, track changes as sales occur, and manage the flow of goods from purchase to final sale. You may benefit from inventory management by using the information provided by these technologies to increase profit margins and reduce costs.[1]

The 10 fundamental phases in managing your retail inventory check the items you have, their amount, their location, and other details like expiration dates. By understanding demand, expenses, and other factors, this stock data may help businesses improve earnings.

Figure 4. Steps Involved in Inventory Management [1]

ESTABLISH A CONSOLIDATED DATABASE FOR ALL PRODUCTS:

List every item you sell in one location along with the following information: Product name, Stock-keeping unit (SKU), Brand, Variables like size, retail price, product category, lot number, location, and expiration date, Vendor and vendor SKU, Wholesale cost, Minimum reorder amount, and Economic order quantity (EOQ). Upload product descriptions and photographs to aid in product identification for staff. This step is crucial if you do online business. Enter new goods into your inventory record as you add them. Update data if it changes, such as a vendor or a wholesale price. Create procedures for inputting inventory, specifying who oversees it and when. Rich data may help a retail inventory management system work to its full potential.[1]

Locate the Stock Location: It is simple to keep track of the whereabouts of your goods if your company is tiny and has only one outlet. Probably in the stockroom or on display are the items. Inventory, however, may be present in warehouses, distribution centres, transportation, stockrooms, and shop shelves for retail chains with several locations and omnichannel vendors. Other specialised places, such sections, shelves, and racks, can be found inside those destinations. Products that are misplaced or ignored result in missed sales and lost money. Management techniques for retail inventories aid in preventing this. To automate the mapping of your inventory, use radio frequency identification (RFID) tags, bar codes, and labels that carry category and department codes fully or partially.[1]

Conduct accurate and routine stock counts: One should count your inventory on a regular basis to ensure that it is accurate. Account for shrinkage, damage, flaws, and returns to avoid mistakes. A retail inventory management system makes this process easier because you don't have to start from scratch; you only need to double-check your data. Hence, you may concentrate largely on deviations. The complexity, size, and kind of inventory management system you employ all influence how frequently counts are performed in your firm. But at the very least, experts advise counting inventories once per quarter or once a year. Several companies regularly count certain stock items. There are other counting methods, such as cycle counting and physical counting.[1]

Combine Sales Data with Inventory Data to Simplify Reporting: Data on sales and inventory may be combined using a retail inventory management system. This image demonstrates which products are selling the quickest and which are trailing in terms of sales velocity. Use the product data to choose how much and when to order again, as well as when to run specials or discounts.[1]

Create a Purchasing Process: To avoid falling behind seasonal patterns or running the risk of stock shortages, schedule times to evaluate data and arrange orders. You can use electronic

systems to send reorder warnings based on the stock levels of specific products. A buffer that enables normal sales to continue should be included in these levels. If you're using a manual method, check the sold-out or reorder points for each item and add them to your shopping list. Consider a product's profitability, demand, and lead time when deciding which purchases to make first. A purchase order should then be made.[1]

Establish a Process for Markdowns and Promotions: For a variety of causes, including a cooling trend, obsolescence, or seasonal variables, product sales may fall short of expectations. If you provide markdowns, be strict about reducing and moving sluggish sellers so that you may free up space for more lucrative goods. Have a plan for promotions in advance as well to make sure you have adequate inventory on hand to fulfil demand.[1]

Create a Stock Receiving Procedure: You will confirm arriving orders and properly input products into an inventory system during the receiving process. Without a set protocol, any supplier error or damage during transit can cause issues including unforeseen stock shortages, overpayment to suppliers, and dead goods. Verify that each delivery's contents match the order by comparing it to the purchase order. Count cartons and pallets while verifying the kind and quantity of the products and keeping an eye out for any errors, damage, or shortages. All problems should be followed up with the vendors. After that, add the new items to inventory counts and store the products. You might add price tags or bar codes to the merchandise depending on your need. The simplest method of controlling inventory is perpetual inventory management, which entails counting items as soon as they arrive.[1]

Create a Procedure for Returns: Without a system in place to handle client returns, you run a higher risk of holding onto unsold inventory or skipping the chance to put a sellable item back on display. When a consumer returns an item, examine it to see if it is broken or defective and then send it back to the vendor, fix it, or write it off as necessary. If the item is marketable, include it in your inventory counts and place it where it belongs (in a physical store, ecommerce inventory, etc.[1]

Determine a Dead Stock Procedure: Overstocking inventory drains capital and reduces profitability. Dead stock includes defective goods, lost deliveries, and unsold seasonal items. Items that fall under this heading ought to be noted and subsequently removed from the inventory. Establish a location for dead stock storage and handle it frequently. Send pullbacks, or goods you can return to suppliers for credit, as soon as possible. Take note of any return shipment deadlines. According to their policy, suppliers should be informed and given damaged or defective products back. You can take care of the leftovers by selling to outlets, giving, recycling, or disposing of them, depending on your product line.[1]

Pick Your Inventory KPIs: Choose and monitor a few key performance indicators to determine the success of your process (KPIs). For retailers, key performance indicators include profitability, inventory value, sell-through rate, and turnover rate. The detailed reference on KPIs for inventory management explains how to calculate these and provides examples.[1]

Typical Ways to Control Inventory

To evaluate what you have, you must first identify what you have and where you store it. This is the essence of taking stock. Not every firm or each stage of an organization's growth and development need the same warehouse control techniques. Some techniques are excessively complex, particularly for smaller businesses. You should be able to track inventory levels, make orders, and distribute product using your system. Some fundamental inventory tracking systems are as follows:

MANUAL:

The simplest approach to keep track of what comes in and goes out is to physically record inventory using a pen and paper and a ledger or stock book. Small firms with few products can get away with employing this kind of system. Since it is an actual record that cannot be mined and used for planning, this technique may be challenging. [1]

STOCK CARDS:

Stock cards, also known as bin cards, are used in a little more complicated technique. A stock card is a table that keeps track of each product's running unit price, selling price, and inventory count. In sizable warehouses or stock rooms, utilise unique cards for every item. The system keeps track of purchases, sales, refunds, and other stock withdrawals for purposes like promotions. On the stock card, you can make extra notes on the item, such as any issues it may have. Consistent updates are essential for a stock card system to function well. Also, you need to keep track of any unexpected stock pulls to avoid having inaccurate data.[1]

Simple Spreadsheets: Spreadsheets are frequently used by businesses, particularly small ones, to keep track of inventories. Spreadsheets are a technique to begin automating and electronically gathering product data, whether they use Microsoft Excel or something comparable. You may make sure that you have access to the most recent stock levels and statistics by updating often and using simple scripting. These systems may be rapidly modified by businesses to suit their needs. Users will need an in-depth understanding of the spreadsheet's functionality because every person who creates a spreadsheet does so slightly differently. Because there are no high-level macros or coding connections that allow the spreadsheet system to automatically update itself, this approach is also referred to as manual.[1]

BASIC INVENTORY SOFTWARE:

Often affordable and geared for small and medium-sized enterprises, simple inventory software. To provide real-time, automated stock changes, this straightforward automation frequently uses the cloud and integrates with your point-of-sale programme. Moreover, you can

use analytics and reporting to compare costs, place reorders, determine which goods sell best and worst, and dig deeper into order information or customer behaviour. As your company expands, certain straightforward inventory management software programmes may be upgraded to include more sophisticated features.[1]

INVENTORY MANAGEMENT STATISTICS

Inventory management has the duty of comprehending the stock mix of a corporation and the various demand for that stock. It also explains how a business tracks its stock and purchases, stores, utilises, and even sells its stock. Recent data indicates that the massive disregard of inventory management in the United States results in a sizeable financial loss. This results in significant missed opportunities, errors, and expense growth. [3]

Another statistic that emphasises how important it is to always maintain inventory accuracy and visibility is the fact that many American firms still do not use any kind of inventory management technology. Also, a good inventory control system improves customer satisfaction. The most crucial information on inventory control, statistics for warehouses, the supply chain industry, inventory accuracy, and inventory management software.

Accounts receivable and accounts payable, along with inventory, have locked up $1.1 trillion in cash (IMPO Mag): Stock is a significant source of capital encumbrance. Almost 7% of the US GDP is represented by the $1.1 trillion in cash that is kept in accounts payable, receivable, and inventories (gross domestic product). There is currently $1.43 worth of inventories held by US-based businesses for every $1 in sales. According to Marketing Options, Inc., Many businesses are storing up inventory to guarantee they can meet all customer demands and prevent stock shortages.[3]

It has been shown that overstocking has its own costs and challenges. The capital has been completely depleted by overstocking, rendering it unusable for any future uses. Investing in technology that boosts output or efficiency is one illustration. Moreover, there is a higher risk of higher costs due to managing and keeping more inventory, as well as a danger of shrinkage because the products may become dated or even expire.

