# MEDISTOCK : Medicine Inventory Management System

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in Computer Science and Engineering

By

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# SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY**
**(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade “A” by NAAC | 12B Status by UGC | Approved by AICTE**

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**APRIL - 2023**

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## BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **Krishnakumar S(Reg.No - 39110539) and Dion Paul KG(Reg.No - 39110278)** who carried out the Project Phase-2 entitled **"MEDISTOCK : Medicine Inventory Management System"** under my supervision from January 2023 to April 2023.

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**Submitted for Viva voce Examination held on________________________**

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## DECLARATION

I, **KRISHNAKUMAR S (Reg.No - 39110539),** hereby declare that the Project Phase- 2 Report entitled **”MEDISTOCK : Medicine Inventory Management System”** done by me under the guidance of **Dr. J. REFONAA, M.E.,Ph.D.** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in **Computer Science and Engineering**.

**DATE: 24.04.23**

**PLACE: Chennai** **SIGNATURE OF THE CANDIDATE**

## ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to **Board of Management** of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my thanks to **Dr. T.Sasikala M.E., Ph. D**, **Dean**, School of Computing, **Dr. L. Lakshmanan M.E., Ph.D.,** Head of the Department of Computer Science and Engineering for providing me necessary support and details at the right time during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to my Project Guide **Dr.J. REFONAA, M.E Ph.D,** for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of my phase-1 project work.

I wish to express my thanks to all Teaching and Non-teaching staff members of the **Department of Computer Science and Engineering** who were helpful in many ways for the completion of the project.

# ABSTRACT

The report is about web based medicine inventory management system named MediStock. The system will be used by the pharmacists and staffs of the company The project is designed for developing the medical store management system whose purpose is to reduce the complexities of record keeping and documentation in the inventory management, payments and list of suppliers. Effective inventory management is crucial for healthcare facilities to provide timely and high-quality patient care while minimizing costs. Medistock inventory management systems have been developed to optimize inventory control, but their implementation can be challenging due to various factors such as data inaccuracy, inadequate training, and lack of standardization. This literature review provides a comprehensive overview of the current research trends in Medistock inventory management systems. The review highlights the importance of inventory management in healthcare facilities and discusses various techniques proposed to optimize inventory control, including the use of radio-frequency identification technology, artificial neural networks, and just-in-time inventory management systems. The review also examines the challenges associated with Medistock inventory management systems and potential solutions to these challenges. The findings suggest that implementing effective Medistock inventory management systems is crucial for healthcare facilities to optimize inventory control, reduce costs, and enhance patient care. However, a comprehensive understanding of the healthcare facility's unique needs and challenges is required to implement an effective inventory management system.

# LIST OF FIGURES

# CHAPTER 1

# INTRODUCTION

MediStock is an inventory management system which manages the medicines of the distribution company. This company distributes the medicines outside to a large number of medical stores. This company is managing the stock by making use of the paper based system. The pharmacists makes the orders through medical sales representative. Medical sales representative orders the medicines by contacting the company through the phone. Company staff writes the pharmacist' orders on the book. Hence the company is having difficulties in managing the stock when they are using the paper based system.

Medical inventory management is a critical component of healthcare operations, as it ensures timely patient care, reduces costs, and improves profitability. Medistock inventory management systems are designed to help healthcare facilities manage their inventory efficiently, thereby enhancing patient care and reducing operational costs. With the advent of technology, various inventory management techniques have been developed to optimize inventory control in healthcare facilities. However, despite these advancements, healthcare facilities still face numerous challenges in managing their inventory effectively.

This literature review aims to explore the current research trends in medistock inventory management systems. The review will discuss the importance of inventory management in healthcare facilities, as well as the various techniques that have been proposed to optimize inventory control. It will also examine the challenges associated with medistock inventory management systems and the potential solutions to these challenges.

Overall, this literature review seeks to provide a comprehensive understanding of medistock inventory management systems and their impact on healthcare operations. By reviewing the existing literature, this study aims to identify the most effective strategies for optimizing inventory control in healthcare facilities, thereby enhancing patient care and reducing operational costs.

In recent years, several studies have emphasized the importance of inventory management in healthcare facilities. Effective inventory management can lead to improved patient care, reduced healthcare costs, and financial stability for healthcare facilities. For instance, studies have demonstrated that effective inventory management can reduce medical waste, optimize resource utilization, and improve patient outcomes. Conversely, poor inventory management can result in stock outs, excess inventory, and higher operational costs, leading to suboptimal patient care and reduced profitability for healthcare facilities In conclusion, medistock inventory management systems are crucial for healthcare facilities to optimize inventory control, reduce costs, and enhance patient care. By providing a centralized and automated inventory management system, these systems enable healthcare facilities to improve inventory accuracy, minimize waste, and ensure that medical supplies are available when needed. However, implementing effective inventory management systems requires a comprehensive understanding of the healthcare facility's unique needs and challenges.

Problems of using the paper based system:

- Most of the medical representatives are making excess orders.

- Most of the customers are facing time consumption when they order through the phone.

- Some medical representatives do delay to make an order with Company.They forget to make the orders.

- When the medical representatives forget or delay to make an order to

Company, this is making delay to deliver the goods to the customers which disappoints them.

- Some of the hand written orders are getting lost from an accountant

- Some customers are buying the goods themselves which makes time consumption and the delay in arrival of goods

**Aims:**

Aims of MediStock:

- To track the orders of the medicine from the pharmacists.

- To make easier for Medistock to manage the stock of the medicines.

- To prevent the medical sales representatives from making the ordersof medicine from the pharmacists.

**User Requirements:**

The following are the user requirements for MediStock:

- Company wants to avoid the medical sales representative to make an order from the hospitals or pharmacies.

- Company wants to have direct contact with the pharmacies.

- Company wants the medicine to be ordered instantly.

- Pharmacists wants the medicine to be delivered without getting delayed and want to avoid the medical sales representative frommaking the order.

- Company and Pharmacies want to save the order as pdf files.

- Company wants to avoid pharmacists from over ordering the stock.

- Our stock details should not be able to edit by the pharmacists.

- Company wants to add and update the stocks.

- Company wants to display the stock available to the pharmacists.

- Company should see the pharmacists' orders.

- The order details of a pharmacist should not be displayed to other pharmacists.

# CHAPTER 2

# LITERATURE SURVEY

Harvard University was inspired by Hollerith's idea in the 1930s and created the first modern check-out system. It used a punch card that corresponded with catalog items and was used to generate billing as well as manage inventory. Customers would fill out the punch cards and a computer would read them, sending the information to the storeroom, which would then bring the item to the customer. A version of this system is still used today for expensive and controlled items such as medication, however, it did not become too popular because of its high costs and slow Lead time.

Inventory management system is an automated system that is for the purpose of tracking the inventory. Using the inventory management system can track the kinds of inventory like bulk items such as clothing, food, books, equipment and any other items that the consumers or wholesalers purchase. Inventory management is one of the most challenging problems for the public universities which were used for the purpose of tracking the books in the libraries. Before the introduction of the Inventory Management system, the universities were using paper based system which causes problems such as staff having difficulties in managing of stock efficiently. Passing information about stocks from one employee to another employee will result in causing of errors and wasting of time. Also, employees will forget the batch number, goods will be sold to the wrong customers, moving items around the warehouses will make difficulties for the employees to findout the goods which they need (Yinyeh & Alhassan, 2013).

Benefits of using Inventory Management System are it prevents companies from running out of stocks. This system provides report on inventory whichis needed or place preapproved order for the suppliers for the need of more inventories (Vitez, 2017). It eliminates the human error because manual stock management is quite challenging and it wastes time and money being spent on the stock management. Having automated inventory management system removes the human error, decreases time consumption and themoney being spent on the manual stock management. It helps the user to understand the sales figures as automated inventory management system can be fed with rules and programs that automatically provides estimation on sales and purchases (Collins, 2015)

Inventory management systems are still being used in the industry for many years. It is established that purpose of an inventory management system is to avoid conflict in between the demand and supply (Tardieu, 2015).Before the introductions of automated warehouse system, dispatching the goods to dealers were conducted by using manual entry excel sheets.

Automated warehouse or inventory management system should be developed due to the manual handling can use human error which will affect the effective use of warehouse. In order to develop the automated system, study of the current system should be done thoroughly. Primary goal of the warehouse is to manage the movement and storage of the goods in most efficient ways.

Effective inventory management is crucial for healthcare facilities to provide timely and high-quality patient care while minimizing costs. In recent years, medistock inventory management systems have been developed to optimize inventory control, reduce medical waste, and improve resource utilization in healthcare facilities. This literature survey aims to provide a comprehensive overview of the current research trends in medistock inventory management systems.

One of the primary challenges in inventory management is the accurate the tracking of inventory levels. Radio-frequency identification (RFID) technology has been proposed as a solution to this challenge. RFID tags can be attached to medical supplies, enabling real-time tracking of inventory levels and reducing the risk of stock outs or overstocking. In a study by Ma et al. (2020), RFID technology was found to be effective in improving inventory accuracy and reducing the risk of stockouts in a hospital setting. The study also highlighted the need for standardized processes and training to ensure the successful implementation of RFID technology.

Artificial neural networks (ANN) have also been proposed as a technique for improving inventory management in healthcare facilities. ANN can be used to predict demand for medical supplies, allowing for better inventory optimization and reduction of waste. In a study by Soman et al. (2019), ANN was found to be effective in predicting demand for medical supplies in a hospital setting. The study demonstrated that ANN could reduce inventory levels by up to 25%, resulting in significant cost savings for healthcare facilities.

Another technique proposed for optimizing inventory management is the just-in-time (JIT) inventory management system. JIT involves ordering medical supplies only when they are needed, reducing the risk of overstocking and minimizing waste. In a study by Rizwan et al. (2021), JIT was found to be effective in reducing inventory levels and improving resource utilization in a hospital setting. The study also highlighted the need for proper planning and forecasting to ensure the successful implementation of JIT.

