

# Design and Optimization of An Inventory Management System for Central Stores

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## ABSTRACT

*The challenges that merchants face to manage their products has been a major concern. The use of manual methods by merchants to carry on their businesses has been totally inefficient and inaccurate way of doing business. The goal of this paper is to design a computerized inventory management system that solves the problem inherent in the manual system with the use of Python Flask Framework and SQLite database model. The system is a web-based platform designed for online supermarket inventory system and has user's dashboard and admin. The admin is responsible for uploading new stock to the online store and the control every customer activity. This system successfully produced and can be recycled for inventory management that is more efficient and faster.*

**Keywords:** inventory control, management system, merchants. Stock records, online supermarket.

## 1. INTRODUCTION

An inventory control system contains a rundown of requests to be filled and afterward prompts laborers to pick the vital things; likewise, it furnishes them with bundling and other legitimate data. Stock control might be utilized to robotize deals request satisfaction measure and furthermore oversee in and outward development of things. Mechanization is the substitution of human laborers by innovation. For ideal deals and stock administration measure, strong usefulness is required for overseeing co-ordinations offices. A Stock Management framework is an instrument used to follow products and enterprises of an organization, it is a cycle that coordinates the progression of provisions into, and out of an association to guarantee right quality and amount at right expense [1]. A mechanized stock administration framework is a modernized strategy for controlling deals and item in an organization. This application will amplify proficiency, decrease work and stay away from over expense. It will be effective in following merchandise consistently, the stock programming will upgrade stream of products, improve client care and furthermore improve the progression of money [2]. Inventories are important for the qualities of any business and can be applied as the associations own technique in building its abilities. Through their use of the conventional checking, gauging, and recording frameworks, the stock has never been the equivalent in the mediation of advances that can give extra competency. Nonetheless, it ought to be noticed that stock administration is not really an advanced development. As per [3], the soonest people kept stores of food and stone apparatuses. Peruses acquainted with the good book will review that Joseph was, in addition to other things, an amazingly capable stock administrator. Getting back to at this very moment, the individual who maintains a business that includes selling items has an alternate perspective on inventories.

This activity may serve around 70 occupied with, requesting individuals, and gives a few dozen sorts, shadings, and sizes of items, just as many different sorts of provisions. It takes a genuine, cognizant exertion to screen every one of these things, to assess their uses, to arrange new supplies from wholesalers at proper occasions, to choose when to cease once in a while purchased things and when to include alluring new ones, etc. These are the normal worries of stock administration at the retail level; the administrators of most retail organizations face essentially similar arrangement of issues [3]. The fundamental, basic capacity of stock administration framework is the capacity to play out the principle business exchanges. Such exchanges incorporate item enlistment, client and seller following, following installment cycles, buy and request handling, and a definitive objective of boosting deals and benefits. A model; the request handling is utilized to give the board data on stock, deals, conveyance notes, solicitations, etc. Such information or data is utilized for dynamic at the executives' levels [4]. With the goal for organizations to have significant and satisfactory data for appropriate administration and dynamic, it is basic practice for organizations to put resources into stock administration frameworks. These frameworks perform numerous exercises among which is handling information into data that include exercises, for example, figuring, looking at, arranging, ordering, and summing up information. These exercises compose, examine, and control information, in this way changing over them into data for end clients including chiefs who need it for dynamic [5].

## **2. THEORETICAL FRAMEWORK**

Stock management system has adopted a method which work in real time using technology to transmit information to a central-based computer system as inventory, which is then monitored and as transactions occur to ensure efficient operations and an organized management system and generate detail-oriented records and also better records and reports that cover all aspects of the business [6].

### **2.1 inventory control system**

Inventory control system is the action that hold accessibility thing to customers. It buy directions, assembling and dispersion work address showcasing issue. This job incorporates the gracefully of current deals things, new items, consumables, save parts, out of date things and every other flexibly, Wild, 2002. Furthermore, wild accept that the motivation behind the stock control work in supporting the business exercises is to upgrade the accompanying three targets: client assistance, stock expenses and working expenses.

