An Improved Web-Based Inventory Management System for Universities

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Abstract. One of the most significant difficulties encountered by organisations, including educational institutions, is inventory management. Overstocking, low-quality raw materials, ineffective sourcing, incompetent staff management, etc., impact the majority of these institutions' equities. In addition, there is a lack of timely and accurate information. An improved web-based inventory control system has been developed to solve these problems. The inventory of the OAUSTECH store unit of the University of Lagos (OLAUSTECH) was captured. The procurement and storage unit data of OAUSTECH was collected through interviews, a record book inspection and some printed data. The system was implemented using BOOTSTARAP, MySQL and PHP and HTML files. Quick alert messages, reporting to management when inventory levels drop below a certain point, computation of pricing levels and other inventory analysis elements, vendor delivery performance metrics, and the creation of an affordable inventory recommender system are all things that come out of the system.

Keywords: Inventory Management System, web-based, stock threshold.

1. Introduction

If a factory wants to keep running smoothly, it has to have enough inventory, which includes things like raw materials, consumables, parts and spare parts, semi-finished items, fuels and lubricants, and completed goods (Dessalegn and Roy, 2002). Holding items and supplies in anticipation of future events is what is known as inventory. A large portion of organisations' inventory is marked by overstocking, deteriorating commodities, improper procurement methods, inadequate and inefficient control systems for inventory management, and a lack of competence in human resource management and responsibility allocation (Liu et al., 2010). Effective inventory, according to Miller (2010), can directly or indirectly affect an establishment's ability to make a profit.

According to Lwiki et al. (2013), the purpose of inventory management is to meet management-set goals by controlling the amount of a certain category of products in stock. Inventory control, according to Naliaka and Namusonge (2015), is a method to ensure related documents are

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accessible when needed considering the economics of shortages, ordering costs, purchase price and working capital. Effective inventory control can help prevent storage costs, inventory spoilage, theft and obsolescence of materials (Adeyemi and Salami, 2010, Atnafu and Balda, 2018). Universities as businesses must have inventory to operate smoothly and efficiently. The university's current system uses a manual inventory system; Inventory, goods, orders and purchases are, among other things, recorded in the ledger, which can lead to errors and insufficient data for analysis. Black and white information is always used to describe inventory, items, sales, and transactions making it poorly organized and maintained.

Failure to provide items to employees or users when needed can lead to more consequences than financial loss. When available, seasonal items should be stocked to meet demand during the off-season. Considering all of this, "inventory control" is essential for every business. But if not managed effectively, inventory is a necessity. The university's decision-making process is affected in several ways by maintaining appropriate inventory levels. The store unit will face increased demand for some items due to the university development; Trying to manually deal with this obvious and inevitable problem will eventually lead to wasted time and money, to inefficiencies and ultimately to poor management. Only a web-based inventory control system can provide accurate inventory at all times, which is essential for this department/unit to make better decisions.

To increase the efficiency of an organization, good inventory management is still essential (Chukwuemeka and Onwusoronye, 2013). Out of stock, reduced productivity and profits, customer dissatisfaction and other problems are inevitable when a business does not manage its inventory effectively. Efficient and effective inventory management is essential for a business to run smoothly and survive (Srour and Azmy, 2021). An inventory control system is a collection of software and hardware solutions that automate the process of tracking inventory, according to Yinyeh and Alhassan (2013). The originality and usefulness of new technologies should be appreciated, according to Ikuomola and Nureni (2013).

A web-based application has grown in significance in recent years, as more and more companies see the benefits of incorporating new technology into their operations (Chaffee, 2009). current stock. Because of the many benefits, like improved mobility forecasting, instantaneous access to information, and insights into device usage, the need to establish a web-based inventory system is growing. and demand, while simultaneously boosting the system's total production. The inherent challenges with the university's manual inventory approach were the impetus for Oyekan and Ikuomola's (2023) adaptive web-based inventory management system.