Despite the benefits of medistock inventory management systems, healthcare facilities still face numerous challenges in implementing effective inventory management systems. One of the primary challenges is data inaccuracy, which can lead to overstocking or stock outs. In a study by Ng et al. (2021), data inaccuracy was found to be a significant challenge in implementing RFID technology for inventory management in healthcare facilities. The study highlighted the need for regular data validation and cleansing to ensure accurate inventory tracking.

Another challenge in implementing effective inventory management systems is inadequate training. In a study by Yin et al. (2020), inadequate training was identified as a significant barrier to the successful implementation of RFID technology for inventory management in a hospital setting.

## Purpose of Medicine Inventory Management System :

Medicine Inventory Management System is a system consists of data entry, retrieval and monitoring stock facility and also alerts of expiry dates and minimum quantity of each drugs. This system refers to the database bydrugs name, drug code and description of the drugs. This system provides two alerts one for expiry date of medicine and another one for quantity of the drugs. The system checks the date up to-date to remind pharmacist by trigger alert message if the drugs is about to reach the minimal quantity.

Giving alert to the pharmacist will be able to control the stock of the drugs efficiently (RAZALI, 2005). Pharmacy Information System collects, storesand manages information relating to drugs and monitors the use of the drugs with patient care. Pharmacy Information management System tracks and dispense the medicine to the hospitals and health care organizations.

This system is widely used in the clinics and other health organizations today. This system has been regularly used for delivery of pharmacy services since early 1980s. Nowadays system is able to perform function of clinical decision support such as dose range checking, drug-drug interaction checking and drug-laboratory results. This system will reducethe risks of drug dispensation and drug interpretation errors (Asadi, Moghaddasi, Hosseini, Sajjadi, & Maserat, 2011).

Due to growing popularity of the use of computers had slowed down the growth of innovation ways for the pharmaceutical companies to distribute and to market their drugs to the pharmacies. Most of the computer systemshave been found useful in helping to save lives around the world. In 2010, earthquake had affected Haiti which had led to increase in demand of the need of medicines for the injured victims. Hospitals in the country did not have time to provide medicines for the needy without losing the track of what medicine has been given to who and what has not been given, even when the hospitals were having huge quantities of stock of medicines.

When the Pharmacy Inventory Management was introduced to health industry, it had helped the pharmacy inside the hospital to tackle the problem in shortage of medicine thereby hospital is able to save the lives in process (Ernest, Inalegwu, Solomon, & Sam-David, 2016).

## 2.1 Existing Related Systems

- Fully Integrated Pharmacy Information Management: This system has billing for hospitals, report generation for inventory reports, prescription management and patient profiles for looking at the information of lab results. Also, this system has inventory management for maintaining the counts of stock levels which will alert when the level reaches the certain point. This is desktop-based software which can be installed by the pharmacists or any users who had purchase this software. This software gives the privileges for the pharmacists or any users who is using this system to change and modify the stock details without the management will not be aware of, which will result financial loss for the hospital or pharmacy. This software has no admin login. This software is used by pharmacy's personal purpose.

- Med Star Pharmacy Management System: is cloud based software which can be accessible by every user around the world. This software has modules like inventory, centralized billing, Point-Of-Sale (POS) and Material Movement tracking. This system is used pharmacist who will have privileges to modify and update the stock details. This system has no admin login. This system is used by pharmacy's personal purpose.

- QS/1 Pharmacy Management System: This system monitors the changes in the quantity of the inventory and it helps the pharmacists to restore the stock quantities to match the demand of the prescription. Dashboard provides a real-time overview of all the activities of the prescription. In this system, pharmacists are able to identify the color coding through the use of color coding when the stock level goes critically down it displays red color and when the stock level goes down up to average level it displays yellow color. This system is used pharmacist who will have privileges to modify and update the stock details. This system has no admin login. This system is used by pharmay's personal purpose.

## 2.2 Proposed System

The proposed system, MediStock, involves two users: an accountant and a pharmacist. The system allows pharmacists to view and order stocks, while the accountant has the privileges to edit and update the stock details. Unlike the existing systems mentioned earlier, the proposed system has an admin login, with the accountant serving as the admin. It is a web-based system that requires an internet connection to function. To prevent over- ordering, the system displays the expiry date of the stock. Expired stock can be disposed of by burning the medicine. Over- ordering can lead to a quick run-out of stock, which may result in losses for the company and waiting for the next shipment for months. The proposed system generates reports that can be saved as PDF files and converted into Excel files using a software called PDF Converter. Additionally, the system prevents sales representatives from dealing with the stock orders from the pharmacy.

The proposed medical inventory management system is an automated system that utilizes barcode scanning technology to manage the inventory of medical supplies and equipment. The system will consist of two main components: a database and a user interface. The database will store all the information about the inventory, including the item name, description, quantity, expiration date, and location. The user interface will allow users to view and update the inventory, as well as generate reports.

Barcode scanning technology will be used to track the movement of medical supplies and equipment. Each item in the inventory will be assigned a unique barcode, which will be scanned whenever the item is moved or used. This will enable the system to automatically update the inventory database in real-time, reducing the need for manual data entry and minimizing the risk of errors.

The system will also include an alert system that will notify users when an item is about to expire or run out of stock. This will help healthcare providers plan their inventory replenishment and avoid running out of critical supplies.

Benefits of the Proposed System:

The proposed medical inventory management system offers several benefits to healthcare providers:

Improved efficiency: The use of barcode scanning technology will streamline the inventory management process, reducing the time and effort required to manage the inventory. This will free up staff to focus on other tasks, improving overall efficiency.

Reduced waste: By tracking expiration dates and usage rates, the system will help healthcare providers avoid overstocking and reduce the risk of items expiring before they can be used.

Cost savings: The system will enable healthcare providers to optimize their inventory levels, reducing the need for emergency orders and the minimizing the risk of stockouts.

Improved patient care: By ensuring that medical supplies and equipment are always available when needed, the system will help healthcare providers deliver high-quality care to their patients.

Conclusion:

In conclusion, the proposed medical inventory management system offers a comprehensive solution for healthcare providers looking to streamline their inventory management processes. By utilizing barcode scanning technology and an automated database, the system will help healthcare providers optimize their resources, reduce waste, and improve patient care. The system can be customized to meet the specific needs of different healthcare facilities, making it a flexible and adaptable solution for medical inventory management.

## 2.3 OPEN PROBLEMS IN EXISTING SYSTEM

- No direct contact with Company from the customers
- Medical representative makes the excess orders
- Time consumption for the customers when making orders through the phone
- Customers faces time consumption when purchasing the stock themselves
- Medical representative delays to make the orders
- Hand written orders can be lost from Company Accountant

# CHAPTER 3

## REQUIREMENT ANALYSIS

### 3.1 SOFTWARE REQUIREMENTS SPECIFICATION DOCUMENT

JAVASCRIPT : JavaScript is scripting language that enables you to create dynamically updating content , control multimedia , animate images , pretty much everything else.

CSS : CSS (Cascading Style Sheets) is used to style and layout web pages, for Example, to alter the font, color, size, and spacing of your content, split it Into multiple columns, or add animations and other decorative features

PHP : PHP (Hypertext Preprocessor) is the most widely used open source and General purpose server side scripting language used mainly in web Development to create dynamic websites and applications.

HTML : HTML (Hypertext Markup Language) is the code that is used to structure a web page and its content.

SQL : SQL is used to communicate with a database.It is the standard language for Relational database management systems. SQL statements are used to Perform tasks such as update data on a database, or retrieve data From a database.

### 3.2 Hardware Requirements

- **Hardware Minimum Requirement**
- **Disk space - 32 GB or more,10 GB or more for Foundation Edition**
- **Windows 7 or More**
- **Processor – 1.4 GHz 64 Bit**
- **Memory – 1 Gb**

### 3.3 Software Requirements

- **Visual Studio Code**

Visual Studio Code (VS Code) is a free and open-source source code editor developed by Microsoft. It is widely used by developers for various programming languages such as JavaScript, Python, and C#. It comes with many built-in features such as debugging, syntax highlighting, code completion, and Git integration. It also supports a wide range of extensions that can be installed from the VS Code Marketplace, making it highly customizable to meet the needs of individual developers. Overall, VS Code is a popular choice for developers due to its versatility, ease of use, and extensive customization options

## ❖ XAMPP

XAMPP is a free and open-source cross-platform web server solution stack that includes Apache, MySQL, PHP, and Perl. It is commonly used by web developers to create and test dynamic web applications locally on their computers before deploying them to a live web server. XAMPP is easy to install and comes with a control panel that allows users to start and stop Apache and MySQL servers with just a few clicks. It is compatible with Windows, Linux, and Mac OS, making it a popular choice among developers of all platforms. XAMPP is an ideal tool for web developers looking for a quick and easy way to set up a local web server environment.

## ❖ MailTrap

Mailtrap is a cloud-based email testing tool that allows developers and QA teams to test and preview emails in a safe and controlled environment. It intercepts emails sent from development or staging environments and routes them to a private inbox within Mailtrap, preventing them from being sent to real users. This ensures that developers can test their email templates and content without accidentally sending emails to real users. Mailtrap also offers features such as HTML and text email previews, spam testing, and email tracking to help teams ensure that their emails are delivered correctly and look professional. Overall, Mailtrap is a valuable tool for any team that relies on email communications in their development process.

# CHAPTER 4

## Description of Proposed System

In proposed system (MediStock), there are two users involved for using this system one is an accountant of Company and another one is a pharmacist. This system gives privileges for the pharmacists only to view and order the stocks. Company Accountant has privileges to edit and update the stock details. Difference between this system and the systems mentioned above there is no admin login in existing system and there is an admin login in proposed system. Company Accountant will be an admin of proposed system. Proposed system is web-based system which will work if there is an internet connection. This system prevents the pharmacists from over ordering the stock by displaying the expiry date. Once the stock gets expired, the pharmacists only have to dispose by burning the medicine. Over ordering will result quick run out of the stock which the company will incur loss and they have to wait for next shipment for months. Proposed system has report generation which the order will be saved as pdf file and it can be converted into Excel file by using the software named PDF Converter. This system also avoids sales representative to deal will order of the stock from the pharmacy.