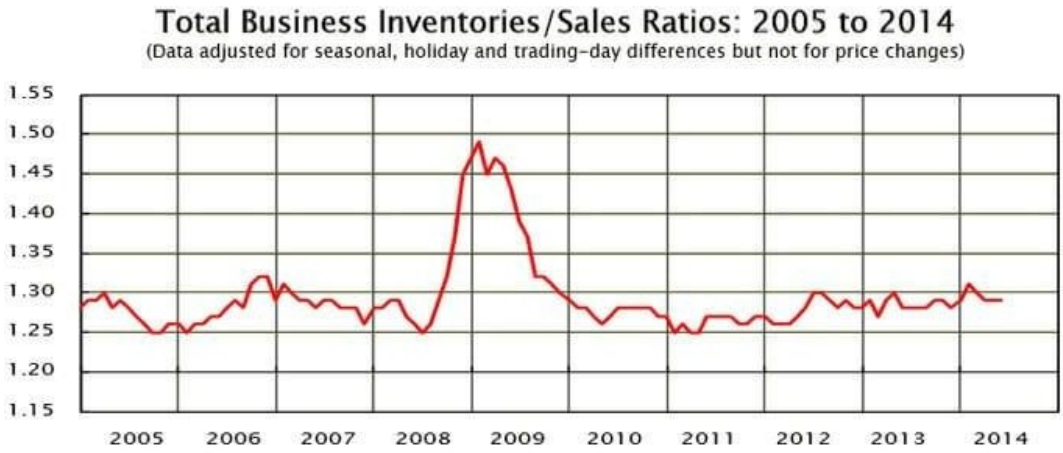


Figure 5. Total Business Inventories

Only 43% of small businesses (Package X) keep track of and manage their inventories. These inventory management data could significantly affect a business's ability to function economically in the long run. Companies that don't track their inventory are much more likely to have problems with predicting than those that do. Inventory forecasting involves making precise estimations and estimates of the amount of inventory you'll need over a specific period.

The amount of inventory on hand has increased by 8.3% over the past five years based on average daily sales (Supply Chain Digest): Statistics show that reducing stock-outs and overstocks can reduce total inventory expenses by up to 10%, which is a significant amount of money for any firm. The money that may currently be kept in inventory might be used for a variety of highly beneficial activities for any organisation, including hiring new employees, growing the firm, doing research and development, and much more.[3]

CLASSIFICATION OF INVENTORY MANAGEMENT

According to [1], Inventory management was created in response to the need to exercise management and control over the accumulations of raw materials, supplies, components, work in progress, and finished goods that appear at various points along a company's production and logistics channel.

In terms of the products that are kept on hand and used by companies to satisfy demand in the future, stocks are a resource [2]. In a similar vein, the author holds that "inventory is the stock of a piece or resource used in an organisation" and that an inventory system is a collection of policies and controls that monitor inventory levels and evaluate those to maintain, the timing of when it needs to be replenished, and how large orders should be.

Depending on their working state inventories can be divided into the following categories [1]:

Stocks of raw materials, which include the essential elements needed to make products.

Stocks of goods currently in production and sitting between operations, to which they have applied direct wage costs and indirect production costs.
Stocks of completed products, which include items that have been transferred from the production area to the warehouse because they are finished.
Stocks of raw materials and consumables that are intended to be used in all company operations, such as spare components and products for machinery repair and upkeep.
It is possible to classify inventory management considering two general aspects [2]

ACCORDING TO THE PRODUCT

Perishable and non-perishable goods are managed differently depending on the type of merchandise. The EOQ (Economic Order Amount) model, which essentially tries to match the costs of maintaining the inventory with those of placing the order and finding an economic quantity of the order that optimises the costs generated, was one of the earliest analytical models to develop, it was discovered after studying the literature. This model makes several assumptions, including that the products are non-perishable and that the demand is reliable.
While some items may deteriorate or become out of style over time, many of the inventory models investigated in the literature study assume that products can be kept on hand forever to meet demand. Due to their brief shelf lives, variable demand, and high customer demands, perishable product inventory management problems can be difficult to handle in general. More recent studies have found that inventory management for perishable products is more difficult due to their delivery, quality, speed, and effectiveness because failing to adhere to dates and times results in financial losses and public health problems.

ACCORDING TO THE DEMAND

Depending on the type of demand, they could be split into independent and dependent categories. According to another author, it would be practical to use a theory of requirements in the case of items with dependent demands when using Material Requirements Planning (MRP) systems, and it is advised to use a philosophy of replenishment of stocks in the case of items with independent demand when using periodic and continuous review systems. The inventories are routinely examined as part of the periodic review, and an order is made to increase the inventory level to a predetermined level. Periodic review models are commonly used in the planning of inventories, particularly those with a stochastic component.

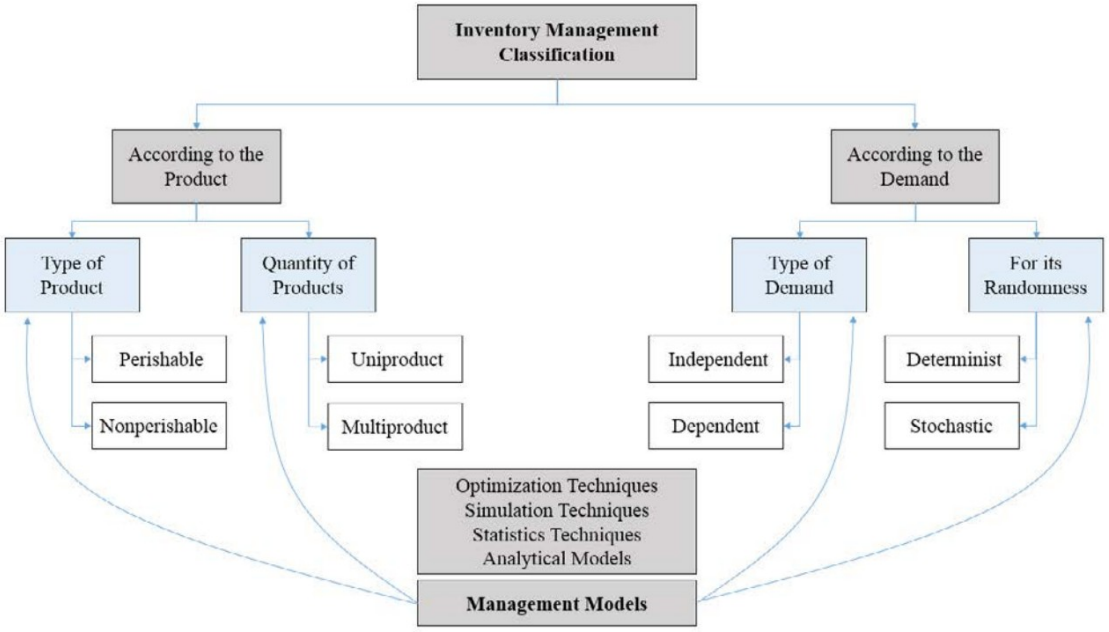


Figure 6. Inventory Management Classification [8]

Depending on the chance component, demand for goods may be fixed or stochastic. The distinction between a deterministic demand and a stochastic demand is that the deterministic demand is known with surety or in an expected way, whereas the stochastic demand creates uncertainty. For effective administration, it is crucial to employ forecasting techniques founded on the collection of past data.

TOP LEVEL INVENTORY CATEGORY:

Top-level inventory is divided into four distinct categories: completed products, work-in-progress (WIP), merchandise and consumables, and raw materials. These four major groups make it easier for companies to organise and keep track of the products they have on hand or might need in the future. To assist businesses in correctly and effectively managing their inventory, the primary groups can be further broken down. [9]

RAW MATERIALS:

The resources a business employs to produce and finish goods are known as raw materials. The basic materials, such as the oil used to make shampoo, are usually unrecognisable from their original forms when the product is finished. An example are Components used by a business that manufactures T-shirts include cloth, thread, dyes, and graphic patterns.

Components: Components are like raw materials in that they are the materials that a business uses to build and polish goods, but unlike raw materials, recognisable components, like a screw, stay in the finished product.

WORK IN PROGRESS (WIP):

WIP inventory stands for work in progress and includes personnel, overhead, raw materials or componentry, and even packaging materials. for instance, A printed circuit board, a cover, and components make up a mobile phone. At a designated workstation, the parts are currently being put together.

FINISHED GOODS:

Finished commodities are products that are offered for sale. As an example, a jewellery company produces pendant chains. A completed product that is ready for sale is made by staff by attaching a necklace to a preprinted card and placing it inside cellophane bags. The packing and labour used to create the final product are both included in the cost of goods sold (COGS) of the object.

MAINTENANCE, REPAIR AND OPERATIONS (MRO) GOODS:

MRO materials are used to support and keep the manufacturing process and infrastructure. MRO inventory is used to keep track of these working components. These goods usually aid in manufacturing but do not directly impact the finished product. MRO products include, among other things, suits, gloves, coolants, oils, and lubricants.

PACKING AND PACKAGING MATERIALS:

There are three different kinds of packaging supplies. The merchandise is made useful and protected by the primary packaging. The wrapping of the completed product, known as secondary packing, may contain labels or SKU details. Bulk wrapping for transportation is tertiary packing. For instance, the sealed container containing, for instance, flax seeds is the main form of packaging at a seed business. The secondary packaging involves putting the flax seed bags into a box for shipping and storing. The shrink cover needed to transport stacks of product containers is known as tertiary packing.

SAFETY STOCK AND ANTICIPATION STOCK:

Safety stock is the additional merchandise a business purchases and keeps on hand to handle unforeseen circumstances. Despite having carrying expenses, safety stock promotes client happiness. Like anticipation stock, anticipation stock consists of unfinished or completed goods that a company buys based on market and manufacturing patterns. A company might buy safety stock if the price of a raw substance is increasing or if the main selling season is about to start. For instance, a veterinarian in a remote area keeps a supply of disinfectant and pet gifts on hand in case the motorway waters during the spring thaw, delaying delivery vehicles and meeting customer demand.

DECOUPLING INVENTORY:

The word "decoupling inventory" refers to additional products or work-in-progress (WIP) maintained at each location of the production line to avoid work halts. While all businesses may maintain safety stock, decoupling inventory is only applicable to businesses that produce products and is helpful when various sections of the production line operate at different rates. For instance, to decorate bridal cakes, designers maintain a supply of sugar flowers in a patisserie. This allows them to continue working even when the ornament team's supply of frosting mix is running low. Because the flowers are an integral component of the cake's design, the baker would be unable to serve a completed cake if they ran out of them.