Strategy is most gainful isn't to advance one of this to the detriment of others. Stock Control needs to make esteem judgment. On the off chance that there is no benefit, organization leave business in brief period. On the off chance that helpless client care, so client lost and friends leave business in longer term. Remains that fund and showcasing perspective is answer: watch stock have a fine judgment make. In the client support, it very well may be considered in a few different ways, pivot at kind of interest. At one help common shop climate will for the most part is taken as 'supply of previous accessibility'. While at one flexibly to client determination, administration expected is exact conveyance in time battle against client asks date. Stock costs, it requires a base cost I stock. Is ought to be considered cautiously, since that having any stocks in stores for a couple of months is terrible practice. In limiting the stock generally may taking care of the significant costs which is: low-esteem things are not viewed as a huge issue. The low stock or the store limited, the size of the things will likewise be a significant thought. Working expense had gotten a greater amount of an issue for has been put on stock administration. Working expense is prime are those related with activity shops, stock control, purchase and administration which related. Calculated turn of events, connecting circulation cost with stock, had expanded this new trap transportation cost to examination.

### **2.2 Automated Inventory Control System**

The automated inventory control system software is a computer-based system for tracking product levels, orders, sales and deliveries. It can also be used in the manufacturing industry to create a work order, bill of materials and other production related documents. Companies use inventory management software to avoid product overstock and outages and also, as a tool for organizing inventory data that was generally stored in hardcopy form. The software is made up of components working together to create a cohesive inventory control system [6].

- Asset tracking: This involves tracking products via its barcodes and other tracking criteria such as serial number when they are in a warehouse or store.
- Order management: Once products reach a certain low level; a company's inventory control system can be programmed to tell managers to reorder that product. This helps companies to avoid running out of products or tying up too much capital in inventory.
- Service management: Companies that are primarily service oriented rather than product oriented can use this software to track the cost of the materials they use to provide services. This way, they can attach prices to their services that reflect the total cost of performing them.

### **2.3 The Problem of Inventory Control System**

Indeed, even the littlest organizations need to execute some type of stock control framework to keep an exact product check, just as for bookkeeping purposes. Entrepreneurs by and large have a decision between utilizing a modernized or a manual stock framework. A manual framework offers various likely favorable circumstances and inconveniences. Joseph (2013) advocates that there are two factor shortcomings of the manual Calculation stock framework which are work - concentrated and human mistake. Work escalated can be exceptionally to work utilizing manual stock framework. They need persistent observing guarantee that every exchange clarify and that item kept up at a level reasonable stocking. It's additionally more troublesome offer data stock during business, since need registering makes use stock records measure that more problematic. Time spend screen stock levels could be utilized on exercises more beneficial for the business.

A manual stock framework depends with numerous in dynamic individual, which expands plausibility human blunder. The individual may neglect to record an exchange or just some unacceptable tally number of things. This choice on extra request need not which increment has stock expenses of organization and utilize important extra room. Count physical mistaken can likewise result in not requesting actually an item, which means business could run out a solitary thing criticality in wrong time.

## 2.4 Review of Related Literature

At the present time, survey a bit of the past procedures used by experts for stock control framework. Various procedures have been used to oversee stock control framework. We give a brief review of exploration thinks about that have been coordinated using various strategies on stock control framework.

As indicated by [7], composed an article on "Distribution center Management System" in which he expressed that stock is a significant issue which has the enthusiasm of chiefs a maker as a result of its effect on the association execution. The accomplishment of the proposed framework is the capacity to limit cost and expanding client assistance level, while the inadequacy is the failure to utilize a particular chronic number for every unit of item in the standardized identification. Sande, (2013) composed an article on "execution markers in Logistics administration" Provision and Warehouse Management".

In [8], composed a diary on "The conclusive manual for warehousing". He suggested that stockroom administrators include an incentive for makers, gathering and tasks and union focuses by getting, putting away, keeping up, picking and transportation materials to help huge volume buy markdown. The accomplishment of this framework is the capacity to improve ease methodology, while the deficiencies is the powerlessness to deal with a perplexing assembling organization.

As indicated by [6], proposed in his diary "Impact of stock administration of authoritative adequacy" that the investigation of the impact of stock administration of hierarchical viability in chose associations in Enugu, was done to get to the effect of appropriate stock on the board on hierarchical exhibitions in Nigeria organizations. Inventories are fundamental to the effective working and retailing association. The accomplishment of this framework is the capacity to assess the idea of connection between stock administration and hierarchical productivity, while the deficiency is the capacity to improve variety of stock framework to suit explicit requirements of creation in an association.