The goal of this work was to provide a comprehensive and organized method for using a web-based inventory control system for independent demand-side inventory management that will be an improvement over the one developed by (Oyekan and Ikuomola, 2023). An enhanced web-based inventory control system for university inventory management is a digital system that can guarantee the exchange of data between various internal components and the outside world. Managing thousands of different things by hand might be a real pain, but with the help

of a computer, you can keep everything under control and secure. The burden of producing an excessive amount of paperwork and processing data is also decreased, and precise inventory records may be maintained. Store managers must use computer technology for data processing and communication networks in today's competitive and global market environment so that they can access and modify large amounts of inventory information.

2. Methodology

2.1 The inventory system currently in use by OAUSTECH

From the inventory's senior executive officer (SEO) all the way down to the system's consumers (schools and departments/units), the OAUSTECH Inventory System is a complex web of interdependent persons. Only the desk or shelf containing the records may be used to access the "Inventory Management Tool" control system, which is dependent on human record keeping.

In a brick-and-mortar shop, employees manually maintain track of inventory using the OAUSTECH system. Ten things are available at the shops: diesel, office supplies, furniture, office consumables, software, office supplies, chemicals and reagents, motor vehicles, and furniture and accessories.

Inventory is used because there is only one store at the university. Inventory management tools include records such as inventory tags, received item notes, store registers, and store requisitions. To facilitate tracking, the shop registration includes codes and folio numbers. The ledger is updated with all newly imported objects so they can be easily tracked.

Figure 1 displays the workflow of the university inventory system. Its reliance on manual record keeping and the fact that documents may only be accessed at the desk or shelf where they are maintained are both highlighted.

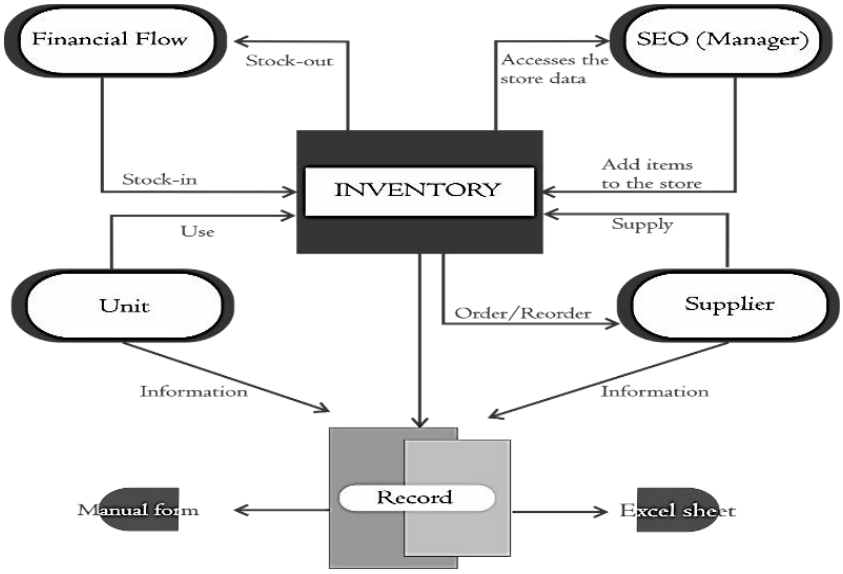

Figure 1. This is the dataflow diagram for the OAUSTECH current inventory system.

2.2 The system's suggested architecture

Figure 2 shows the blueprint for a university's customisable web-based inventory management system. A user authentication process, an interface for interacting with and providing feedback to the user, a controller for application and transition handling, a model for handling data-related issues, and a database for storing inventory data are all components of the system. Users are able to interact with the application's backend services through the user interface. Before users may access the system, they must complete the authentication process that is administered by the controller. After the controller validates that all the tests it established for itself succeeded, it requests the model to cache the records after receiving the user's credentials from the view. Once the user is located, they will receive a suitable answer and be led to the correct page.