CYCLE INVENTORY:

Cycle stock inventory, also called working stock, is the amount of stock that is available to meet average demand over a particular time frame. Large orders or operations have reduced buying and preparation costs but higher inventory keeping costs. In contrast, smaller batch quantities result in reduced inventory maintenance and carrying costs, but higher ordering and setup costs because more orders and sets are required to meet demand. When the two prices are equal, the total cost is decreased. The outcome of this process is cycle inventories. Surplus material is frequently purchased and then retained in inventory to reach this reduction stage. The result of purchasing goods in lots or batches rather than just as required is cycle inventory.

SERVICE INVENTORY:

How many services a company can offer in a specific time frame is referred to as service inventory in management accounting. For instance, a motel with 18 rooms has a service capacity of 80 one-night visits per week. For example, a café that serves food for 12 hours a day has 10 tables where customers typically consume their meals and spend an hour doing so. This means that it serves 200 dinners each day.

TRANSIT INVENTORY:

The need to move resources or products between places as well as the reality that travelling from one location to another takes some travel time results in transit inventories. Since it continues to be transported, the inventory is also referred to as pipeline inventory. It is a crucial element of inventory control. When products are transported by vehicle or train, a local warehouse and the retail location frequently differ by weeks or even days. For instance, an art supply shop purchases 80 boxes of a well-known pencil set. The tins are currently in transport after leaving the source.

THEORETICAL INVENTORY:

The least quantity of merchandise a business requires to finish a procedure immediately is known as theoretical inventory, also referred to as book inventory. Production and the

restaurant business are the two main applications of theoretical inventory. It is calculated using the formula of real versus theoretical. For instance, an eatery finds that it spends 30% of its money on food instead of the intended 35%. The 8% of food that was mishandled or thrown away makes up the "theoretical inventory".

EXCESS INVENTORY:

Excess inventory, also referred to as obsolete inventory, is leftover or underused merchandise or raw materials that a business must pay to keep even though it doesn't plan to use or sell them. For instance, a shampoo company makes 60,000 specially branded summer shampoo bottles, but only sells 55,000 of them before the season is over. Since no one wants to purchase them, they are compelled to discount or throw them away.

Figure 7. Types of Inventory [9]

THE PROBLEM IN INVENTORY MANAGEMENT:

Ineffective software or processes for inventory management: Many companies still handle their inventories by hand or with antiquated outdated software, which can impede the development of your business. Using physical, labour-intensive, or low-tech systems might not seem like a big issue when you run a small, one-warehouse business, but as you expand, that will change. Inventory needs to be increased and stores need to be added as sales numbers rise. It will be challenging to expand outdated and ineffective inventory management techniques, which will prove to be a problem and fall short of your expectations. Manual inventory tracking methods

typically involve paperwork or monitoring activities distributed across numerous files and programs, which can lead to redundant data, incomplete data, an enormous amount of time spent working with it, and a lack of security.

Managing Waste & Defects in Inventory: Even though it might seem unimportant, it is one of the most prevalent and recurring inventory management problems and can ultimately result in enormous losses. To complete purchases on time, it's essential to keep an optimal inventory level. Without established processes and untrained employees, you risk having damaged or unnecessary merchandise, which can be expensive and result in unhappy clients.

Track Outdated Material: Almost every company will run into this issue at some time. Some goods or resources won't be used or sold, and they might even go out of current or expired. These resources or goods frequently build up over time as warehouse managers largely disregard them. The empty stock is ignored, and new stock is bought if the good or material is later required; the earlier stock may sit in the store for so long that it is ruined. Costs go up, and resources are wasted.

Inadequate knowledge and communication: The truth is that while every business would love to employ inventory managers who're exceptional speakers, tech-savvy, and quickly adjust to new technology, this rarely happens. If an ERP system is not used properly, even installing one with the most features will not be sufficient.

Insufficient central inventory hub: Stocktaking becomes very challenging when there are numerous places where you have inventories. Delays in shipment are caused by complicated transportation due to discrete stock data from various places. It is one of the biggest and most persistent problems that most companies today are dealing with.

Limited visibility of the inventory: If you are unable to find or identify inventories in your warehouse, it becomes very difficult to ship products on time, which can damage the image of your business. Your bottom line will undoubtedly suffer if your inventory is inaccurate, hard to locate, or incomplete. The inability to locate or recognise merchandise in the warehouse is, in fact, the most frequent reason for incomplete, incorrect, or late dispatches. For the warehouse to operate efficiently and to provide satisfying client encounters, the proper stock must be received and located.

Organizing Warehouse Space and Efficiency: One of the hardest jobs for any company is the efficient administration of the room. Inventory management platforms must be used to plan and build warehouses to handle when new stock is shipped while making the most effective use of available space. If you sell delicate or perishable products, you need to offer special handling and organizing, like cold storage. You must put into place specific measures to stop theft and harm to pricey merchandise. It takes a lot of time and involves several stages, including getting supplies, storing them, selecting inventory, packaging, and ultimately shipping. These duties must be finished as quickly as feasible.

Track items which are Lost, damaged, or stolen: Without a comprehensive inventory management system, it is virtually impossible to monitor an object as it is transferred during regular business operations. For instance, construction contractors frequently use dozens of

items of machinery and multiple crews at different locations each day. With everything going on, it's normal for workers to "walk away" or for things to be left behind on a job site. Additionally, tools and equipment used for the task may be harmed without warning or responsibility. Inventory administration must be done carefully if these circumstances are to be minimized or avoided. You can take charge of your inventory with the correct program without having to watch over each pricey piece of equipment individually.

Uncertain Demand: Since consumer demand is continuously shifting, inventory storage is challenging. What portion should I keep? If you produce too much, your goods could go bad; if you produce too little, you won't be capable to satisfy client demand.

Recognizing Materials That Were Placed Incorrectly: Finding items when you have sales orders can be challenging and time-consuming if there is no appropriate system in place to monitor products, materials, or equipment in the shop. After all, a store has the capacity to hold hundreds of items. Customers may become displeased as a result, and sales may be postponed. Stock scarcity and excess inventory Deciding what quantity of an item is needed to satisfy demand is one of the trickiest parts of inventory management. Failure to obtain the proper quantity from vendors can lead to stock-outs or store surpluses. It causes inefficiencies and reduced income for your business in either scenario. Stock excess encumbers your capital with unsold goods.

Complexity of the Supply Chain: International supply networks are active and can lead to issues with planning and inventory management. Unexpected economic peaks and crashes affect the cost and supply of raw materials, which influences producers and sellers. You must be much more adaptable because they also determine how, when, and where to send the goods, which results in unpredictable lead times.

Employee adoption of your inventory management solution is difficult: Even the most loyal member of your staff isn't as worried about your financial health as you are. Not to mention that most of your team is committed to finishing their duties in a timely manner. These qualities aren't terrible, but they do make workers less willing to invest their time and energy in labour-intensive, intricate inventory management techniques. Employees are more likely to skip a stage in a system that requires them to pause at the computer each time they use an item, for instance, if they are rushing to service a customer. Your inventory management system or your client support will suffer in this situation. If you don't have a well-organized procedure, you're caught between a rock and a hard place.

INVENTORY MANAGEMENT TECHNIQUES

An organization's inventory often makes up a significant portion, if not the majority, of its capital. Thus, it is crucial to implement an effective inventory management strategy to maintain optimal inventory levels. For small businesses, cash flow issues may arise, leading to low stock levels, stockouts, and unhappy customers. Overstocking can also lead to business failure.

Therefore, utilizing inventory management techniques can be helpful. With proper inventory control techniques, business owners can ensure accurate inventory counts, reduce the chances of human error, save physical inventory resources, and more.

Ordering, storing, monitoring, and controlling inventory levels are all included in the term "inventory management." Businesses must manage their inventories effectively if they want to cut costs, boost productivity, and guarantee customer happiness. For inventory management, a variety of methods are employed.

ABC ANALYSIS:

Inventory items are categorised according to their worth using the common inventory management technique known as ABC analysis. It is based on the Pareto principle, which claims that a relatively small number of things account for a sizable portion of the total value. The method classifies inventory items into the following three groups: A, B, and C.

Category A: These are the most expensive and carefully attended-to things. They make up around 20% of the inventory but are responsible for about 80% of its value. Since their stock-outs have a considerable impact on the company's revenue, these items should be regularly watched and handled.

Category B: Items with a moderate value and a moderate level of attention. They make up about 30% of the inventory and about 15% of the value of the entire inventory. To ensure that they are available when needed, these goods can be controlled with a reasonable amount of care, although overstocking should be avoided.

Category C: These are the least valuable and attention-demanding objects. They make up about 50% of the inventory but only about 5% of the value of the entire inventory. When it comes to these products, stock-outs can be tolerated with little negative influence on the company's operations.

Businesses can more effectively allocate resources and set priorities for inventory management by employing the ABC analysis. By assisting in the identification of high-value items that require closer examination, this technique enables firms to decide on inventory levels, orders, and reorders with complete knowledge.

JUST IN TIME (JIT) INVENTORY MANAGEMENT:

With just-in-time (JIT) inventory management, commodities are only received when they are actually needed, aiming to lower inventory levels. JIT is founded on the idea of demand-driven production, where products are only created in response to orders from customers or urgent needs. The JIT method aims to minimise waste, lower storage expenses, and boost productivity. To ensure that the goods arrive exactly when they are needed, JIT inventory management calls for precise demand forecasts and close cooperation between suppliers and the manufacturer.