The proposed system is a medical inventory management system that aims to streamline and improve the management of medical supplies and equipment within a healthcare facility. The system will be designed to track and manage inventory levels, order and receive supplies, and manage expiration dates, among other key functions.

The system will be web-based, allowing authorized personnel to access it from anywhere with an internet connection. The user interface will be intuitive and user-friendly, allowing for easy navigation and efficient use of the system. The system will also incorporate a dashboard that displays key inventory metrics, such as current inventory levels, upcoming expirations, and reorder alerts.

One of the key features of the system will be the ability to set and manage inventory levels for different types of supplies and equipment. The system will automatically generate reorder alerts when inventory levels fall below a set threshold, allowing staff to proactively order supplies before they run out. The system will also track incoming shipments and provide alerts when items are received, allowing staff to quickly update inventory levels and ensure accuracy.

Another key feature of the system will be the ability to track expiration dates for supplies and equipment. The system will provide alerts when items are approaching their expiration date, allowing staff to proactively manage expirations and prevent waste. The system will also provide reporting capabilities to track expiration trends over time and identify areas for improvement.

Overall, the medical inventory management system will provide healthcare facilities with a comprehensive tool for managing their inventory, reducing waste, and improving efficiency. By providing real-time visibility into inventory levels and expiration dates, the system will help ensure that staff always have the supplies and equipment they need to provide high-quality care to patients.

In addition to the features mentioned above, the medical inventory management system will also provide a centralized location for managing all inventory-related tasks, including creating purchase orders, receiving shipments, and updating inventory counts. This will help reduce errors and streamline the inventory management process, freeing up staff time to focus on other important tasks. Overall, the system will provide significant benefits to healthcare facilities, including improved efficiency, reduced waste, and better patient care.

## 4.1 Existing System vs Medistock

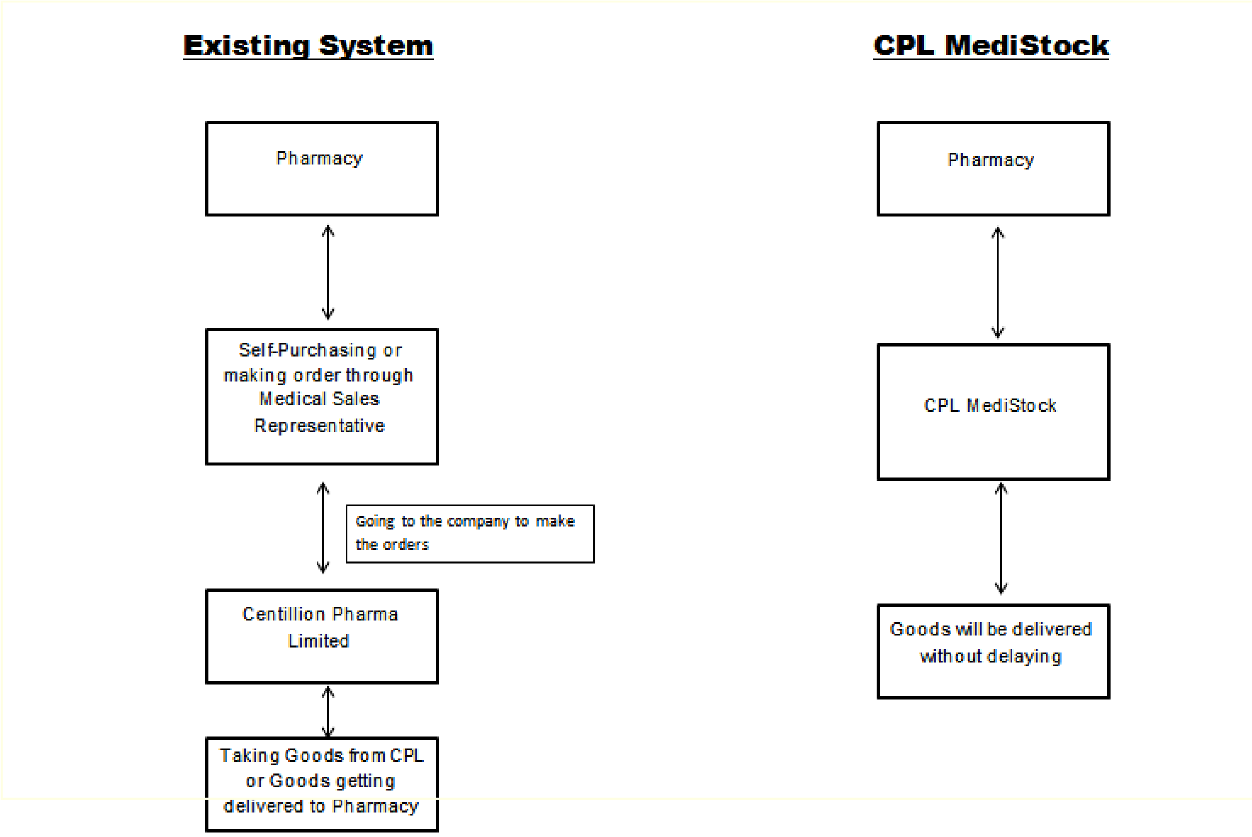


**Fig 4.1 Existing System Vs Medistock**

The existing medical inventory management systems are often manual and require significant time and effort to manage inventory levels, track orders, and monitor expirations. These systems are often prone to errors, such as misplaced or lost items, resulting in inefficient use of resources and increased costs. On the other hand, the latest medical inventory management system, Medistock, is an advanced web-based system that provides real-time visibility into inventory levels, automatically generates reorder alerts, and tracks expiration dates. Medistock also offers an intuitive user interface and reporting capabilities, making it easy to use and efficient. Compared to the existing systems, Medistock provides a comprehensive and reliable solution for managing medical inventory, reducing waste, and improving patient care. With its advanced features and capabilities, Medistock is the clear choice for healthcare facilities looking to streamline their inventory management

Processes and maximize their resources. Cloud-based: Unlike some existing inventory management systems that may be installed on local machines or servers, present Medi stock is a cloud-based system. This means that healthcare providers can access the system from anywhere, as long as they have an internet connection.

Integration: Present Medi stock is designed to integrate with other systems used in healthcare, such as electronic health records (EHRs) and billing systems. This integration can help streamline workflows and improve accuracy.

Customization: Present Medi stock offers customization options that allow healthcare providers to tailor the system to their specific needs. For example, providers can customize the system to track supplies for specific departments or locations.

Analytics: Present Medi stock includes data analytics capabilities that can provide insights into usage patterns, cost savings, and more. These analytics can help healthcare providers make data-driven decisions about inventory management.

Security: Present Medi stock has robust security features designed to meet data security and compliance requirements in the healthcare industry. This can provide peace of mind for healthcare providers and patients.

These are just a few examples of the differences that may exist between an existing inventory management system and present Medi stock.

**4.2 ARCHITECTURE / OVERALL DESIGN OF PROPOSED SYSTEM**

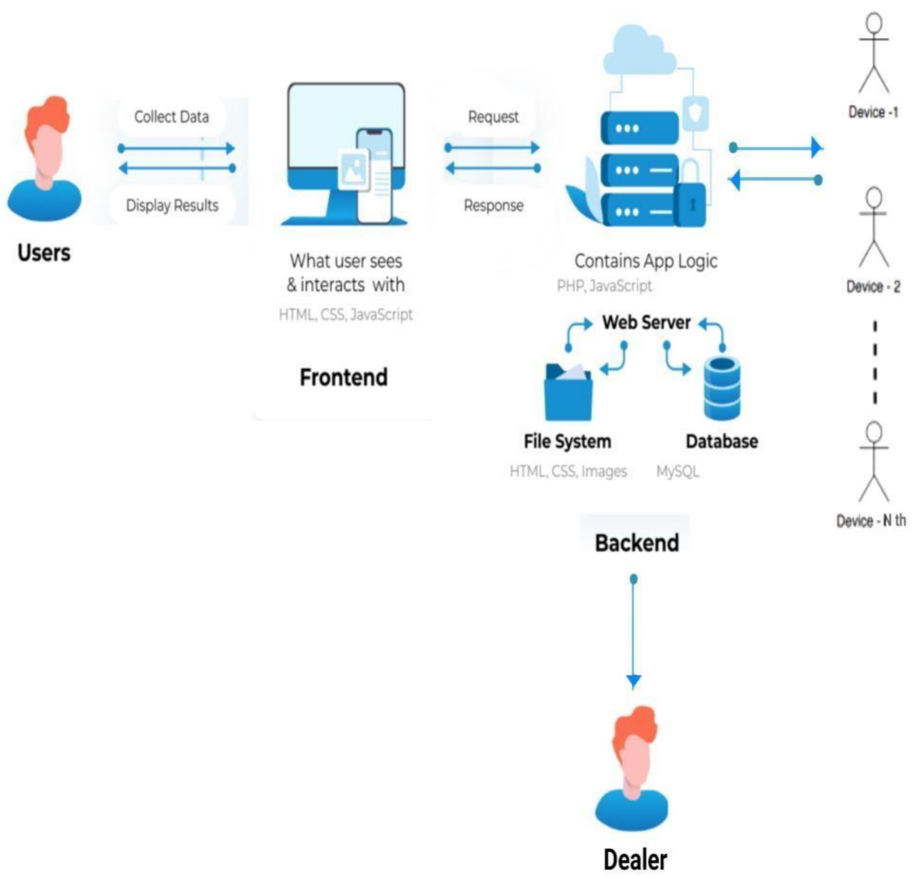


***Fig 4.2 System Architecture for Medistock***

Administrator will log into the system by using the preset username and password. After entering the login details, administrator will be redirected to the homepage. Administrator have to choose the following menu Add Stock, Update Stock, Update Quantity and View Pharmacists' Orders in a homepage. When the administrator choose Add Stock, he or she have to enter the medicine details then after entering the details stock will be added to the database. Administrator can confirm whether the stock is added or not when he or she is redirected to the view stock page after entering the stock details. When the administrator choose Update Stock, heor she will be redirected to select the medicine, after selecting the medicine, the administrator will be redirected to enter the updatable detailsof medicine. After submit the details, the stock will be updated and the administrator can confirm whether the stock is updated or not by looking at the view stock page after being redirected from the update stock page.