This is categorised by the view component of the architecture; before an item can be input into the system, the user must interact with the code pages and categories. In order to prevent unauthorised users from making changes to an item, the controller verifies their credentials. In order to have the necessary information accessible during item configuration, the controller handles all user interactions on this page and passes them on to the model for additional processing. These objects can be made available upon request and any activities linked to them can be monitored by the administrator, who has the necessary credentials. The admin has the ability to pre-order or request an item on behalf of the user, making it dynamic and adaptive. Furthermore, it has an alert system that goes out when a product is running low on supply or is about to expire, allowing for better inventory management.

Before data is saved to the database, the original model uses a secure technique to handle all database-related queries to keep the data intact during processing.

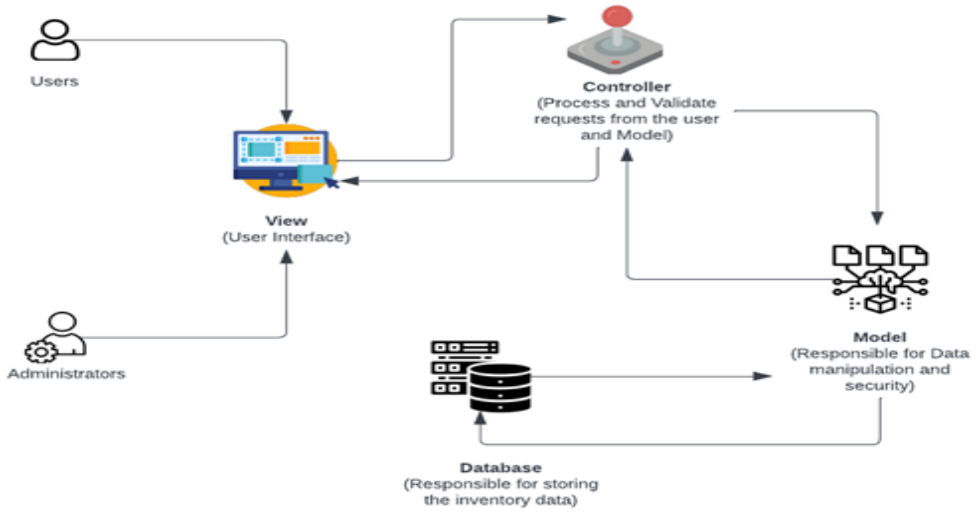

Figure 2. Campus-Wide Web-Based Inventory Management System Architecture

3. Implementation and discussion

Web technologies like HTML and BOOTSTRAP are used for the front-end design of a web-based inventory control system, while PHP and MySQLi are used for the back-end design.

The backend of the system follows the MVC (Model-View-Controller) software development pattern, which offers a structured and adaptable approach to communication between different components of the application. This pattern greatly simplifies the process of codebase maintenance and updates.

To ensure data integrity and safeguard against potential threats, all database queries are meticulously prepared and executed as PDO (PHP Data Objects) statements. This approach adds an additional layer of security, enhancing the protection of sensitive data during interactions with the database.

3.1 First evaluation of a university-wide online inventory control system

There are two categories of users for this software:

Regular Users (who are employees of various departments and units of the university, who may need to register in the store) and Administrators (who manage the supply unit and store). By identifying the user's category, the system can intelligently reroute them from the single login screen to the correct website. After starting up the web-based inventory programme, the user has a lot of options for what they can do with the system. Things that are in stock and may be ordered are shown in Figure 3. It lists the many kinds of stock items along with their names,

codes, folios, quantities, and prices. The store now allows customers to place orders with real-time information on available items.