The following are the key features of JIT inventory management:

Small, frequent orders: JIT inventory management places frequent orders for small quantities of items as opposed to rare orders for large amounts. As a result, there will be less need for storage space and less chance of stockouts or obsolescence.

Supplier coordination: It is essential for JIT inventory management in order to guarantee that products are supplied as soon as needed. This entails creating trustworthy channels for communication, maintaining high standards for quality, and exchanging data on production schedules and stock levels.

Just-in-time production: A just-in-time production strategy is frequently used in conjunction with JIT inventory management. This entails lowering inventory, cutting waste, and creating things only as needed.

Continuous improvement: It is necessary for JIT inventory management in order to find and remove supply chain inefficiencies. This entails pinpointing bottlenecks, cutting lead times, and enhancing quality assurance.

By lowering inventory levels, cutting waste, and increasing responsiveness to consumer demand, JIT inventory management can assist firms in cutting costs and increasing efficiency. Yet, for it to be successful, rigorous planning, precise forecasting, and close supplier collaboration are all required.

ECONOMIC ORDER QUANTITY (EOQ):

Economic Order Quantity (EOQ) is a method of inventory management that aids in helping firms choose the right number of inventory products to order in order to reduce both the cost of purchasing and the cost of keeping the inventory on hand. The cost of ordering, the cost of maintaining inventory, and the demand for the inventory item are all factors in the EOQ calculation.

Key characteristics of EOQ include:

Demand forecasting: To establish the ideal order quantity, EOQ requires precise demand forecasting. This entails calculating the inventory item's demand over a predetermined timeframe, usually a year.

Cost analysis: EOQ accounts for the cost of placing orders as well as the cost of maintaining inventories. Order processing fees are included in holding costs, as are expenses for storage, insurance, and obsolescence.

Safety stock: An extra amount of inventory is included in the EOQ as a precaution against unanticipated surges in demand or delivery delays.

Reorder point: The inventory level at which a new order should be placed is referred to as the reorder point and is also included in EOQ. The lead time, or the amount of time it takes to receive an order, is added to the safety stock to determine the reorder point.

By establishing the appropriate order quantity that balances the cost of ordering and the cost of keeping inventory, EOQ aids organisations in reducing the overall cost of inventory management. Nonetheless, it makes the supposition that the demand will always be there, the lead time will be known, and the expenses associated with placing orders and maintaining inventories will always be the same.

SAFETY STOCK :

An inventory management strategy known as "safety stock" entails keeping excess goods on hand as a backup in case of sudden spikes in demand or delivery delays. Safety stock serves as a safeguard that the company would be able to satisfy customer demand even in the event of unanticipated changes in demand or supply chain interruptions. Safety stock's salient characteristics include:

Demand Variability: When a stock item's demand is erratic or unclear, safety stock is necessary. Seasonal variations, shifting consumer preferences, or unanticipated occurrences like natural disasters can all contribute to this.

Lead time variability: Safety stock is also necessary when the time it takes for a supplier to deliver an order varies. This may happen as a result of production or lead time-affecting circumstances, such as delays in transportation.

Service level: The percentage of time that the company can supply customer demand without a stockout is known as the intended service level, and it is used to calculate safety stock. The quantity of safety stock needed increases as the targeted service level rises.

Inventory Costs: Costs associated with holding safety stock, such as storage, insurance, and obsolescence, are additional. These expenses must be weighed against the advantages of keeping excess stock on hand to satisfy unforeseen demand.

Safety stock helps businesses to ensure that they can meet customer demand even when there are unexpected fluctuations in demand or supply chain disruptions. However, it incurs additional inventory holding costs and requires accurate demand forecasting and lead time estimation.

FIRST-IN-FIRST-OUT (FIFO) AND LAST-IN-FIRST-OUT (LIFO) INVENTORY MANAGEMENT:

Businesses use the inventory management techniques First-In-First-Out (FIFO) and Last-In-First-Out (LIFO) to calculate the cost of goods sold and the value of inventory.

According to FIFO, the first products bought are also the first items sold. In other words, the oldest stock is sold first, followed by the newest stock. With this method, the ending inventory is valued at the cost of the newest inventory, while the cost of goods sold is determined using the cost of the oldest inventory. Contrarily, LIFO makes the assumption that the most recent purchases will be the first to be made and sold. By using this method, the ending inventory is valued at the cost of the oldest inventory, while the cost of goods sold is determined using the cost of the most recent inventory. Key characteristics of FIFO and LIFO include:

Cost of goods sold: Depending on whether the newest or oldest inventory is sold first, FIFO and LIFO produce differing cost of goods sold figures.

Tax implications: Because LIFO reduces taxable income during periods of increased prices due to a greater cost of products supplied, businesses frequently employ it for tax considerations.

Inventory valuation: Depending on whether the newest or oldest inventory is included, FIFO and LIFO also produce varying valuations of the ending inventory.

Inventory turnover: The adoption of one method over another can lead to varying inventory levels and turnover rates, which can also have an impact on FIFO and LIFO.

The financial statements and tax liabilities of a firm can be significantly impacted by FIFO and LIFO. Hence, based on their unique circumstances and goals, firms must carefully evaluate which strategy to adopt. FIFO is more frequently employed in general, while LIFO has advantages in some circumstances, such as when prices are growing quickly.

VENDOR-MANAGED INVENTORY (VMI):

Vendor-Managed Inventory (VMI) is an inventory management approach where the product's supplier is in charge of overseeing and refilling the product's inventory levels at the client's location. In other words, the supplier keeps an eye on the supply levels at the client's location and automatically replenishes the stock as required. The main characteristics of VMI include:

Supplier obligation: With VMI, the supplier, not the customer, is in charge of keeping an eye on and controlling the client's inventory levels.

Real-time data sharing: To make sure that the inventory is refilled when required, VMI relies on real-time data sharing between the client and supplier, including sales data and inventory levels.

Savings: VMI can minimise inventory carrying costs and the risk of stockouts, which can save money for both the client and the supplier.

Efficiency gain: By automating the inventory management process and eliminating the need for manual inventory tracking and ordering, VMI can also increase efficiency.

As it may enhance inventory management and cut costs, VMI can be advantageous for both the client and the supplier. Yet, it necessitates constant data sharing and communication, as well as tight cooperation and trust between the two sides. It is most frequently utilised in sectors like the retail business where products have a high turnover rate and are frequently refilled.

CROSS-DOCKING:

Cross-docking, a logistics technique, is the direct transfer of goods arriving from a supplier or manufacturer from an inbound truck or container to an outbound truck or container for delivery to a client, without first being kept in a warehouse or distribution centre. Cross- docking's characteristics include:

Cross-docking minimises the need for warehousing and storage because goods are promptly shifted from inbound to departing trucks or containers, which lowers the expenses associated with inventory management and storage.

Cross-docking can increase transportation efficiency by cutting down on the time and expenses associated with inventory management and warehousing.

Faster order fulfilment: When products are transported immediately from the inbound to the outbound truck or container without holding them in storage or warehousing, cross-docking can also lead to speedier order fulfilment and delivery timeframes.

Tighter supply chain management: Cross-docking calls for more precise supply chain management in order to guarantee that goods are delivered on schedule and in the right amounts. This needs close coordination between suppliers, transporters, and customers.
Cross-docking is frequently utilised in sectors with high product turnover and frequent restocking, like retail, groceries, and automotive. Companies who need to lower transportation and inventory costs while enhancing order fulfilment times and supply chain effectiveness may find it useful.

BULK PURCHASING:

Bulk purchasing is a procurement approach when a corporation purchases a lot of a product or raw material at a discounted price from a supplier or manufacturer. Bulk purchasing's main characteristic is buying in big quantities to benefit from economies of scale, which can lead to cheaper costs per unit. The advantages of buying in bulk include:
Cost savings: By making a large number of purchases, businesses can bargain for reduced unit costs, which can save them a lot of money.
Reduced lead times: By stocking up on goods, businesses can avoid stockouts and production delays, which can assist cut lead times.
Better supply chain management: To guarantee that products are delivered on time and in the right amounts, bulk purchasing calls for close supply chain coordination and real-time communication between suppliers and customers.
Improved inventory management: Bulk purchases can also assist businesses in better managing their inventory levels by lowering the frequency of reordering and restocking.
Industries like manufacturing, construction, and retail, where goods and commodities are frequently used in big amounts, frequently use bulk purchasing. To make sure that the amounts acquired are in line with demand and that surplus inventory is not squandered or become outdated, thorough planning and forecasting are necessary.

OUT-SOURCING INVENTORY CONTROL PERSONNEL :

Hiring an outside entity to undertake a business's inventory management and control duties is known as outsourcing inventory control people. Using this tactic, a business can give a specialised third-party service provider the time-consuming and resource-intensive responsibility of managing inventories. The following are the main benefits of outsourcing inventory control personnel:
Cost Savings: By outsourcing your inventory needs, you can save money on the costs of employing and training your own staff members as well as the overhead expenses of running an inventory department.
Knowledge and resources: Outsourcing can give you access to specific knowledge and resources that might not be available internally, including inventory management software.
Enhanced efficiency: By letting a company concentrate on its core business operations while a third-party service provider manages inventory, outsourcing inventory control employees can assist increase efficiency.

Flexibility and scalability: Outsourcing can offer a flexible and scalable approach to inventory management, enabling a business to change inventory levels in response to demand and avoid the costs and dangers of having too much inventory on hand.

In businesses like manufacturing, retail, and distribution where inventory management can be a difficult and time-consuming operation, hiring inventory control specialists is frequently outsourced. But, it is important to carefully assess the third-party service provider to make sure they have the knowledge, resources, and dependability needed to manage inventories efficiently.

