

# **INVENTORY MANAGEMENT SYSTEM FOR RETAILERS**

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## **PROBLEM STATEMENT:**

To develop an application for an inventory management system for retailers.

## **NEED FOR THE APPLICATION:**

The goal of retail inventory management is to maintain the right amount of desired product in stock—neither too little nor too much. Retailers may meet client demand without running out of product by properly managing their inventory. Effective retail inventory management reduces costs and improves knowledge of sales patterns in practice. Tools and techniques for retail inventory management provide merchants with more data on which to run their businesses. Applications have been created to assist shops in keeping track of and managing the supply of their own products. Retailers will be prompted by the system to register their accounts by providing necessary information. Retailers can log into the programme to access their accounts. Once retailers have successfully logged in to the programme, they can update the information on their inventory. Users can also add new goods by providing the necessary information regarding the item. They have access to the current inventory's specifics. If there is no stock detected in the accounts of the retailers, the system will immediately send an email alert to them, in order for them to order new supplies.

## **LITERATURE SURVEY:**

**Title of the paper: Inventory management for retail companies: A literature review and current trends**

**Year: 2021**

**Authors: Cinthya Vanessa Muñoz Macas, Jorge Andrés Espinoza Aguirre, Rodrigo Arcentales-Carrión, Mario Peña**

The purpose of this paper was to review and analyze extensive literature on inventory management, including several definitions and important concepts for the retail sector. Retail enterprises have become highly important in many countries due to their significant economic influence. This makes it absolutely essential that they evaluate their KPIs. 22 important inventory management KPIs must be considered when shops evaluate their stocks, according

to research. From them, the following ten key indicators were developed: inventory level, actual inventory and its connection to the company's information system, shortage or shortage frequency, frequency of product reordering or replenishment, service level, replacement frequency, product availability, inventory excess, number of items on the shelf, and level of income.

The organization will be able to utilize these indications to determine the inventory's condition and the model's evaluation, which can be used to make ongoing adjustments that will improve the health of the business. The importance of using indicators to analyze an inventory management system is illustrated by the three main advantages of higher operating performance, lesser financial loss, and greater profit rates.

Overall, the study's findings show that order quantity, inventory localization, and optimization are the main areas of attention for the systems, techniques, and tools. The most widely used tools in the retail industry for resolving location-related issues are RFID systems due to their capacity to track inventory and high levels of reliability in inventory records. RFID systems are capable of keeping track of inventory and provide a high level of confidence on inventory records. The Smart Shelf is a significant RFID application that can track and identify the placement of products with RFID tags that have already been labeled. This strategy refers to the systems, protocols, and tools that enable merchants to monitor both the location of their inventory and inventory loss.

Similar to this, order quantity optimization methods like the EOQ, JRP, AUD and IQD policies, and MDP place a strong emphasis on determining the proper order of goods. It focuses on calculating the order quantity while taking expenses and inventory management into account. Research really indicates that merchants are collaborating with VMI. In this approach, the inventory is managed by the supplier in accordance with the retailer's decisions, which results in complete supply chain optimization. The order quantity optimization methods discussed above are elaborated below.

1. Economic Order Quantity:

The EOQ order policy is centered on products that are depreciating. It determines the optimal time to resupply as well as how long it will take for the stock to run out completely. These numbers can be used to identify the appropriate ordering and backlog procedures in order to reduce the overall cost of stock per unit of time. The store has the chance to examine the relationship between order size and anticipated expenses using an EOQ model.

2. Joint Replenishment Problem:

If many goods are ordered together or not is determined by JRP. Major ordering (fixed, setup) and minor ordering expenses are two factors from the ordering problem that must be taken into account when evaluating an inventory with a variety of items in order to lower the total cost of the inventory system. The former occurs when the order is placed without taking into account the quantity of unique goods in the order. The latter is employed when taking into account each individual product in the positioning order.

3. All Unit Discount policy and Incremental Quantity Discount policy:

The AUD policy outlines a discount rate that is offered for every item purchased. On the other hand, the IQD policy only applies the reduced pricing rate to additional units that are over the total number of items for which it is granted. Due to the fact that materials are typically the most expensive part of the manufacturing process, the policy was adapted to work with finished goods and raw materials during times of scarcity, and the newsvendor satisfies customers' demands during this time even though the finished product has been fully sold.

#### 4. Markov decision process:

A MDP raises the projected overall revenue of a group of products over a certain time. The best markdown strategy for each item must be found in order for this model to achieve its goal. In this architecture, a policy specifies a weekly set discount percentage for every item across all inventory levels. The MDP model, however, has a drawback when dealing with more than two things; it exhibits a problem with the interaction between items leading to the impossibility of an ideal solution.

Also included in the current study are methods for inventory optimization, such as the Bayesian Estimation Method, the LIS for Omni-Channel, the Threshold and Differential Algorithms, and the Multi Channel Distribution Center, which are all systems and algorithms devoted to inventory optimization. The inventory optimization methods discussed above are elaborated below.

#### 1. Bayesian Estimation Method:

Using limited data from routine shelf inspections, the Bayesian technique calculates the error distribution brought on by inspections. Its main objective is to give managers strategic guidelines so they may make decisions based on empirical evidence. This technique has been employed by management scientists to determine demand measurements and stock levels to enhance replenishment decisions.

#### 2. Multi-Channel Distribution Center:

MCDC is characterized as an inventory system that includes worker cooperation, WMS hardware and software, items and their arrangement, and implemented stock policies. To enhance them for customers and retail orders, this optimization model requires precise, readily accessible information on daily inventory encompassing both items and locations.