When the administrator choose Update Quantity, he or she will be redirected to select the medicine after selecting the medicine administrator will have to enter the quantity of medicine when the new consignment of the same medicine arrives. After submitting the details, the quantity will updated in the database. Administrator can confirm whether the quantity is added or not by looking at the view stock page when the administrator is redirected from the Update Quantity page. When the Administrator choose View Pharmacists' page he or see the orders of the medicines.

The system architecture for Medistock is based on a three-tier architecture, consisting of a presentation layer, application layer, and data layer. The presentation layer is the user interface, which is designed to be intuitive and user-friendly, allowing users to easily navigate and interact with the system. The application layer is the business logic layer, where the core functionalities of the system are implemented. This layer includes modules for inventory management, order tracking, expiration management, and reporting. The data layer is the database, where all the system data is stored, including inventory levels, orders, shipments, and expiration dates.

Medistock is built using web technologies, making it easily accessible from anywhere with an internet connection. The system uses a RESTful API to communicate between the presentation layer and the application layer, ensuring fast and efficient data transfer. The system is designed to be scalable, allowing for easy addition of new features and modules as the needs of the healthcare facility evolve.

Medistock also incorporates security features, such as role-based access control and data encryption, to ensure the safety and privacy of patient and facility data. The system is designed to be highly available and reliable, with redundant servers and automated backups to prevent data loss or system downtime. Overall, the system architecture for Medistock provides a robust and scalable solution for healthcare facilities to manage their medical inventory with ease and efficiency.

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## 4.3 A representation of the Class Diagram

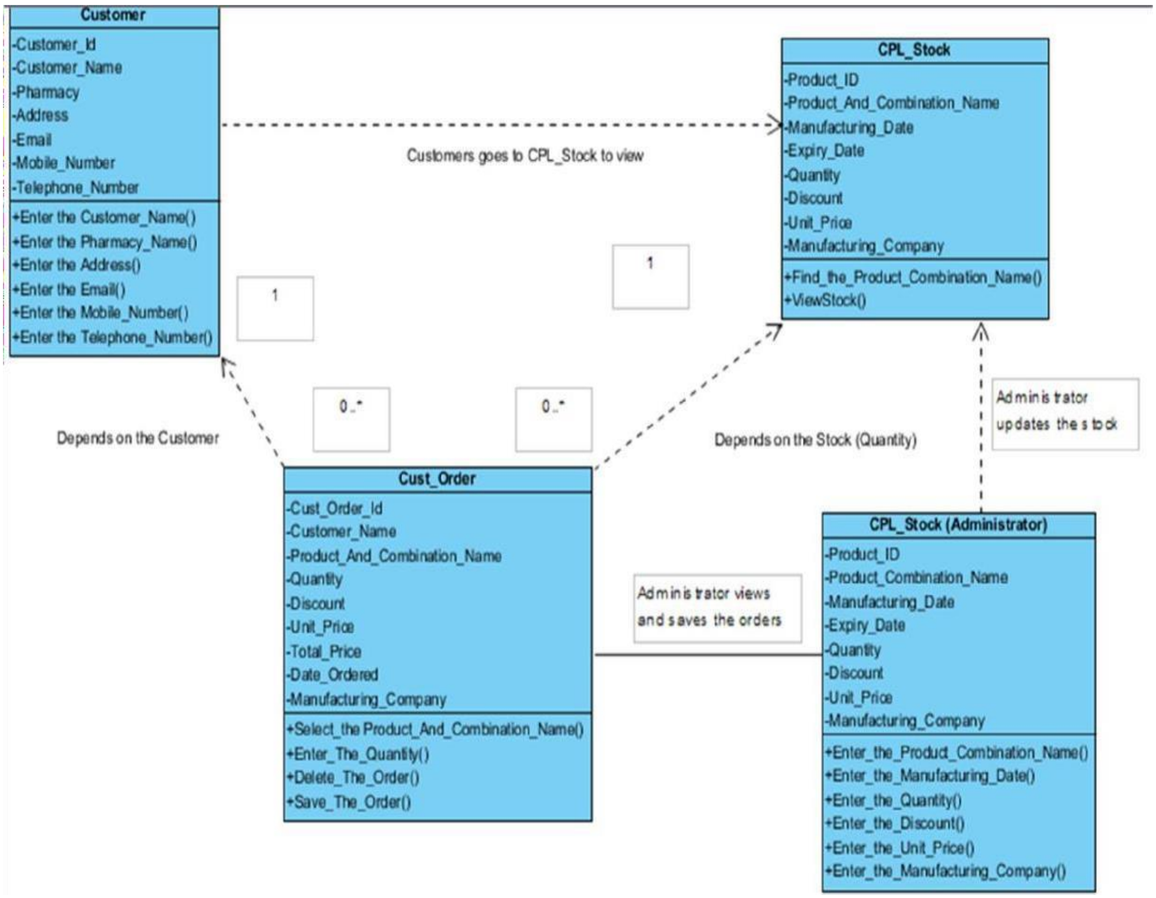


***Fig 4.3 Class Diagram***

Class Diagrams are one of the most useful types of diagrams in UML. They map out the structure of a particular system by modeling its class,attributes, operations and relationship between the objects.

Firstly, a pharmacist will be logging into the system by enter the username and the password. If the pharmacist is not the member of the site, then he or she have to register to be the member by enter the parameters named Customer_Name (First Name & Last Name), Pharmacy, Address, Email, Mobile_Number and Telephone_Number. Then the pharmacist will browse the Stock by selecting the parameter Product_And_Combination_Name. Administrator updates or add the stock by entering the parameters Product_And_Combination_Name, Manufacturing_Date, Expiry_Date, Quantity, Discount, Unit_Price and Manufacturing_Company. Administrator will view the orders with the attributes stated in the Cust_Order. The parameter need Quantity in Cust_Order will reduce the Quantity in Stock.

## 4.4 Sequence Diagram

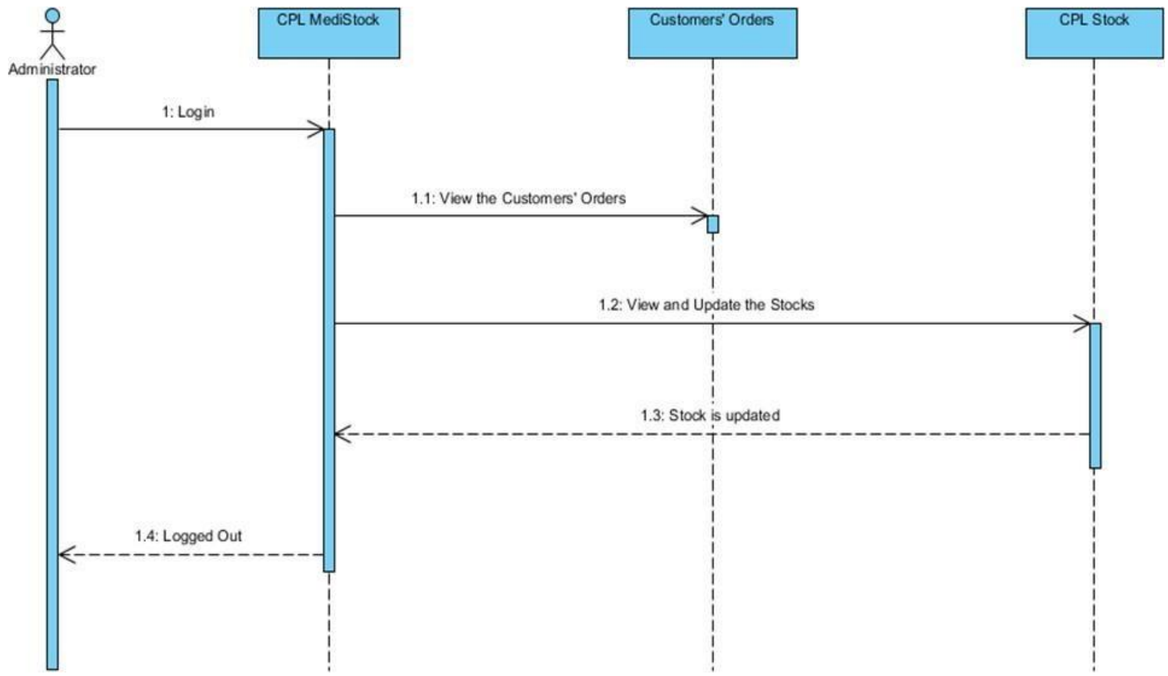


*Fig 4.4 Sequence Diagram*

In this sequence diagram, an administrator will be logging into the systemnamed CPL MediStock. After logging into the system, administrator will be view the pharmacists' order which have been ordered. Administrator can add and update the stock by going to the stock database after updating or adding the stock, the system will send the message to the administrator stating that the stock is added or updated successfully. Then the administrator will be logged out of the system

### 4.5 Data Set

1. Item Name: The name of the medical item in the inventory, such as syringes, bandages, or medication.
2. Item ID: A unique identifier for each item in the inventory.
3. Manufacturer: The name of the company that produces the item.
4. Quantity on Hand: The number of items currently in stock.
5. Minimum Stock Level: The minimum number of items required to ensure that the inventory level does not fall below a critical level.
6. Maximum Stock Level: The maximum number of items that can be stored in the inventory.
7. Reorder Point: The inventory level at which an order for additional items should be placed.
8. Cost per Item: The cost of purchasing each item from the manufacturer.
9. Supplier: The name of the company that supplies the items.
10. Lead Time: The time it takes for a supplier to deliver items after an order is placed.
11. Expiration Date: The date after which the item should not be used due to its decreased effectiveness or safety.
12. Location in Inventory: The physical location of the item in the inventory.
13. Usage Rate: The rate at which items are used in the healthcare facility.