LEAD-TIME ANALYSIS:

A supply chain management technique called lead-time analysis measures the amount of time it takes for a product to travel from the point of order placing to the point of delivery to the consumer. In order to cut lead times and boost customer satisfaction, it requires measuring the lead times for each stage of the supply chain and identifying areas where improvements can be made. Lead-time analysis's salient characteristics include:

Recognizing the supply chain's phases : Lead-time analysis entails identifying the steps of the supply chain, including procurement, production, transportation, and delivery.

Measuring lead times: Lead-time analysis entails calculating the amount of time needed for each step of the supply chain, such as order processing, manufacture, transportation, and delivery.

Analysing the data : In order to minimise lead times and boost supply chain efficiency, data gathered through lead-time analysis is reviewed to pinpoint areas that can be improved.

Applying changes: Following the identification of problem areas, actions can be made to shorten lead times and boost customer satisfaction, such as streamlining production schedules, enhancing transportation options, and speeding up processing.

Several businesses, including manufacturing, retail, and distribution, can benefit from lead-time analysis. Businesses can identify supply chain bottlenecks and streamline procedures to cut lead times and raise customer satisfaction. Businesses can cut inventory expenses by shortening lead times since they can maintain lower stock levels without running the risk of stockouts.

SOFTWARE APPLICATIONS AND TRACKING SYSTEM:

Businesses can efficiently and accurately track inventory levels, orders, and shipments with the aid of software programmes and tracking systems. These tools might include everything from straightforward spreadsheet programmes to specialist inventory management programmes with cutting-edge capabilities. The following are some of the main characteristics of inventory management software and tracking systems:

Real-time inventory tracking: It is made possible by software programmes and tracking systems, which let firms correctly track their stock levels and prevent stockouts.

Order and shipment tracking: These solutions also enable businesses to track customer orders and shipments, enabling them to keep tabs on their progress in real time.

Demand planning and forecasting: Some inventory management software has tools that can assist organisations predict their future inventory demands and optimise their inventory levels. Integration with other systems: To give a complete picture of business activities, inventory management software can be combined with other systems like accounting software or point-of-sale systems.

Barcode and RFID scanning: Some inventory management software enables barcode and RFID scanning, enabling companies to accurately and swiftly follow the movement of their inventory.

Businesses can boost productivity, minimise mistakes, and achieve optimal inventory levels by using software programmes and tracking systems for inventory management. To ensure that the tool is used effectively, however, great consideration must be given to choosing the best one for the needs of the organisation. The numerous channels used for product distribution and client sales are referred to as inventory management channels. Inventory levels, expenses, and customer satisfaction can all be significantly impacted by the channels an organisation utilises for inventory management.

BRICK-AND-MORTAR STORES :

Brick-and-mortar stores are real, actual places where people may shop and make purchases. Despite rising competition from e-commerce in recent years, these stores continue to play a significant role in the retail industry and have been a traditional channel for inventory management for retail firms. Customers can view and touch things in brick-and-mortar businesses before making a purchase, which is one of their key benefits. This might be particularly crucial for goods like apparel or furniture where clients cherish the physical sensation. Physical stores can also provide a comfortable setting for returns and exchanges, which can greatly influence consumer satisfaction. Businesses can develop relationships with consumers through in-person interactions at brick-and-mortar locations. This can facilitate the development of a sense of loyalty and trust, which can be challenging to build through internet media. Furthermore, physical stores can be leveraged to develop immersive brand experiences, like pop-up shops or experiential retail locations, which can aid in setting a company apart from its rivals. Yet, there are several drawbacks to using brick and mortar businesses as a route for inventory management. The high cost of real estate and other overhead expenses, which can make it difficult for enterprises to run economically, is one of the key problems. However, managing physical stores may be time- and resource-consuming, especially if a company has many locations.

In general, brick-and-mortar stores can be a useful channel for inventory management for companies that value face-to-face consumer contacts and the chance to build immersive brand experiences. To remain profitable and competitive in the increasingly digital retail environment, they need to be managed carefully.

ONLINE MARKETPLACES:

Online marketplaces are e-commerce platforms that let companies sell their goods to customers all over the world online. Online marketplaces like Amazon, eBay, and Etsy are examples. Particularly in the wake of the COVID-19 epidemic, which has expedited the shift to online purchasing, these platforms have grown to be an increasingly significant inventory management channel for firms of all kinds. Reaching a sizable and varied audience of potential buyers is one of the key benefits of online marketplaces. Millions of users of these platforms frequently have active product-buying intentions, which can make it simpler for companies to draw in new clients and boost sales. Online marketplaces also often manage logistics for shipping and payment processing, which can save firms time and money. Online markets can provide companies with useful information about consumer behaviour and preferences that can be utilised to improve inventory management techniques. To recognise trends in product demand, for instance, and modify inventory levels accordingly, organisations can employ data analytics technologies.

The downsides of selling on internet markets do exist, though. The intense competition that exists between firms and the thousands of other vendors selling comparable goods is one of the major problems. It may be challenging to stand out from the competition and draw clients as a result, especially for smaller enterprises with constrained resources. Online marketplaces also frequently charge fees and commissions on sales, which can hurt a company's profitability. Also, they have stringent guidelines that can be difficult to handle for customer service and product listings.

In general, online marketplaces can be a useful avenue for inventory management for companies wishing to connect with a wide range of clients. To remain profitable and competitive in a market that is becoming more crowded, they need to be managed carefully.

E-commerce websites: E-commerce websites are online marketplaces that let companies offer goods and services to customers directly through their websites. These websites are increasingly being used by companies of all sizes as a channel for inventory management since they provide a number of advantages like higher visibility, fewer operating expenses, and the opportunity to sell goods round-the-clock to customers anywhere in the globe. The capability of e-commerce websites to reach a global audience of potential clients is one of their key benefits. Companies can advertise their goods to customers all over the world, which helps boost sales and broaden their clientele. In addition, since they do not need actual storefronts or sales employees, e-commerce websites sometimes have lower overhead expenses than conventional brick-and-mortar retailers. Businesses may observe and analyse client behaviour and preferences on e-commerce websites, which they can utilise to improve their inventory management procedures. To recognise trends in product demand, for instance, and modify inventory levels accordingly, organisations can employ data analytics technologies. Yet, using e-commerce platforms to sell has certain drawbacks as well. The intense competition that exists between firms and the thousands of other vendors selling comparable goods is one of the major

problems. It may be challenging to stand out from the competition and draw clients as a result, especially for smaller enterprises with constrained resources.

E-commerce websites also need to be managed carefully to maintain their profitability and competitiveness. To draw in and keep customers, businesses must spend money on digital marketing, SEO, and website design. In addition, they must carefully control their inventory levels to prevent stockouts and excess inventory, both of which can reduce profitability. In general, e-commerce websites can be a useful avenue for inventory management for companies trying to expand their clientele globally and cut costs. To remain profitable and competitive in a market that is becoming more crowded, they need to be managed carefully.

WHOLESALE DISTRIBUTION:

Businesses sell their products in bulk to other businesses through a route called wholesale distribution rather than selling to customers directly. To sell their goods to shops, e-commerce sites, and other businesses, manufacturers, wholesalers, and distributors frequently use this channel. Selling products in bulk can assist to lower per-unit costs and boost profitability, making it one of the key benefits of wholesale distribution. By buying goods in bulk from manufacturers and reselling them to retailers at a premium, wholesale distributors can also take advantage of economies of scale. Selling to retailers and other companies who might not have direct access to manufacturers or wholesalers through wholesale distribution also enables firms to reach a wider audience of prospective customers. This could aid in boosting revenue and broadening a company's clientele. Using wholesale distribution as a conduit for inventory management has significant drawbacks, too. While businesses must carefully manage their inventory levels to ensure that they have enough products to meet demand without overstocking, one of the key challenges is the danger of excess inventory or stockouts.

However, since companies must compete with other wholesalers and distributors to sell their goods to retailers and other businesses, wholesale distribution may be quite competitive. It may be challenging to stand out from the competition and draw clients as a result, especially for smaller enterprises with constrained resources. In general, organisations wishing to sell their goods in bulk to retailers and other businesses may find that wholesale distribution is a useful avenue for managing their inventories. To maintain optimal inventory levels and the company's competitiveness in a crowded market, diligent management is necessary.