In [9], composed a diary on "Plan and Implementation of Warehouse the board utilizing standardized identification framework". They recommended that accessibility of good distribution center administration is one of the significant viewpoints that ought to be worried in an organization. The usage of standardized tag arrangement can influence decidedly the nature of the distribution center administration. The accomplishment is the capacity to improve information quality in framework, while the inadequacy is powerlessness to improve efficiency.

As per [10], composed a diary on "Stockroom Management Solutions: installed or best of breed". He suggested that stock taking is an indispensable activity in a business. The accomplishment of the framework is the capacity to improve the stock administration of crude materials stock, while the weakness is failure to adapt to high volume and assortment.

As per [11], Stated that, "The expression stock or stock alludes to the rundown of the item a firm is offering available to be purchased, and the parts that make up the items". In organizations, appropriate stock administration is urgent to guaranteeing the productive activity of your business, stock administration is the cycle by which things are been followed, a stock is fundamentally a point by point rundown of the apparent multitude of things accessible.

As per [12], broaden the methodology of Doll and Whybark (1973) and present a heuristic for assurance of creation frequencies and process durations considering wellbeing stocks. They compute the security stock as a wellbeing factor duplicated with the standard deviation of the interest during lead time. So as to appraise the standard deviation during the lead time they utilize the standard deviation of the one-time frame ahead conjecture and an observationally assessed consistent.

In [13], contends that once a creation of a thing is started, the time until the beginning of the resulting creation of that thing is a component of the current inventories, everything being equal, just as the ensuing interest for the rest of the things that happens preceding the arrangement for the following creation run.

As indicated by [14], imply that there is an elevated level of reliance among the stock degrees of the items in a solitary machine multi-thing climate. This is mostly because of the way that having set a solicitation for the office's consideration, an item will sit tight for it to finish the handling of different items on the off chance that it is occupied at the hour of the solicitation.

As indicated by [15], the reliance among stock degrees of items may cause delays for the beginning of an arrangement, which suggests that the lead times won't be consistent, rather it will differ.

As per [16], there are two basic components in the control strategy of SLSP; parcel measuring and sequencing. Most strategies in writing utilize a powerful parcel estimating strategy where the part size is acclimated to request acknowledgment. The sequencing is either fixed or dynamic. A dynamic sequencing improves the transformation to request acknowledgment while the fixed sequencing disentangles the booking of arrangements. With regards to dynamic sequencing,

As per [5], these are found in the three essential jobs that these frameworks can perform for a business undertaking. These jobs incorporate help for its business cycles and tasks, uphold for dynamic by its representatives and administrators, and backing of its methodologies for upper hand. In Nigeria, the business area

is prospering and numerous organizations are managing in the offer of different merchandise and items including hardware, electrical, and their embellishments. Such organizations incorporate Appliance World Limited, New Master Electronics Ltd, Cellular Service Logistics, Anisuma Traders Ltd, Segofer Technical Services which is the contextual analysis, etc (Uganda Business Directory 2008-2010). All the above organizations have or require to put resources into stock administration frameworks so as to have the option to increase upper hand, fulfill client needs, and expand benefits which is a definitive objective of each business/organization.

### 3. SOFTWARE DEVELOPMENT LIFE CYCLE METHODOLOGIES

Software development life cycle (SDLC) assumes a significant part in building up another or existing framework as it assists with portraying the total prerequisite of the framework. It is utilized by designers and will be the premise during the testing stage. Basic philosophies incorporate prototyping, cascade, iterative and gradual turn of events, quick application twisting turn of events, extraordinary programming and different sorts of methodology.

#### 3.1 V-Model Method of Inventory Management

Testing is underlined in this technique more than the waterfall model. In Nabil and Govardhan (2010) in the paper that thought about the five models of programming designing characterized V-molded life cycle as a consecutive way of execution of cycles. The testing techniques are grown right off the bat in the existence cycle before any coding is done, during every one of the stage's previous execution. Necessities start the existence cycle model simply like the cascade model. Before advancement is begun, a framework test plan is made. The test plan centers around meeting the usefulness indicated in necessities gathering. The high-plan stage centers around framework engineering and plan. A mix test plan is made in this stage so as to test the bits of the product frameworks capacity to cooperate. In any case, the low-level plan stage lies where the genuine programming segments are planned, and units are made in this spot also. The usage stage is, once more, where all the coding happens. When coding is finished, the way of execution proceeds up the correct side of V where the test plans grew before are currently put to utilize.