These variables can be used to track inventory levels, predict demand, and optimize inventory control using various inventory management techniques such as RFID technology, ANN, and JIT. Proper data collection, validation, and cleansing can ensure the accuracy and reliability of the dataset for effective inventory management.

## 4.6 Pre-Processing

Pre-processing is an essential step in preparing data for analysis in medical inventory management systems. The following are some common pre-processing techniques that can be applied to medical inventory data:

1. Data cleaning: This involves removing or correcting errors in the dataset, such as missing data, duplicates, or incorrect values. This can be achieved by using tools such as data validation, data profiling, and data cleansing.

2. Data normalization: This involves transforming data into a standard format to reduce redundancy and inconsistency. For example, different spellings of the same item can be normalized to a standard spelling.

3. Data integration: This involves combining data from different sources into a single dataset. For example, data from different departments in a healthcare facility can be integrated to get a comprehensive inventory view.

4. Data transformation: This involves converting data into a different format to make it more suitable for analysis. For example, inventory data can be transformed into a time-series format to track trends over time.

5. Data reduction: This involves reducing the amount of data in the dataset to improve processing efficiency. For example, data can be summarized by category or time period to reduce the number of data points.

6. Data discretization: This involves converting continuous data into discrete categories to make it easier to analyse. For example, inventory levels can be categorized as high, medium, or low.

7. Outlier detection: This involves identifying and removing or correcting data points that are significantly different from the rest of the data. For example, inventory levels that are abnormally high or low can be flagged for further investigation.

These pre-processing techniques can improve the accuracy, completeness, and consistency of medical inventory data, making it easier to analyse and make informed decisions about inventory management. It is important to note that the specific pre-processing techniques used will depend on the nature of the data and the specific requirements of the inventory management system.

## 4.7 Methodology

Implementing a successful medical inventory management system involves several key steps. The first step is to identify the inventory needs of the healthcare facility by reviewing past inventory usage and tracking trends in patient needs. Once the inventory needs are identified, appropriate data collection methods should be selected, such as manual or automated methods through barcode scanners technology. The next step is to select and set up an inventory management software that meets the needs of the healthcare facility. This includes inputting all relevant data into the system and configuring it to track inventory levels and generate alerts when inventory levels fall below a certain threshold. Once the inventory management system is set up, inventory control policies should be established, including setting minimum and maximum inventory levels, determining reorder points, and establishing procedures for inventory counting and auditing. Staff training should also be provided to ensure that staff members know how to use the system and follow inventory control policies. Finally, the performance of the medical inventory management system should be regularly monitored and evaluated, including tracking inventory levels, evaluating the effectiveness of inventory control policies, and making adjustments as needed to optimize system performance. By following this methodology, healthcare facilities can improve patient care and reduce inventory costs through efficient and effective medical inventory management.

## 4.8 Algorithm used in an Overview

There are various algorithms that can be used in medical inventory management systems to optimize inventory control and improve patient care. Some of the commonly used algorithms are:

1. Economic Order Quantity (EOQ): This algorithm calculates the optimal order quantity for a specific item by considering factors such as item cost, ordering cost, and carrying cost. The goal is to minimize inventory costs while ensuring that enough items are available to meet demand.

2. Just-In-Time (JIT): This algorithm aims to minimize inventory levels by ensuring that items are delivered just in time to meet demand. JIT relies on accurate demand forecasting and efficient supply chain management to minimize inventory costs while ensuring that items are available when needed.

3. Minimum/Maximum (Min/Max) Inventory Control: This algorithm sets minimum and maximum inventory levels for each item in the inventory. When inventory levels fall below the minimum level, an order is placed to bring inventory levels back up to the maximum level. This algorithm ensures that inventory levels are always within a desired range, minimizing the risk of stock outs while also minimizing inventory costs.

4. Reorder Point (ROP): This algorithm calculates the inventory level at which an order should be placed to ensure that inventory levels do not fall below a critical level. The ROP takes into account factors such as lead time, usage rate, and safety stock to ensure that items are always available when needed.

5. Inventory Optimization: This algorithm uses advanced data analytics techniques such as machine learning and artificial intelligence to optimize inventory levels and improve demand forecasting. By analysing historical data and real-time inventory data, inventory optimization algorithms can predict future demand and adjust inventory levels accordingly.

These algorithms can be used individually or in combination to create a customized inventory management system that meets the specific needs of a healthcare facility. The choice of algorithm will depend on factors such as the nature of the inventory, the level of demand variability, and the desired level of inventory control.

## 4.9 Project Demonstration

❖ Code for email testing

```php
<?php
use PHPMailer\PHPMailer\PHPMailer;
use PHPMailer\PHPMailer\SMTP;
use PHPMailer\PHPMailer\Exception;

require_once __DIR__ . '/vendor/phpmailer/src/Exception.php';
require_once __DIR__ . '/vendor/phpmailer/src/PHPMailer.php';
require_once __DIR__ . '/vendor/phpmailer/src/SMTP.php';

$mail = new PHPMailer(true);

$mail->SMTPDebug = 0;
$mail->isSMTP();
$mail->Host = 'sandbox.smtp.mailtrap.io';
$mail->SMTPAuth = true;
$mail->SMTPSecure = "tls";
$mail->Port = 2525;

$mail->mailer = "smtp";

$mail->Username = '66411f91d32a06';
$mail->Password = 'f73ab06e528556';

// Sender and recipient address
$mail->SetFrom('company@gmail.com', 'Company');
$mail->addAddress('adminemail@gmail.com', 'Admin');
$mail->addReplyTo('adminemail@gmail.com', 'Admin');

// Setting the subject and body
$mail->IsHTML(true);
$mail->Subject = "Item getting out of stock";
$mail->Body = $body_content;

$mail->send();

?>
```

➢ The above code is used connect the webpage to the Mail Id

❖ Code For Checking Whether the medicine is expired or not

```php
<?php
use PHPMailer\PHPMailer\PHPMailer;
use PHPMailer\PHPMailer\SMTP;
use PHPMailer\PHPMailer\Exception;

require_once __DIR__ . '/vendor/phpmailer/src/Exception.php';
require_once __DIR__ . '/vendor/phpmailer/src/PHPMailer.php';
require_once __DIR__ . '/vendor/phpmailer/src/SMTP.php';

$mail = new PHPMailer(true);

$mail->SMTPDebug = 0;
$mail->isSMTP();
$mail->Host = 'sandbox.smtp.mailtrap.io';
$mail->SMTPAuth = true;
$mail->SMTPSecure = "tls";
$mail->Port = 2525;

$mail->mailer = "smtp";

$mail->Username = '66411f91d32a06';
$mail->Password = 'f73ab06e528556';


//checking date
$host = "localhost";
$username = "root";
$password = "";
$database = "cplmedistock";
$connect =  mysqli_connect($host,$username,$password, $database);

if(!$connect)
{
    die("Connection failed: " . mysqli_connect_error());
}

    $date = date('Y-m-d');
```

```php
    $date = date('Y-m-d');
    $select_count = "SELECT quantity,product_and_combination_name from cpl_stock WHERE expiry_date<'$date'";

    $result = $connect->query($select_count);

    while ($row = $result->fetch_assoc()) {

        $item_name =  $row['product_and_combination_name'];
        $body_content = '<p>Hi,<p>

                <p> Your medicine '.$item_name.' is expired.
                </p>
                </br>
                Thanks</br>
                Admin';

        // Sender and recipient address
        $mail->SetFrom('company@gmail.com', 'Company');
        $mail->addAddress('adminemail@gmail.com', 'Admin');
        $mail->addReplyTo('adminemail@gmail.com', 'Admin');

        // Setting the subject and body
        $mail->IsHTML(true);
        $mail->Subject = "Medicine expired";
        $mail->Body = $body_content;

        $mail->send();

    }





?>
```

- The Above code is used to check whether the Medicine is expired or not.
- If the medicine is expired the system will send a mail to the admin.
- The admin will check the mail and return the expired product back to the company.
- The system also send a mail to the manufacture about the expired products