DIRECT-TO-CONSUMER :

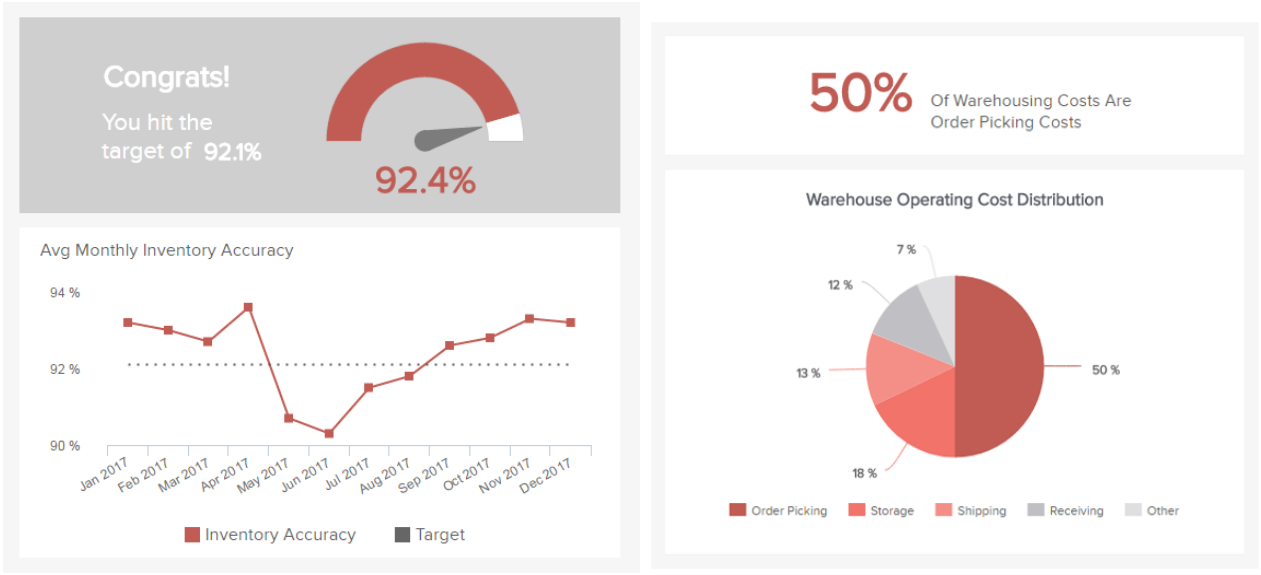
Direct-to-consumer (DTC) is a channel for inventory management when companies sell their goods directly to customers instead of through more conventional channels like brick-and-mortar stores or wholesalers. In recent years, this channel has grown in popularity, especially with companies in the consumer products and e-commerce sectors. The primary benefit of using the DTC channel is that it gives companies complete control over every aspect of the consumer experience, from marketing and sales to fulfilment and customer service. Customers'

overall pleasure may increase and closer ties with them may result from this. The DTC channel can also assist in lowering expenses related to traditional retail channels, such as those for keeping inventory, marketing, and distribution fees. The capacity to gather important customer information and input, which can be used to enhance product offerings and optimise inventory management tactics, is another benefit of the DTC channel. Businesses can, for instance, observe customer behaviour and preferences using data analytics technologies, and then modify inventory levels accordingly. The DTC channel, however, also presents certain difficulties. The requirement to spend in digital marketing and e-commerce platforms in order to reach and engage customers is one of the major issues. For smaller enterprises with fewer resources, this can be especially difficult.

However, the DTC channel may be quite competitive because companies must contend with both other DTC brands and conventional retail channels for customers. To guarantee that the business remains competitive, this calls for careful monitoring of inventory levels, pricing tactics, and customer service. Ultimately, the DTC channel can be a useful channel for inventory management for companies trying to keep prices down, maintain control over the customer experience, and gather important customer information. To succeed, it needs careful management and investments in e-commerce and digital marketing platforms.

CASE STUDY: MAXI'S VENDOR-MANAGED INVENTORY MODEL

Maxi is a leading retailer in the market, offering a wide range of products to customers through its retail stores and online platform. As a large-scale retailer, Maxi faces the challenge of managing inventory efficiently to meet customer demand while minimizing costs. To address this challenge, Maxi has implemented a vendor-managed inventory (VMI) model that involves its suppliers managing inventory levels at Maxi's stores and distribution centres. This case study will examine Maxi's VMI model in detail, exploring the benefits and challenges of this approach to inventory management. We will also discuss the key success factors that have enabled Maxi to effectively implement its VMI model, as well as opportunities for further improvement. By analyzing Maxi's VMI model, we can gain insights into best practices for inventory management and supply chain optimization, as well as the importance of collaboration between retailers and suppliers in driving business success.



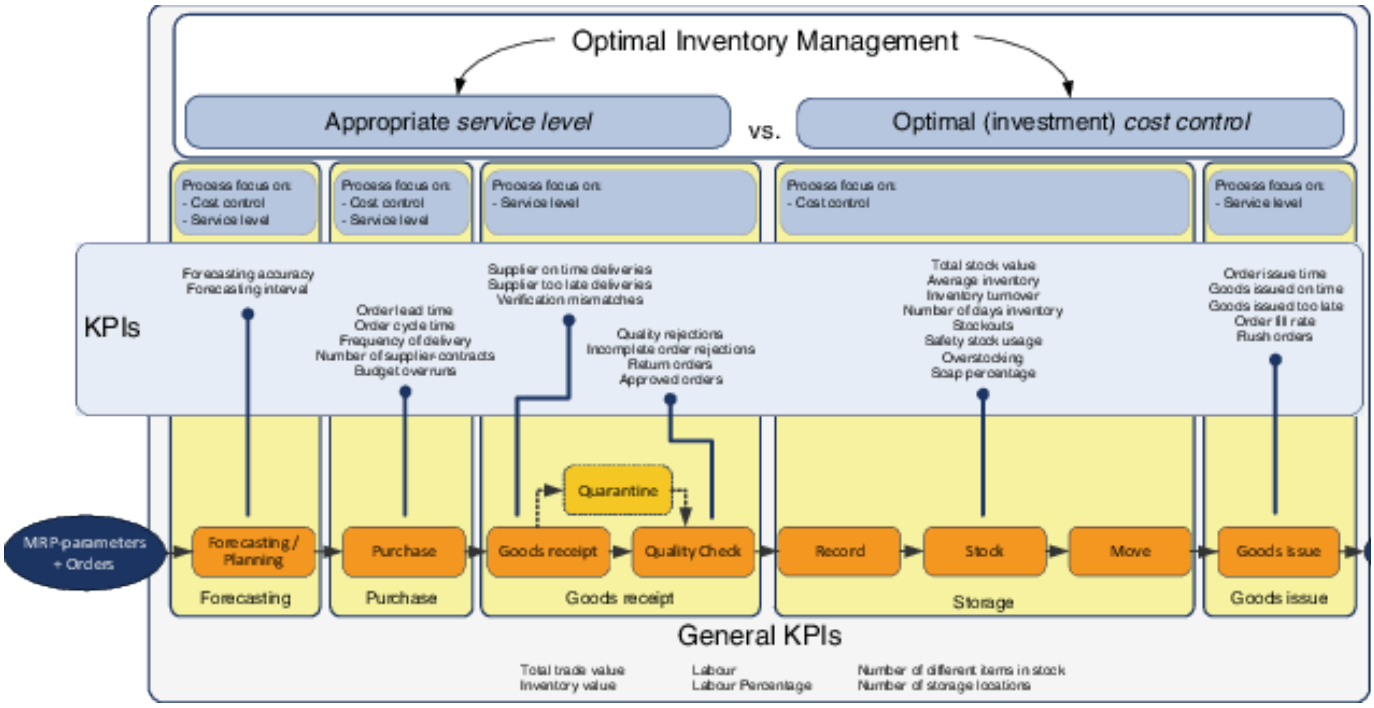


Figure 8. Maxi Measures of Inventory Performance

The Maxi vendor management inventory model manages inventory levels in a supply chain that involves multiple vendors. This model is designed to help companies optimize their inventory levels by strategically selecting which vendors to work with, and by carefully managing their relationships with those vendors.

The Maxi vendor management inventory model involves several key steps:

Vendor selection: Companies must first identify the vendors who are best suited to meet their inventory needs. This may involve evaluating vendors based on factors such as price, quality, delivery time, and reliability.

Order management: Once vendors have been selected, companies must work with them to manage their orders. This may involve establishing minimum order quantities, lead times, and other parameters that help ensure that inventory levels are maintained at the appropriate level.

Inventory monitoring: Companies must monitor inventory levels carefully to ensure that they are not overstocking or understocking their inventory. This may involve using tools such as inventory management software to track inventory levels, sales forecasts, and order history.

Reorder point determination: Based on the inventory monitoring, the reorder point must be determined. The reorder point is the level of inventory at which a new order must be placed with the vendor to avoid running out of stock.

Safety stock management: In addition to setting a reorder point, companies may also establish a safety stock level. This is an additional quantity of inventory that is held in reserve to protect against unexpected demand or supply chain disruptions.

By carefully managing their relationships with vendors and optimizing their inventory levels, companies can use the Maxi vendor management inventory model to reduce inventory costs, improve supply chain efficiency, and better meet customer demand.

MAXI'S MEASURES OF INVENTORY PERFORMANCE

The Maxi's Measures of Inventory Performance is a set of metrics used to evaluate how well a company is managing its inventory. These metrics provide insights into the efficiency and effectiveness of a company's inventory management practices and can help identify areas for improvement. Here are some of the key measures of inventory performance used in the Maxi model:

Inventory Turnover Ratio: This is a ratio that measures how many times a company's inventory is sold and replaced over a given period. A high inventory turnover ratio indicates that a company is efficiently managing its inventory and is selling its products quickly.

Gross Margin Return on Investment (GMROI): This is a measure of profitability that takes into account a company's inventory investment. The GMROI calculates the amount of gross profit earned for every dollar invested in inventory. A high GMROI indicates that a company is generating a significant profit from its inventory investment.

Figure 9. Gross margin return on Investment.

Stockout Rate: This measures the frequency with which a company runs out of stock of a particular product. A high stockout rate can result in lost sales and dissatisfied customers. It is

essential to keep stockout rates as low as possible to ensure that customers have access to the products they need.

Carrying Cost of Inventory: This is the cost of holding inventory, including costs associated with storage, handling, and insurance. A high carrying cost of inventory can result in significant expenses for a company. By reducing the carrying cost of inventory, a company can improve its overall profitability.

Lead Time: This is the time it takes to receive an order from a supplier. A long lead time can result in delays and stockouts, which can negatively impact a company's inventory performance. By reducing lead times, a company can improve its inventory performance and increase customer satisfaction.