#### 3.2 Points of interest of V-Model

- Each stage has explicit expectations.
- Works well for little tasks where necessities are effortlessly perceived.
- Simple and simple to utilize.
- Higher possibility of accomplishment over the cascade model because of early advancement of test plans during life cycle.

#### 3.3 Primary Unit of Administration

The primary unit of administration explains the actual purpose of the system where the supermarket system is not actual operated in conventional pattern but automatically operated. The user sale products to customers through automated process and stock products in the system that are computed by the system. The administrator is responsive for uploading stocks into products from the store.

#### 3.4 Process Design

Successful process design has to take into account the appropriateness of the process to overall organization objective. Process design requires a broad view of the whole organization and should not have a myopic outlook. And the process should deliver customer value with constant involvement of the management at various stages. In order to achieve a good process design, effective process strategy is required, which deals with a singular line items required to manufacture the end product. Effective process strategy deals with raw material procurement, customer participation, technology investment, etc. Over a period of time process design has undergone change and new concepts like Flexible Manufacturing Systems have been developed, which delivers efficient and effective production design and analysis.

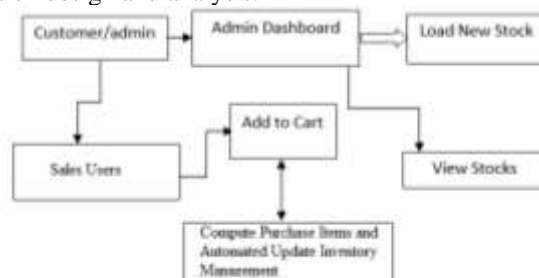


Figure 3.3 Proposed System Process Design

The system description, the administrator/user has access to the system after proper register and unique id assigned to the user. The customer create account and add to cart the product available for sales. The ordering process comes with compute purchase system which is the mean target of the system. At the index page comments are required to complement every. Every box represents and object in the software development and implementation. The administrator on the backend implements the following activities;

- Add new stock
- View stocks
- Control the activities a customer.

This is the simplest pattern and process of the system design to suite the entire system development.

### 3.4 System Data Flow Diagram

A data-flow diagram is a way of representing a flow of a data of a process or a system. The DFD also provides information about the outputs and inputs of each entity and the process itself. A data flow diagram has no control flow, there are no decision rules and no loop. This section explains the transaction pattern between objects. The proposed system is designed to assist the product seller to advertise the product and to check how the project are effective the market. Every object/function has its symbols to represent an entity.