## 4.10 Result

➢ The resultant Webpage

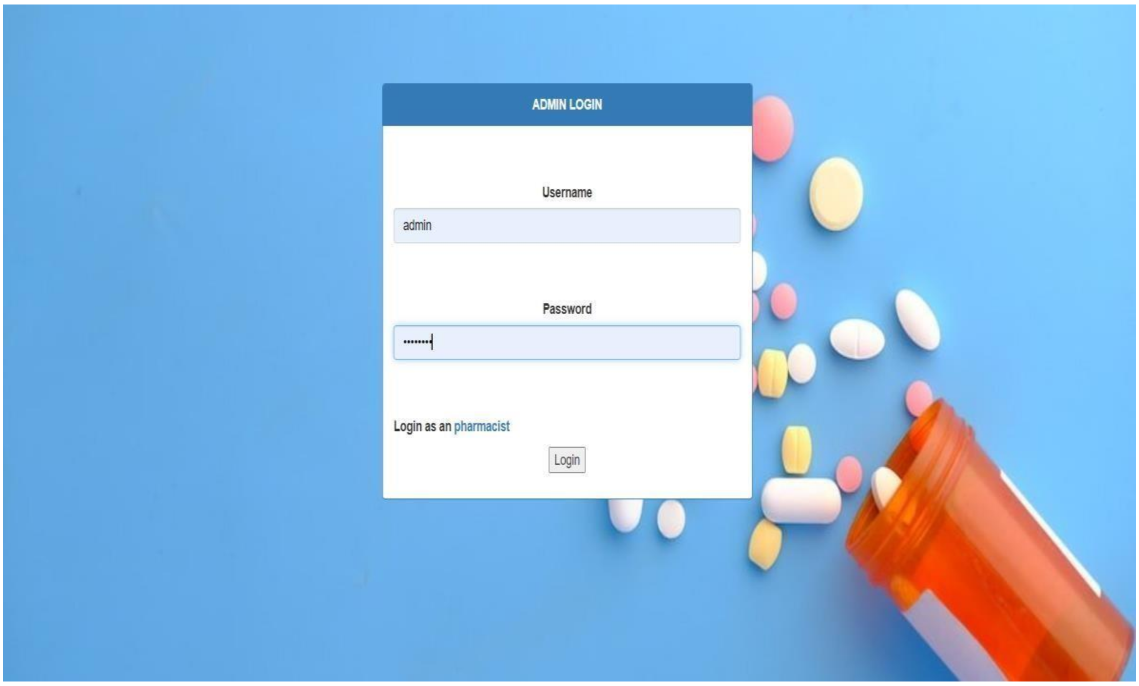


***Fig 4.5 Resultant Web Page***

➢ Xampp control panel

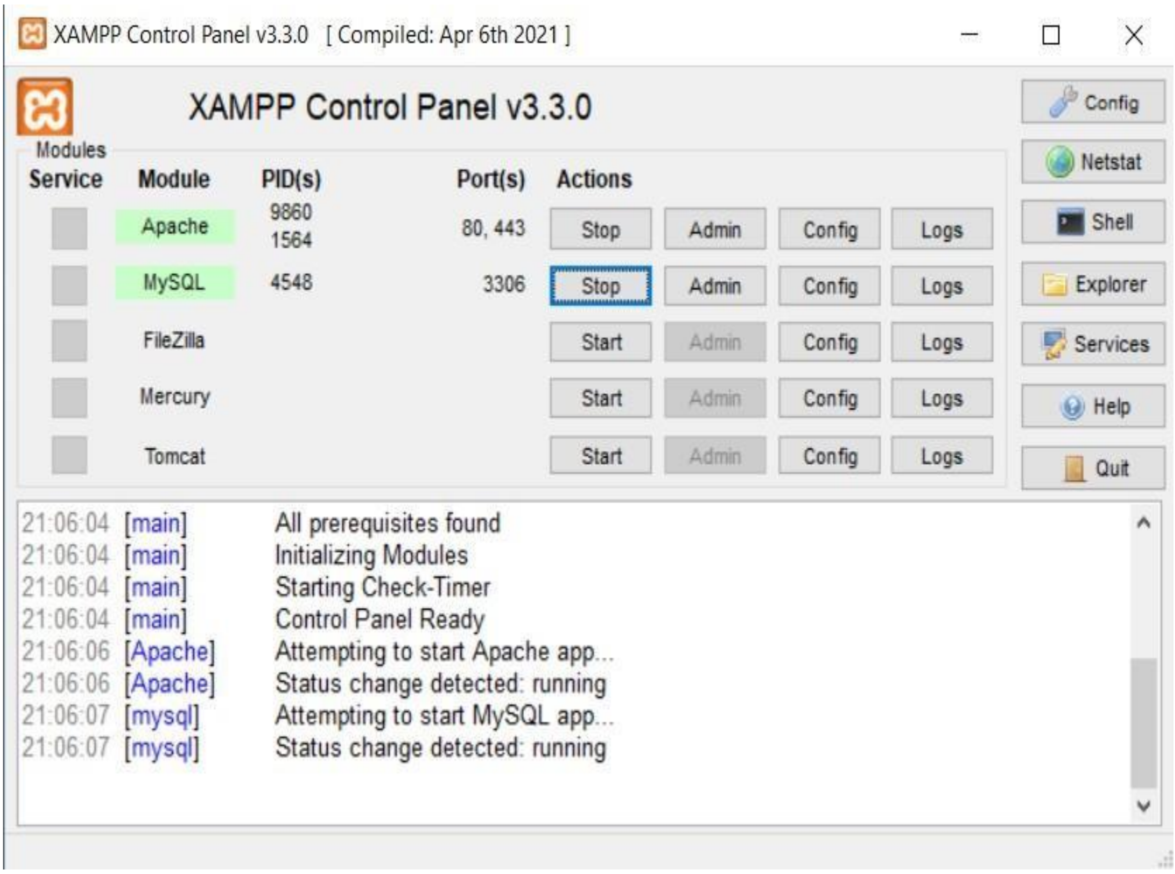


***Fig 4.6 Xampp Control Panel***

➢ The Admin panel

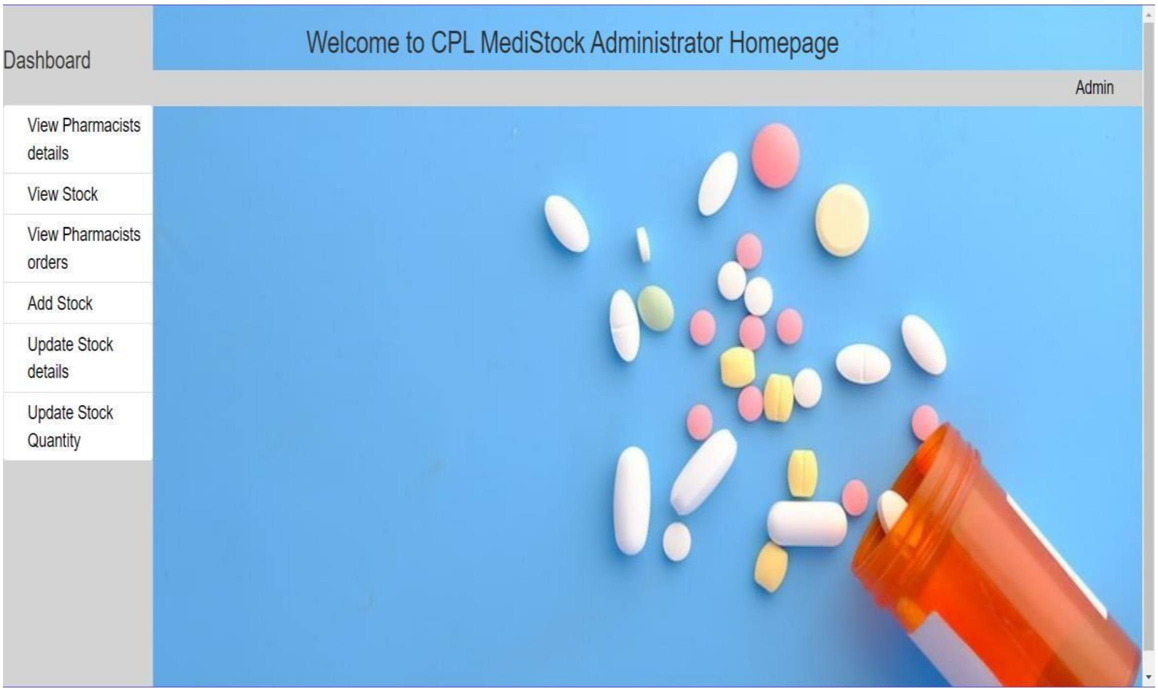


***Fig 4.7 Admin Panel***

➢ The pharmacist panel

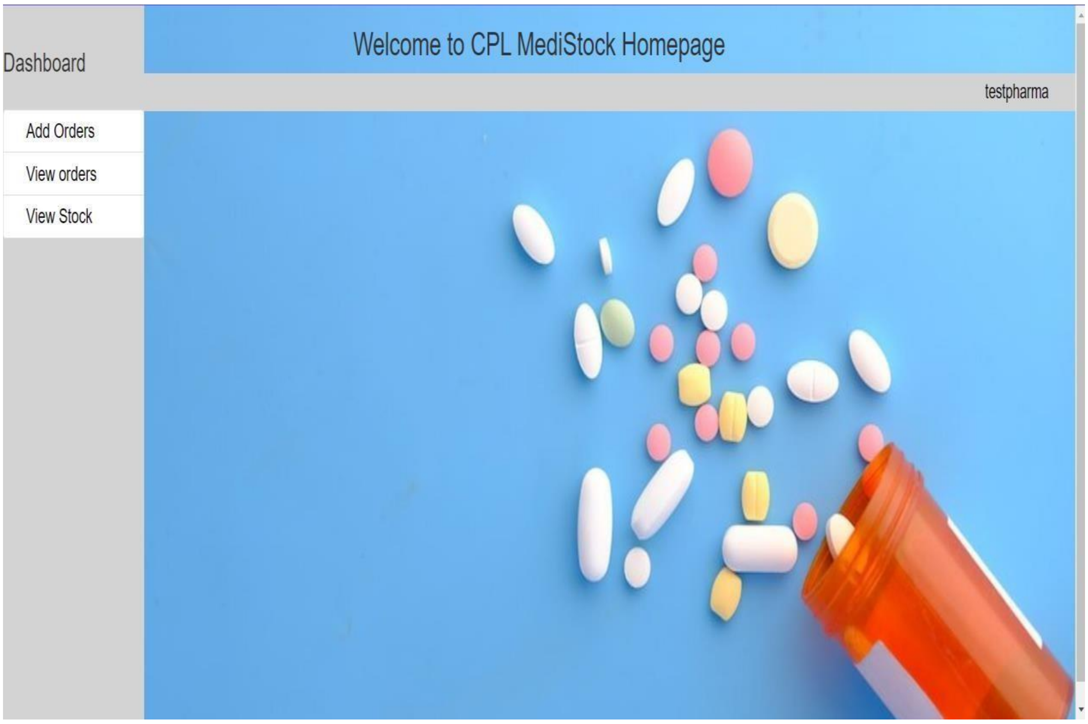


***Fig 4.8 Pharmacist Panel***

- ➢ The expired medicine email

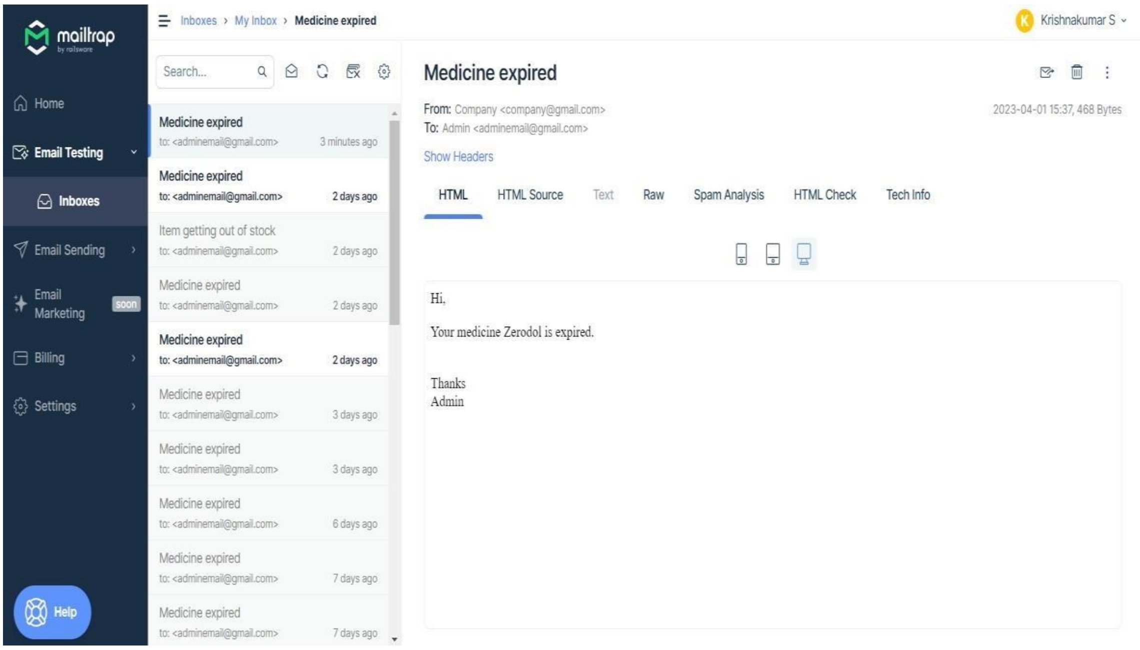


***Fig 4.9 Expiry Email***

- ➢ Email regarding the out of stock of medicine

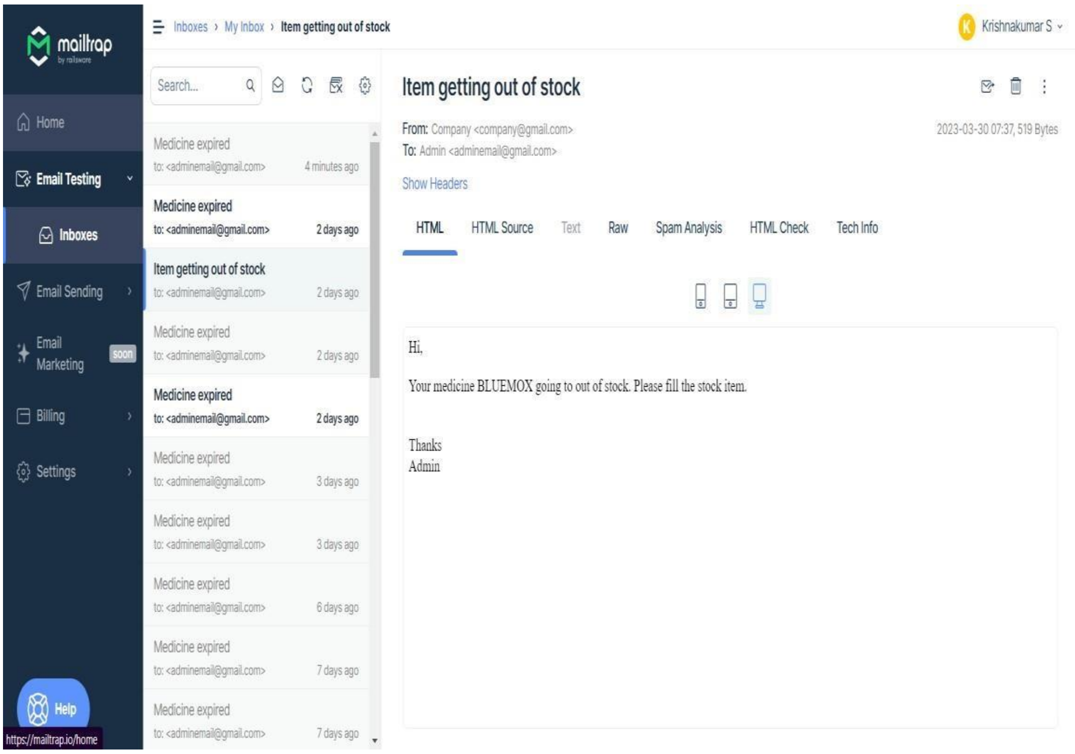


***Fig 4.10 Out Of Stock Email***

Medical inventory management systems are software tools designed to streamline the process of managing medical supplies and equipment. These systems can help healthcare providers improve their inventory control and reduce waste, while ensuring that they always have the supplies they need to provide quality care to their patients.

One of the main benefits of a medical inventory management system is that it can help healthcare providers avoid stockouts or overstocking of medical supplies. This is particularly important in healthcare settings where supplies can be expensive or have a limited shelf life. By accurately tracking inventory levels and automatically generating purchase orders, these systems can help providers optimize their inventory levels and reduce the risk of waste.

Another advantage of a medical inventory management system is that it can help improve patient care. When medical supplies are managed more efficiently, healthcare providers can spend more time focused on patient care, rather than on managing inventory. In addition, by ensuring that the right supplies are always available when needed, providers can reduce the risk of medical errors or delays in treatment.

Overall, the implementation of a medical inventory management system can lead to significant benefits for healthcare providers. These systems can help providers optimize their inventory levels, reduce waste, and improve patient care, ultimately resulting in better outcomes for patients and more efficient operations for healthcare facilities.

## 4.11 Conclusion

The project has successfully achieved all the objectives, user requirements and aims set forth in the introduction. In order to enhance the project, future work will focus on implementing a secure online payment system and a secure website. If more time were available, it would have been possible to include a profile picture and details of the pharmacist. The project has enabled the development of knowledge in areas such as displaying or populating data on a form, reducing stock quantities and making use of user sessions. The proposed system (MediStock) may be demonstrated to pharmacists and company staff, and once their satisfaction is obtained, the system will be deployed to a real environment by hosting it on Google Cloud Platform and making it searchable.

A medical inventory management system is essential for healthcare facilities to operate efficiently and effectively. The system ensures that medical supplies are available in adequate quantities, at the right time, and at the right place. By implementing an inventory management system, healthcare providers can streamline their processes, reduce waste, and ultimately provide better patient care.

The system should be designed to include features such as automated inventory tracking, real-time data reporting, and supply chain management. It should also be user-friendly, accessible, and secure.