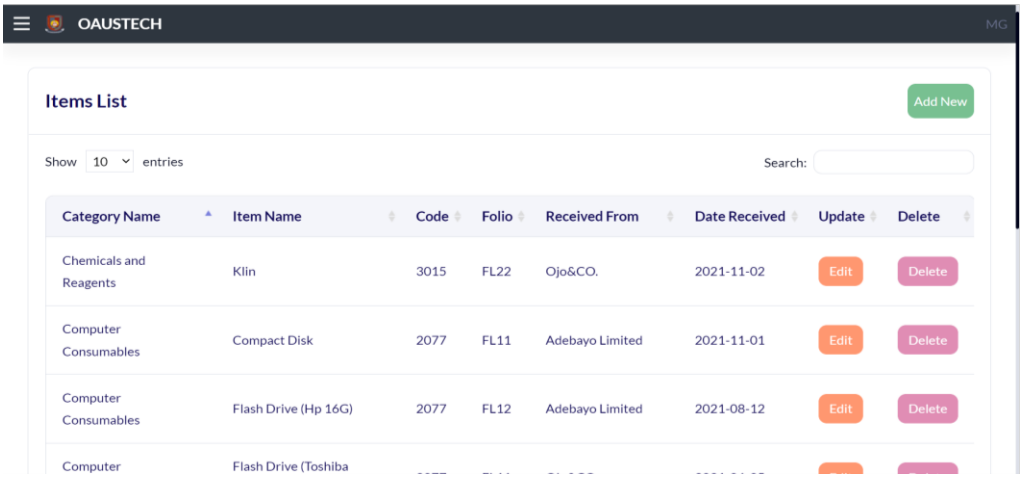

Figure 3. Items that are currently available.

Figs 4 and 5 presents where items can be set up and added to the stock and where they can be made available for request. This allows the stock manager to determine which items are available for request and what quantity. By exercising this level of control, the stock manager can finely tune the stock inventory to align with organizational requirements, ensuring that essential items are readily available for users while also preventing overconsumption or depletion of critical resources. This robust inventory management system optimizes resource allocation and enhances overall operational efficiency.