By regularly monitoring these measures of inventory performance, companies can identify areas for improvement and make data-driven decisions to optimize their inventory management practices.

MANAGING INVENTORY ACROSS MAXI'S SUPPLY CHAIN

Managing inventory across Maxi's supply chain involves ensuring that the right products are available at the right time and in the right quantities. Effective inventory management is critical to supply chain efficiency and can help to reduce costs, increase customer satisfaction, and improve overall performance.

Here are some key strategies for managing inventory across Maxi's supply chain:

Collaborate with suppliers: Collaborating with suppliers is critical to effective inventory management. By working closely with suppliers, companies can ensure that they have the right inventory levels and that orders are delivered on time. This can be achieved by establishing open lines of communication, sharing sales forecasts and inventory data, and setting clear expectations for lead times and order quantities.

Optimize inventory levels: Optimizing inventory levels involves finding the right balance between having enough inventory to meet customer demand while minimizing excess inventory. This can be achieved by using inventory management software to track inventory levels, sales forecasts, and order history. By analyzing this data, companies can identify trends **and make data-driven decisions about inventory levels.**

Implement safety stock: Safety stock is a reserve inventory that is held in case of unexpected demand or supply chain disruptions. Implementing safety stock can help to prevent stockouts and ensure that customers have access to the products they need. However, safety stock should be carefully managed to minimize the carrying cost of inventory.

Implement just-in-time (JIT) inventory: JIT inventory is a system where inventory is delivered to the production line just in time for it to be used. This can help to reduce inventory levels and improve supply chain efficiency. However, JIT inventory requires a high level of coordination with suppliers and may not be suitable for all supply chains.

Use data analytics: Data analytics can be used to identify trends and patterns in inventory levels, sales data, and customer demand. By using data analytics, companies can make more informed decisions about inventory levels, supplier relationships, and supply chain efficiency.

By implementing these strategies, companies can optimize their inventory management practices across Maxi's supply chain, reduce costs, and improve overall supply chain efficiency.

HOW TO IMPROVE INVENTORY MANAGEMENT

Effective inventory management is critical to the success of any business, and there are several strategies that Maxi can use to improve its inventory management practices. Here are some key steps that Maxi can take to improve its inventory management:

Use inventory management software: Inventory management software can help to automate many inventory-related tasks, such as tracking inventory levels, monitoring sales forecasts, and generating purchase orders. By using inventory management software, Maxi can improve the accuracy and efficiency of its inventory management practices.

Implement demand forecasting: Demand forecasting involves using historical sales data and other market data to predict future demand for products. By implementing demand forecasting, Maxi can ensure that it has the right inventory levels to meet customer demand while minimizing excess inventory.

Streamline supplier relationships: Streamlining supplier relationships can help to reduce lead times, improve order accuracy, and ensure that orders are delivered on time. By establishing open lines of communication, sharing sales forecasts and inventory data, and setting clear expectations for lead times and order quantities, Maxi can improve its supplier relationships and inventory management practices.

Implement safety stock: Safety stock is a reserve inventory that is held in case of unexpected demand or supply chain disruptions. By implementing safety stock, Maxi can help to prevent stockouts and ensure that customers have access to the products they need.

Conduct regular inventory audits: Regular inventory audits can help to identify discrepancies between actual inventory levels and recorded inventory levels. By conducting regular inventory audits, Maxi can identify areas for improvement and make data-driven decisions about inventory levels and management practices.

Train employees: Effective inventory management requires a team effort, and it is essential to ensure that employees are trained in inventory management best practices. By providing training and education to employees, Maxi can improve its inventory management practices and increase overall supply chain efficiency.

Categorize inventory: Categorizing inventory based on its level of importance or demand can help Maxi to prioritize its inventory management efforts. By categorizing inventory, Maxi can allocate resources more effectively and ensure that its most important products are always available.

Optimize order quantities: Ordering too much or too little inventory can result in excess inventory or stockouts, respectively. By optimizing order quantities based on sales forecasts and inventory levels, Maxi can improve inventory turnover and reduce carrying costs.

Monitor inventory turnover: Monitoring inventory turnover is a key performance indicator for inventory management. By tracking inventory turnover, Maxi can identify slow-moving inventory and take corrective actions, such as reducing prices or discontinuing products.
Implement barcode scanning: Barcode scanning can help to improve the accuracy and efficiency of inventory management. By using barcode scanning technology, Maxi can track inventory movements, reduce errors, and improve the speed of inventory-related tasks.
Utilize cross-docking: Cross-docking is a supply chain strategy where incoming inventory is immediately transferred to outbound trucks, bypassing storage. By implementing cross-docking, Maxi can reduce inventory holding costs and improve order fulfillment times.
Implement cycle counting: Cycle counting is a process where inventory is counted in small, frequent batches rather than all at once. By implementing cycle counting, Maxi can reduce the amount of time and resources required for inventory counting while improving accuracy
Analyze lead times: Lead time is the time between placing an order and receiving it. By analyzing lead times for different products, Maxi can better manage inventory levels and order quantities to ensure that it has enough inventory to meet customer demand without carrying excessive safety stock.
Implement a just-in-time (JIT) inventory system: JIT is a strategy that involves ordering inventory only when it is needed, rather than maintaining large inventories. By implementing JIT, Maxi can reduce carrying costs, improve inventory turnover, and minimize waste.

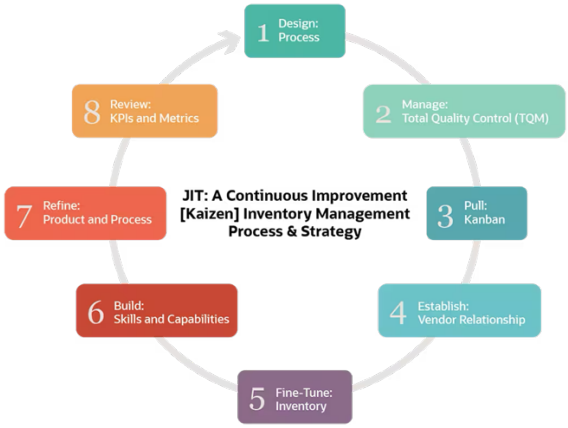


Figure 10. Just-in-Time Inventory Systems

Monitor and control inventory levels at multiple locations: If Maxi has multiple warehouse locations, it is important to monitor and control inventory levels at each location to prevent overstocking or stockouts. By using inventory management software that can track inventory levels at multiple locations, Maxi can ensure that inventory is distributed optimally to meet demand.
Optimize warehouse layout: Optimizing warehouse layout can help to reduce the time and resources required for inventory management tasks. By organizing inventory in a logical and

efficient manner, Maxi can reduce the time it takes to locate and retrieve inventory, which can improve order fulfilment times.

Implement a vendor-managed inventory (VMI) system: VMI is a strategy where the supplier manages inventory levels on behalf of the customer. By implementing a VMI system, Maxi can reduce the amount of time and resources required for inventory management tasks, while ensuring that it always has the inventory it needs.

Utilize forecasting and planning tools: Forecasting and planning tools can help Maxi to predict future demand, plan inventory levels, and optimize order quantities. By using advanced forecasting and planning tools, Maxi can improve inventory management practices and reduce costs.

By incorporating these additional strategies into its inventory management practices, Maxi can to optimize its supply chain efficiency, reduce costs, and improve customer satisfaction.

PITFALLS IN MANAGING INVENTORY

There are several pitfalls in managing inventory that Maxi should be aware of. Here are some examples:

Overstocking: Holding too much inventory can tie up cash flow and lead to increased carrying costs, as well as potential obsolescence or spoilage. It can also result in a lack of warehouse space and require additional resources for inventory management.

Stockouts: Running out of stock can lead to lost sales, decreased customer satisfaction, and damage to the brand reputation. It can also result in additional costs to expedite orders or restock inventory.

Inaccurate forecasting: Inaccurate sales forecasting can result in overstocking or stockouts, which can lead to additional costs and decreased customer satisfaction. It can also lead to a misallocation of resources and poor decision-making.

Poor communication: Poor communication between departments, suppliers, and customers can lead to errors in inventory management, delays, and increased costs.

Inefficient ordering: Inefficient ordering practices, such as placing small or frequent orders, can lead to increased ordering costs and reduced purchasing power. Conversely, placing large orders can result in overstocking and increased carrying costs.

Lack of inventory visibility: Lack of inventory visibility can result in inventory discrepancies, overstocking, and stockouts. This can be caused by manual inventory management processes, inadequate inventory tracking systems, or poor communication between departments.

Inadequate safety stock: Safety stock is the inventory held to protect against unexpected demand or supply chain disruptions. Inadequate safety stock can lead to stockouts and decreased customer satisfaction.

Poor inventory tracking: Poor inventory tracking can lead to inaccurate inventory data, which can result in overstocking, stockouts, and a misallocation of resources. This can be caused by

inadequate inventory tracking systems, manual data entry errors, or poor communication between departments.

Lack of inventory optimization: Without proper inventory optimization, Maxi may hold inventory that is not needed, leading to increased carrying costs and potentially wasted resources. This can also lead to stockouts of high-demand products.

Inadequate technology: Inadequate technology can lead to inefficient inventory management practices and a lack of inventory visibility. This can be caused by outdated inventory management systems, inadequate communication technology, or a lack of training for employees.

OPPORTUNITIES IN INVENTORY MANAGEMENT:

DESIGN FOR SUPPLY CHAIN MANAGEMENT

Design for Supply Chain Management (DfSCM) is an approach that involves designing products and processes with supply chain considerations in mind. By incorporating supply chain considerations into the design process, DfSCM can help Maxi to optimize its supply chain efficiency, reduce costs, and improve customer satisfaction. Here are some ways that DfSCM can be an opportunity for Maxi:

Improved product design: By designing products with supply chain considerations in mind, Maxi can reduce the complexity of its supply chain and make it easier to manufacture, transport, and distribute products. This can result in reduced costs, improved product quality, and increased customer satisfaction.