#### 3. Threshold and Differential algorithms:

Due to its reliable optimization heuristic, the Threshold Accepting algorithm has been applied to tackle numerous optimization issues. Production expenses are implied by the costs for the manufacturer, whereas scarcity, stock holding, fixed ordering, and purchasing costs are implied by the costs for the retailer. For businesses looking to maximize their profit, it is critical to establish key decision variables. Retailers should be permitted to specify their replenishment cycles and pricing, and manufacturers should set the prices associated with large-scale sales. In order to address the second level of the bi-level issue, where both producers and retailers must set their respective prices and, in the case of retailers, the replenishment cycle, Differential Evolution algorithms are also provided as an alternative solution.

It is crucial to note that due to their high implementation and maintenance costs, not all retailers may be able to use these technologies. Retailers with limited resources now have access to less expensive tools that can assist with managing their inventory, such as bar codes or policies like EOQ, AUD, and IQD, allowing them to maximize their stock without having to make substantial investments.

**Title of the paper: A Review of Inventory Management System**

**Year: 2021**

**Author: Varalakshmi G , Asst Prof. Shivaleela**

This article focuses on the development of an inventory management system, a Windows web application that focuses on inventory and issues. It is very convenient for the owners because this application allows the stores to keep records of sales and purchases. If inventory is not maintained, it leads to consumer dissatisfaction and slower sales. By maintaining the inventory system, manual work and human errors are reduced, which at the same time speeds up the process. This inventory management system will also be able to track sales information as inventory. The inventory management system has a number of functions and also has logical tools for evaluating ideal inventory levels and automatically selecting appropriate replenishment strategies. It also has features such as the ability to identify stock levels, automatically calculate reorder points, and alert you to potential stockouts. This technique minimizes delays and eliminates the risk of stocking fast-moving goods. It regulates the movement of inventory in and out, tracks stock levels for all items and inventory, provides access to sales data and analytics, and helps businesses specify specific Safety Stock Requirements. There are four types of inventory management such as raw materials, work in progress, finished items and MRO. Due to weak sales and inventory, it is difficult to keep records manually such as quantity sold per day. Another problem that has been noted is that most customers who buy in-store do not get a suitable receipt as a reference, making it difficult for customers to exchange their existing goods if there are any problems. The primary purpose is to maintain inventory at a level that is neither overstocked nor understocked. As a result of the inventory management system, there will be higher income and profitability, a better climate for employees and an overall increase in customer satisfaction.

**Title of the paper: Research paper on Inventory management system**

**Year: 2018**

**Authors: Punam Khobragade , Roshni Selokar, Rina Maraskolhe, Prof. Manjusha Talmale**

The software that runs the hardware store. It is a Windows application developed for Windows operating systems, which is focused on inventory management and generating the required reports. The motivation of this paper is to create better understanding in redefining the requirement of retailers for paper publication. Hopefully in the future the shopkeeper knowledge that I have is able to make a significant contribution in the new idea development process that might be made. The problem is since this is the first time we create the automation, there are so many requirements that might not be defined properly. Thus the purpose of this paper is to

review and redefine the automation's requirements from basics like, What are their requirements? How can we fulfill the Shopkeeper's requirements? What is our limitation to fulfill those requirements? And the proposed solution is the requirements from the shopkeeper to create backup inventory within limited time and in high accuracy makes us come up with an automation solution by using desktop. At this time we think that this is the base solution. However, it might need some improvement in the future based on the lesson learned so is the new requirement from the shopkeeper The store owner keeps records of sales and purchases here. This system tracks available sales and inventory and lets the store owner know when it's time to reorder as well. The advantage of this system is that it eliminates not only paperwork, but also human errors, possible manual delays, and slower sales are avoided by speeding up sales. It is a secure application in which there is no leakage of information from the warehouse. And it also gives a one-desk organization look, so when the month is over, we know what we sold. The main objective of this paper is to find out the optimum level of inventory to be ordered at a point of time. To study the inventory management system in construction industries based on size of the project, type of the structure, existing management principles.

**Title of the paper: Simulation of inventory management systems in retail stores: A case study**

**Year: 2021**

**Authors: Puppala Sridhar, C.R.Vishnu, R Sridharan**

Inventory management has become a key factor especially in the retail sector. Also, there is a high demand for inventory management and control to increase the performance of the organization. A suitable system for monitoring customer demand needs to be put in place. This paper proposes a simulation of the inventory system in a supermarket. The simulation model was developed, tested, and examined using the well-known Arena programme. The package provides standard drag-and-drop components for building the model. Now this system will help to maintain proper stock level. For the A-category products, the simulation model was developed with a continuous review inventory control system in mind. We've compared the outcomes of running the model using the traditional ordering policy and the suggested ordering policy. Current research focuses on the retail store and provides a solution to the inventory-related problem any business has encountered. The simulation model is developed and operated using Arena simulation software for specific goods. Rigorous experimentation is done with the model by changing the inputs or characteristics of the model. And then a more efficient system is designed. The proposed system will reduce inventory levels by 40% and lost sales by 87% compared to the existing traditional inventory management system. Also, the proposed system is optimized using the OptQuest module in the Arena simulation software. Finally, inventory levels are further reduced by 73% compared to the existing system. The model initially contrasts the level of inventory with the incoming demand. The transaction is recorded as a lost sale if there is more inventory on hand than there is demand; otherwise, the demand will be satisfied and the inventory level will be updated. If there is more demand than there is inventory on hand at the time, the reorder level is checked. Store managers in various organizations can use this system to improve their inventory management system.

## **REFERENCES:**

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