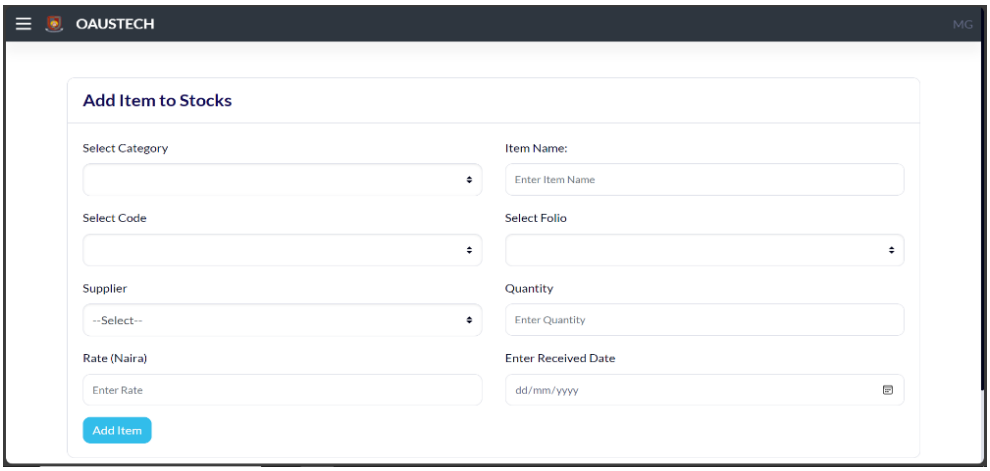

Figure 4. Add Item to Stocks

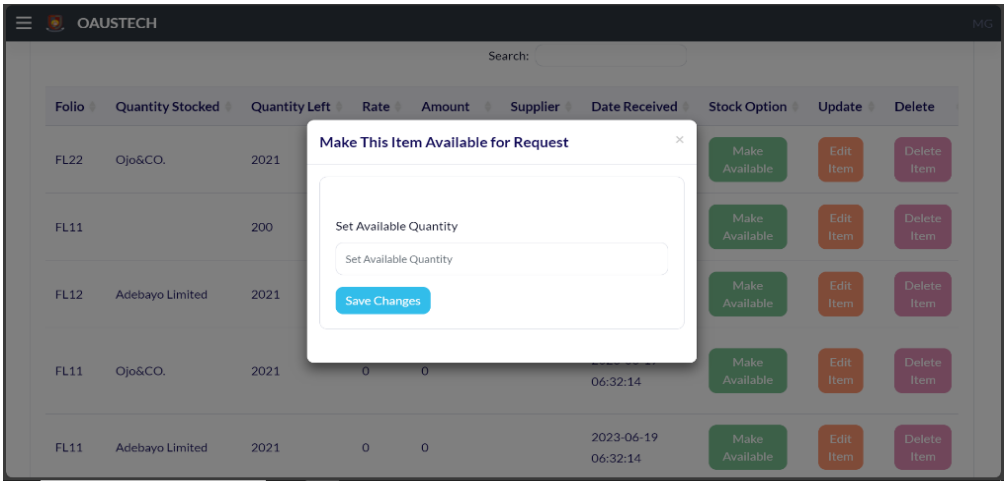

Figure 5. Make Item Available for Request

Figs 5 and 6 show pages for product/item expiration notices and out-of-stock items, respectively. One of the adaptive characteristics of the system is its capacity to notify administrators about goods that are nearing expiration or are no longer in stock. The system will quickly send an alert when an item in stock reaches a predefined threshold level, notifying the administrator that the item has reached the threshold level. The warning remains in effect until the item is changed or deleted. Additionally, notifications for expired items are activated ten days prior to the item's designated expiration date.