Reduced lead times: By designing products that are easier to manufacture and transport, Maxi can reduce lead times and improve its supply chain efficiency. This can help to reduce inventory levels and improve product availability.

Improved supplier relationships: By working closely with suppliers to incorporate DfSCM principles into the product design process, Maxi can improve its supplier relationships and create more collaborative supply chain partnerships.

Reduced waste: DfSCM can help Maxi to reduce waste throughout its supply chain by minimizing unnecessary transportation, packaging, and material costs. This can result in reduced costs and improved sustainability.

Improved customer service: By designing products with supply chain considerations in mind, Maxi can improve its ability to meet customer needs and expectations. This can lead to increased customer loyalty and satisfaction.

By incorporating DfSCM principles into its product design process, Maxi can improve its supply chain efficiency, reduce costs, and improve customer satisfaction.

INTEGRATE DATABASES THROUGHOUT THE SUPPLY CHAIN

Integrating databases throughout the supply chain can be a significant opportunity for Maxi to improve its inventory management and supply chain efficiency. By integrating databases, Maxi

can improve inventory visibility, reduce lead times, and improve collaboration with suppliers, resulting in reduced costs and improved customer satisfaction. Here are some ways that integrating databases throughout the supply chain can be an opportunity for Maxi:

Improved inventory visibility: Integrating databases can improve inventory visibility by providing real-time data on inventory levels, locations, and movements. This can help Maxi to optimize inventory levels, reduce stockouts, and improve customer service.

Improved collaboration with suppliers: By integrating databases with suppliers, Maxi can improve collaboration and communication throughout the supply chain. This can help to reduce lead times, improve order accuracy, and reduce costs.

Improved supply chain efficiency: Integrating databases can improve supply chain efficiency by providing real-time data on supply chain performance, enabling Maxi to identify areas for improvement and optimize its operations.

Reduced manual data entry errors: By integrating databases, Maxi can reduce the risk of manual data entry errors, which can lead to inventory discrepancies, overstocking, and stockouts.

Improved analytics: Integrating databases can improve Maxi's ability to analyze supply chain data, enabling the company to make more informed decisions about inventory management, production planning, and supply chain optimization.

Enhanced traceability: By integrating databases, Maxi can enhance traceability throughout the supply chain, enabling the company to track products from production to delivery. This can improve product quality and reduce the risk of product recalls.

REDESIGN ORGANIZATIONAL INCENTIVES

Redesigning organizational incentives can be an opportunity for Maxi to improve its inventory management and supply chain efficiency. By rethinking its incentive programs, Maxi can motivate employees to prioritize inventory management and supply chain optimization, resulting in improved performance and efficiency. Here are some ways that redesigning organizational incentives can be an opportunity for Maxi:

Improved focus on inventory management: By redesigning its incentive programs, Maxi can motivate employees to prioritize inventory management and supply chain optimization, resulting in improved performance and efficiency.

Alignment of incentives with company goals: Redesigning organizational incentives can help to align employee incentives with the company's goals, ensuring that all employees are working towards the same objectives.

Increased accountability: By redesigning its incentive programs, Maxi can increase accountability, enabling the company to track performance and ensure that employees are meeting their targets.

Improved retention: Redesigning organizational incentives can improve employee retention, enabling Maxi to retain talented employees who are committed to improving inventory management and supply chain efficiency.

Enhanced collaboration: Redesigning organizational incentives can promote collaboration among teams and departments within Maxi, enabling better communication and coordination of efforts. This can result in improved inventory management and supply chain efficiency.
Improved employee engagement: Redesigning organizational incentives can improve employee engagement, motivation, and job satisfaction, which can result in improved productivity, quality, and customer service.

INSTITUTE SUPPLY CHAIN PERFORMANCE MEASUREMENT

Instituting supply chain performance measurement can be an opportunity for Maxi to improve its inventory management and supply chain efficiency. By measuring and analyzing key performance indicators (KPIs), Maxi can identify areas for improvement and make data-driven decisions to optimize its supply chain. Here are some ways that instituting supply chain performance measurement can be an opportunity for Maxi:
A better understanding of supply chain performance: By instituting supply chain performance measurement, Maxi can gain a better understanding of its supply chain performance, enabling the company to identify strengths and weaknesses.
Identification of opportunities for improvement: Supply chain performance measurement can help Maxi to identify areas for improvement, such as reducing lead times, improving on-time delivery, or reducing inventory levels.
Optimization of inventory management: By analyzing inventory-related KPIs, such as inventory turnover or days of inventory, Maxi can optimize its inventory management, reducing costs and improving customer service.
Improved supplier performance: By measuring supplier-related KPIs, such as on-time delivery or quality performance, Maxi can identify opportunities to improve supplier performance and reduce supply chain disruptions.
Better collaboration with partners: Supply chain performance measurement can promote collaboration among supply chain partners, enabling better communication and coordination of efforts.
Improved customer satisfaction: By measuring customer-related KPIs, such as order fill rate or delivery performance, Maxi can identify opportunities to improve customer satisfaction and loyalty.
By instituting supply chain performance measurement, Maxi can optimize its supply chain, reduce costs, and improve customer satisfaction.

OTHER OPPORTUNITIES:

Improved customer service: Effective inventory management can help to improve customer service by ensuring that products are available when customers need them. This can increase customer loyalty and satisfaction.
Reduced costs: Effective inventory management can lead to reduced inventory carrying costs, reduced obsolescence or spoilage, and improved supply chain efficiency, all of which can lead to cost savings.

Increased efficiency: Effective inventory management can increase warehouse efficiency by reducing the amount of time and resources required for inventory management tasks, such as counting and locating inventory.
Improved decision-making: Accurate and timely inventory data can help Maxi to make better decisions related to ordering, stocking, and pricing products.
Supply chain optimization: By optimizing its supply chain, Maxi can improve inventory management by reducing lead times, improving inventory visibility, and improving collaboration with suppliers. This can lead to a reduction in inventory holding costs and improved product availability.
Lean inventory management: Adopting a lean inventory management approach can help Maxi reduce inventory levels while maintaining product availability. This approach emphasizes continuous improvement and waste reduction, resulting in improved supply chain efficiency and reduced costs.
Automation: Automated inventory management systems can improve inventory visibility, reduce manual data entry errors, and streamline inventory management processes. This can lead to improved accuracy, reduced costs, and improved efficiency.
Improved forecasting: Improved sales forecasting can help Maxi better predict demand, allowing for more accurate inventory levels and reducing the risk of overstocking or stockouts. Advanced analytics and machine learning algorithms can be used to improve forecasting accuracy.
Vendor-managed inventory (VMI): VMI is a supply chain collaboration model where suppliers manage inventory levels for their customers. This can lead to improved supply chain efficiency, reduced inventory levels, and reduced costs for Maxi.
Multi-echelon inventory optimization: multi-echelon inventory optimization involves optimizing inventory levels across multiple levels of the supply chain, from suppliers to distribution centres to retail stores. This can lead to improved supply chain efficiency and reduced inventory holding costs.

By leveraging these opportunities, Maxi can improve its inventory management practices, reduce costs, and improve customer satisfaction.

Best Practices for Inventory Management System:

Effective inventory management is critical to the success of any physical product-selling business. Here are some inventory management best practices:

i. **Accurate tracking of inventory levels**: Maintaining an accurate record of inventory levels is critical for effective inventory management. This can be accomplished using inventory management software, which can track inventory levels in real-time and automatically update inventory levels as items are purchased or sold.

ii. **Regular inventory audits**: Inventory audits on a regular basis should be performed to identify discrepancies between inventory levels recorded in the system and actual physical inventory levels. This aids in the detection of errors or problems with the inventory management system.
iii. **Automated inventory replenishment**: By automatically ordering new inventory when levels reach a certain threshold, automated inventory replenishment can help to reduce stockouts and overstocking. This is possible with inventory management software that is linked to suppliers.
iv. **ABC analysis**: The ABC analysis classifies inventory items according to their importance and frequency of use. This directs inventory management efforts and resources towards high-value, high-demand items.
v. **FIFO or FEFO**: Using the first-in, first-out (FIFO) or first-expiry, first-out (FEFO) method ensures that the oldest inventory is sold or used first. This reduces the risk of inventory spoilage and obsolescence.
vi. **Effective supplier management**: Keeping good relationships with suppliers can help to ensure timely inventory delivery and reduce costs associated with late or missing shipments.
vii. **Accurate demand forecasting**: Forecasting demand accurately is critical to avoiding stockouts or overstocking. This can be accomplished with historical sales data, market trends, and customer feedback.
viii. **Safety stock management**: Keeping safety stock levels in check can help to avoid stockouts and ensure that customers always have access to inventory. Demand forecasting and lead times should be used to determine safety stock levels.

Businesses can improve their inventory management processes, reduce costs, and ensure that customers always have access to the products they require by implementing these best practices.

CONCLUSION:

Inventory management is significant for any retailer. It helps the retail stores in the smooth running of their activities and in reducing the cost of managing the inventory. From the above data study, it can be concluded that Maxi Supermarket is managing its inventory very efficiently. The techniques undertaken by the organization are helping it in the continuous flow of its production activities. JIT, VMI model, and KPI analysis are being undertaken efficiently and effectively. The inventory turnover ratio also shows an increasing trend, indicating that retail store sales are increasing every month.

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