Overall, the benefits of a medical inventory management system are significant, including cost savings, improved efficiency, and enhanced patient safety. This system can help healthcare providers to reduce costs associated with stock outs, overstocking, and expired supplies. Furthermore, it can minimize the risk of medical errors caused by inadequate supplies, ensure regulatory compliance, and improve overall patient outcomes.

Therefore, healthcare providers should prioritize the implementation of a medical inventory management system as part of their efforts to improve patient care and reduce operational costs.

The Project has met all the objectives, user requirements and aims from Introduction. The future work of the project will be implementing the project with secured online payment and secured website. The profile picture and details of the pharmacist would have been added, if there were more time. Knowledge of displaying or populating the data on the form, reducing the stock quantity and making use of user session have been acquired during the phases of the project. The proposed system (MediStock) may be demonstrated in front the pharmacists and the staff of the company. Once they are satisfied with the proposed system then it will be deployed to the real environment by hosting the proposed system to Google search engine by using Google Cloud Platform (GCP).

## Future Work

Integration with electronic health records (EHRs) - Many healthcare providers already use EHRs to manage patient data, so integrating inventory management systems with EHRs can streamline workflows and improve accuracy.

Automation - Automated inventory management systems can help reduce human error and improve efficiency, by automatically tracking inventory levels and generating alerts when supplies are running low.

Data analytics - Inventory management systems generate a lot of data, and analyzing this data can provide insights into usage patterns, cost savings, and more. Future work on inventory management systems could focus on developing more advanced data analytics capabilities.

Mobile functionality - Mobile devices are becoming increasingly important in healthcare, and having a mobile app for inventory management could improve accessibility and convenience for healthcare workers.

Sustainability - With growing concerns about the environmental impact of healthcare, inventory management systems could incorporate sustainability features such as tracking the carbon footprint of supplies and identifying environmentally friendly alternatives.

Of course, these are just a few examples of areas where future work on inventory management systems in healthcare could focus, and the specific needs of Medistock may differ. Ultimately, the goal of any inventory management system is to ensure that healthcare providers have the supplies they need when they need them, and future work should be focused on achieving this goal as efficiently and effectively as possible.

## Research Issue

Usability and user experience - While Medistock has been designed to improve the user experience for healthcare providers, there may be usability issues or challenges that arise during implementation. Research could focus on identifying any usability issues and making recommendations for improving the user experience.

Data security and compliance - Medistock is designed to meet data security and compliance requirements in the healthcare industry. However, as technology evolves, new threats and challenges may emerge. Research could focus on identifying emerging threats and making recommendations for improving data security and compliance.

Integration with other systems - Medistock may need to integrate with other systems used by healthcare providers, such as electronic health records (EHRs) or billing systems. Research could focus on identifying the challenges and opportunities for integration and making recommendations for improving interoperability.