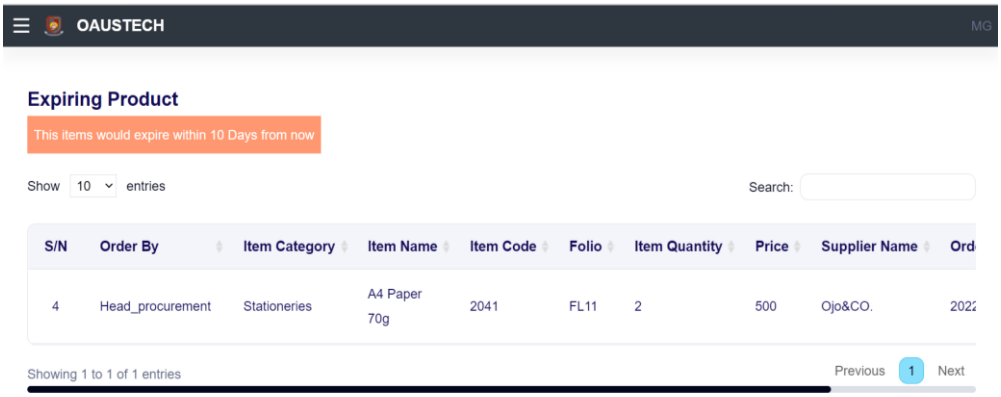

Figure 6. Expiring Items

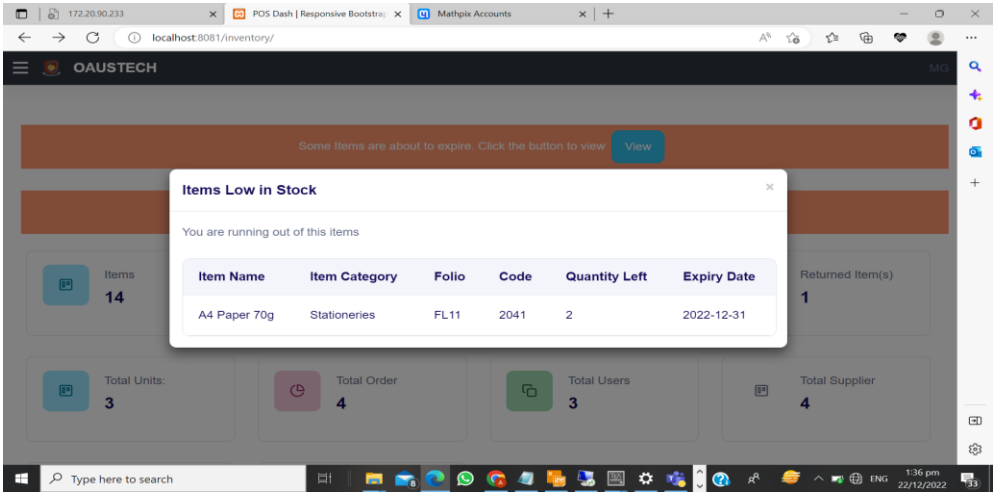

Figure 7. The item is about to be out of stock

Figure 8 illustrates a pivotal feature within the system, demonstrating the capability to generate and subsequently download reports in the form of CSV (Comma-Separated Values) files. This functionality is pivotal for facilitating data consumption and analysis.

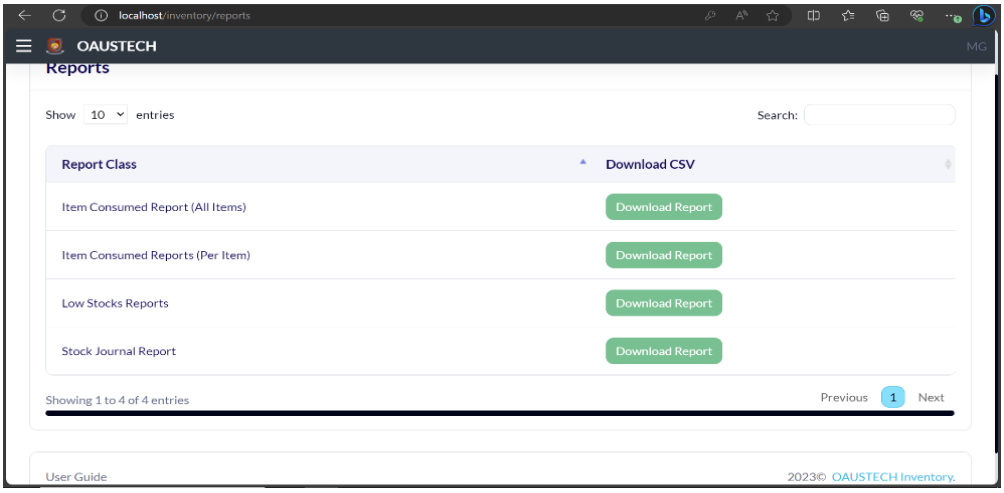

Figure 8. Reports Page

A more advanced online inventory management system has been created specifically for Olusegun Agagu University of Science and Technology, Okitipupa. Difficulties encountered by users when using existing tracks were solved by this work. The application is designed to have the following benefits for the organization:
(i) Create a new product order.
(ii) Maintain inventory records and perform additional tasks such as reporting items under reordering.
(iii) Generate summary reports to distribute to different levels of management to facilitate operations while allowing discretion in decision-making procedures.
(iv) Release documents are saved in a database for the purpose of conducting diverse inventory evaluations.
(v) Inform management promptly by providing timely notifications and reports when stock levels fall below the out-of-stock criteria.

4. Conclusion

One of the major responsibilities of the university sourcing and store is to keep track of products in stock on a daily basis. An improved web-based inventory control system has been developed to simplify this process. Once the inventory level falls below the out-of-stock threshold, this system will promptly create warning messages and report to the management. The present system when compared with the one in Oyekan et al. (2023) has the following improvements:

(i) a unified login system,
(ii) automated report generation
(iii) upgrade of the user interface for better accessibility and user experience

(iv) conversion of the code architecture to the MVC pattern for separation concerns and easy update of the code base

(v) conversion of the queries to use PDO to prevent SQL injection which makes it more secured

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