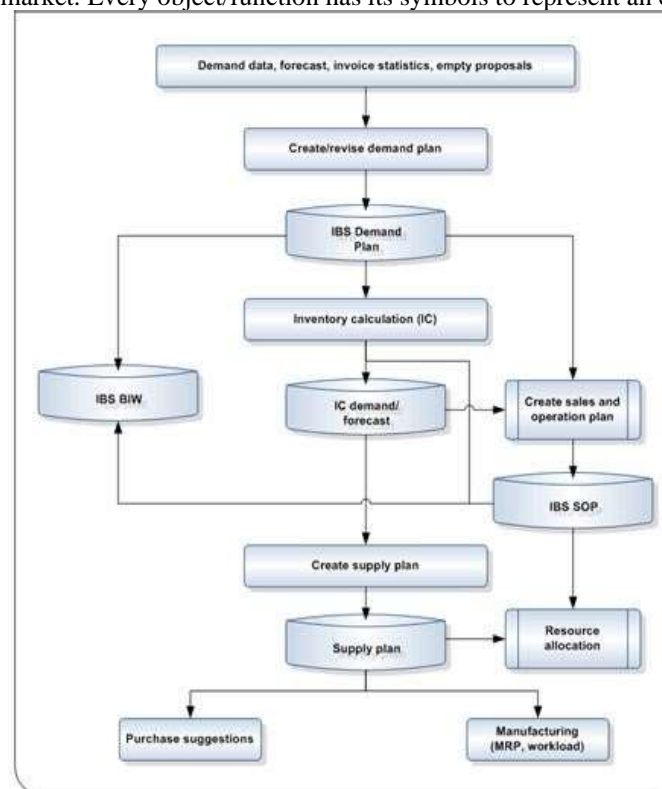


Figure 4.2.1a User Flow chart

## 4. DESIGN OF PROPOSED SYSTEM

Software design is the process by which an agent creates a specification of a software artifact, intended to accomplish goals, using a set of primitive components and subject to constraints. According to Ralph and Wand (2009). Software design may refer to either "all the activity involved in conceptualizing, framing, implementing, commissioning, and ultimately modifying complex systems" or "the activity following requirements specification and before programming, a stylized software engineering process." Software design usually involves problem solving and planning a software solution. This includes both a low-level component and algorithm design and a high-level, architecture design.

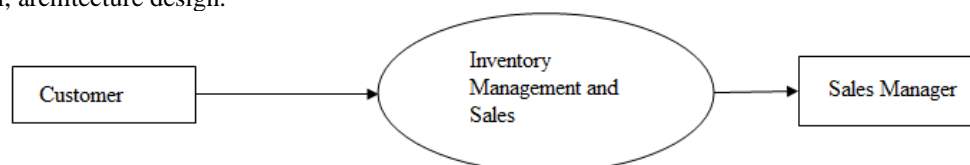


Figure 4.5 O level Context Diagram



#### 4.1 System Structure Chart

A Structure Chart (SC) in software engineering and organizational theory is a chart which shows the breakdown of a system to its lowest manageable levels. They are used in structured programming to arrange program modules into a tree. Each module is represented by a box, which contains the module's name. The tree structure visualizes the relationships between modules. James and McClure (2019). The structure of the system description the tree like representation of entire system. The administrator control and the customer privilege and rating. Product rating has been a method used for marketing product in an online electronic commerce system.

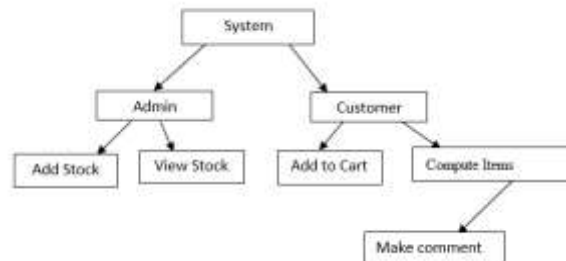


Figure 4.2.2 Structure Chart

#### 4.2 Inventory Input Design

The input design, usually are form with description of fields. Input Design is the process of converting a user-oriented description of the input into a computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system. The designed is implemented using a Microsoft office.

Login Form

Add New User Form Designed

### 5. RESULTS AND DISCUSSION

This research work centers on the utilization of PC framework regarding automated stock control arrangement of MOUAU market. The work covers the manual arrangement of activity as respects to the issues distinguished, expressing the points of the new framework, expressing the different particulars and afterward executing the projects. The work was effectively evolved utilizing python flagon structure, Sqlite Database and client experience was utilized, an easy to understand programming language, and the bundle was tried and enhanced which yields a robotized electronic stock control framework. The undertaking work can't be supposed to be great, yet nonetheless, its advantages can't be overemphasized. It has prompted the improvement in the speed of handling activity, productivity, and precision and improved stockpiling of things. The planned framework was tried, assessed and prescribed to the administration of the organization. The establishment of the product will by and large improve in general business measures at the organization, give consumer loyalty through investing less energy serving the client and guaranteeing that all items are accessible, it will likewise improve stock control, revealing components, following of exchanges made every day, and the various exercises done by explicit framework clients. Along these lines, to stay serious in the business world and the ever-changing data advancements, Mini Business Center needs to grasp the stock framework that has been planned so it can contend well in the business world.

#### 5.1 Conclusion

The research was able to develop a working prototype of an automated inventory management system that would perform business functions such as registration of products, customers, and system users; generating various reports; and maximizing sales through ensuring product availability. The study analyzed the current system being used by the company and was able to identify the strengths, weaknesses, and opportunities for strategic automated inventory management interventions.

These were later used to identify features and functionalities that would be recommended at the time of designing the system. The system design requirements were determined and using these a prototype of an automated inventory management system was developed.

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