Sustainability - There is growing concern about the environmental impact of healthcare, and Medistock could play a role in promoting sustainability by tracking the carbon footprint of supplies and identifying environmentally friendly alternatives. Research could focus on developing sustainability features and measuring the impact of these features.

Cost-effectiveness - While Medistock is designed to improve efficiency and reduce costs associated with inventory management, there may be additional costs associated with implementation and maintenance. Research could focus on measuring the cost-effectiveness of Medistock and identifying opportunities for further cost savings.

These are just a few examples of potential research issues related to Medistock. Depending on the specific needs of healthcare providers and the healthcare industry in general, there may be other research issues that are more relevant. Ultimately, the goal of research on Medistock should be to identify opportunities for improving the efficiency, accuracy, and overall effectiveness of managing healthcare supplies.

Implementation Issues

Implementing a medical inventory management system can be a complex process, and there are several issues that can arise. Some common implementation issues include:

Data migration: When transitioning to a new inventory management system, it is essential to migrate existing data accurately. This process can be challenging, particularly if the data is stored in different formats or locations.

User adoption: It is crucial to ensure that users are comfortable with the new system and understand how to use it. Resistance to change can be a significant barrier to adoption, so it is essential to provide adequate training and support to users.

Integration with existing systems: Medical inventory management systems often need to integrate with other systems used by healthcare providers, such as electronic health records (EHRs) or billing systems. Integration can be challenging and may require custom development.

System performance: The performance of the system is critical, particularly when managing critical supplies in real-time. The system must be able to handle large volumes of data and operate reliably.

Security and compliance: Medical inventory management systems handle sensitive data, and it is essential to ensure that the system is secure and compliant with regulatory requirements such as HIPAA.

Cost: Implementing a medical inventory management system can be expensive, and it is essential to consider the long-term costs associated with maintenance and upgrades.

These are just a few examples of the implementation issues that can arise when implementing a medical inventory management system. It is essential to work with an experienced vendor who can provide support throughout the implementation process and address any issues that arise. Additionally, it is important to have a comprehensive plan that addresses all aspects of the implementation process, including data migration, user adoption, system performance, security and compliance, and cost.

## 4.12 Evaluation

Evaluation is the process where the user and developer review the software to check whether the software has met the user requirement. The project has met the aims and objectives. It has also met the user requirements.

| **User Requirements** | **Has MediStock met the user requirements?** |
|---|---|
| Company wants to avoid the medical sales representative to make an order from the hospitals or pharmacies. | Yes |
| Company wants to have direct contact with the pharmacies | Yes |
| Company wants the medicine to be ordered instantly | Yes |
| Pharmacists wants the medicine to be delivered without getting delayed and want to avoid the medical sales representative from making the order | Yes |
| Company and Pharmacies want to save the order as pdf files | Yes |
| Company wants to avoid pharmacists from over ordering the stock | Yes |
| Our stock details should not be able to edit by the pharmacists | Yes |
| Company wants to Add and Update the stocks | Yes |

| | |
|---|---|
| Company wants to display the stock availability to the Pharmacist | Yes |
| Company should see the Pharmacists Orders | Yes |
| The order details of a pharmacist should not be displayed to other pharmacists | Yes |

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# APPENDIX

## A. SOURCE CODE

### A.(1) Login Page

```
<!DOCTYPE html>
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>CPL MediStock</title>
<link
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.6/css/bootstrap.min.css"
rel="stylesheet"></link>
<script src="https://code.jquery.com/jquery-1.12.4.js">

</script>

<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.6/js/bootstrap.min.js">

</script>

<script src="https://cdnjs.cloudflare.com/ajax/libs/1000hz-bootstrap-
validator/0.11.5/validator.min.js">

</script>
</head>

<style>
body, html {
    height:100%;
    margin:0;


    background-image:url(image1.jpg);
    height:100%;
    background-position:center;
    background-repeat:no-repeat;
    background-size:cover;
}
</style>

<body>

<br />
```

```
<h2 align="center"> Welcome to CPL MediStock </h2>
<br />
<br />
<div class="container">
  <div class="panel panel-primary" style="width:500px;margin:0px auto">
 <div align="center" class="panel-heading"><b>PHARMACIST LOGIN</b></div>
<div class="panel-body">
<form align="center" data-toggle="validator" role="form"
action="Pharmacist_Login.php" method="post" >



<br />
<br />



<div class="form-group">
<label><b> Username</b></label> <input type="text" class="form-control" data-
error="Please enter the username" name="username" required>
<div class="help-block with-errors"></div>
</div>
<br />
<br />

<div class="form-group">
<label for="password" class="control-label"><b>Password</b></label>
<input type="password" class="form-control"   name="password" id ="password"
data-error="Please enter the password"required>
<div class="help-block with-errors"></div>
</div>
<br />
<br />

<p align="left"><b> Login as an <a href="CPL MediStock Admin Login.html">
admin</a></b></p>
<p align="center"><input type="submit" value="Login" /></p>

<p align="center"> <b> Are you a new pharmacist? Please click <a
href="register.html"> here</a> to Register</b>

</p>

</div>
</div>
</form>

</body>
</html>
```

### A.(2) Register Page

```
<!DOCTYPE html>
<head>
<title>Registeration for new Pharmacist</title>
<link
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.6/css/bootstrap.min.css"
rel="stylesheet"></link>

<script src="https://code.jquery.com/jquery-1.12.4.js">

</script>

<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.6/js/bootstrap.min.js">

</script>

<script src="https://cdnjs.cloudflare.com/ajax/libs/1000hz-bootstrap-
validator/0.11.5/validator.min.js">

</script>
</head>


<style>
body, html {
    height:150%;
    margin:0;


    background-image:url(image1.jpg);
    height:159%;
    background-position:center;
    background-repeat:no-repeat;
    background-size:cover;
}



</style>


<body>
<br />
<br />
<br />
<div class="container">
 <div class="panel panel-primary" style="width:500px;margin:0px auto">
```

```
<div align="center" class="panel-heading"><b>PHARMACIST REGISTRATION
FORM</b></div>
<div class="panel-body">
<form align="center" data-toggle="validator" role="form"
action="Pharmacist_Register.php" method="post" >

<div class="form-group">
<label> <b> First name</b></label> <input type="text" class="form-control"
data-error="Please enter the firstname" name="firstname" required>
<div class="help-block with-errors"></div>
</div>
<br />

<div class="form-group">
<label><b> Last name</b></label> <input type="text" class="form-control" data-
error="Please enter the lastname" name="lastname" required>
<div class="help-block with-errors"></div>
</div>
<br />

<div class="form-group">
<label><b> Pharmacy</b></label> <input type="text" class="form-control" data-
error="Please enter the pharmacy" name="pharmacy" required>
<div class="help-block with-errors"></div>
</div>
<br />

<div class="form-group">
<label><b> Address</b></label> <input type="text" class="form-control" data-
error="Please enter the address" name="address" required>
<div class="help-block with-errors"></div>
</div>
<br />

<div class="form-group">
<label><b> Username</b></label> <input type="text" class="form-control" data-
error="Please enter the username" name="username" required>
<div class="help-block with-errors"></div>
</div>
<br />

<div class="form-group">
<label for="password" class="control-label" ><b> Password</b></label>
<input type="password" data-minlength="8" class="form-control" name="password"
id ="password" data-error="Please enter atleast 8 characters" required>
<div class="help-block with-errors"></div>
</div>
<br />

<div class="form-group">
```

```
<label for="confirmpassword" class="control-label"><b> Confirm
Password</b></label>
<input type="password" class="form-control"  name="confirmpassword" id
="confirmpassword" data-match="#password" data-match-error="Sorry!! The
passwords did not match" required>
<div class="help-block with-errors"></div>
</div>
<br />

<div class="form-group"
<label for="email" class="control-label"><b> Email</b></label>
<input type="email" class="form-control" name="email" id="email"required>
<div class="help-block with-errors"></div>
</div>
<br />


<div class="form-group">
<label for="mobilenumber" class="control-label" ><b> Mobile Number</b></label>
<input type="tel" class="form-control" name="mobilenumber" id ="mobilenumber"
placeholder="+233xxxxxxxxx" data-error="Please enter the moblie number"
required>
<div class="help-block with-errors"></div>
</div>
<br />

<div class="form-group">
<label for="telephonenumber" class="control-label" ><b> Telephone Number
(Office)</b></label>
<input type="tel" class="form-control" name="telephonenumber" id
="telephonenumber" placeholder="+233xxxxxxxxx" data-error="Please enter the
telephone number" required>
<div class="help-block with-errors"></div>
</div>
<br />

<p align="center"><input type="submit" value="Register" /></p>

<p align="center"> <b> Registered Pharmacist? Please click <a
href="login.html">here</a> to Login </b>

</p>

</div>
</form>

</body>
</html>
```

### A.(3) Code For Email Testing

```
<?php
use PHPMailer\PHPMailer\PHPMailer;
use PHPMailer\PHPMailer\SMTP;
use PHPMailer\PHPMailer\Exception;

require_once __DIR__. '/vendor/phpmailer/src/Exception.php";
require_once_DIR_. '/vendor/phpmailer/src/PHPMailer.php';
require_once_DIR_. '/vendor/phpmailer/src/SMTP.php';

$mail = new PHPMailer(true);

$mail->SMTPDebug = 0;
$mail->isSMTP();
$mail->Host = "sandbox.smtp.mailtrap.io";
$mail->SMTPAuth = true;
$mail->SMTPSecure = "tls";
$mail->Port = 2525;

$mail->mailer = "smtp";

$mail->Username = "66411f91d32a06";
$mail->Password = "f73ab06e528556";

// Sender and recipient address
$mail->SetFrom("company@gmail.com", "Company");
$mail->addAddress("adminemail@gmail.com", 'Admin');
$mail->addReplyTo("adminemail@gmail.com", 'Admin');

// Setting the subject and body
$mail->IsHTML(true);
$mail->Subject = "Item getting out of stock";
$mail->Body = $body_content;

$mail->send();

?>
```

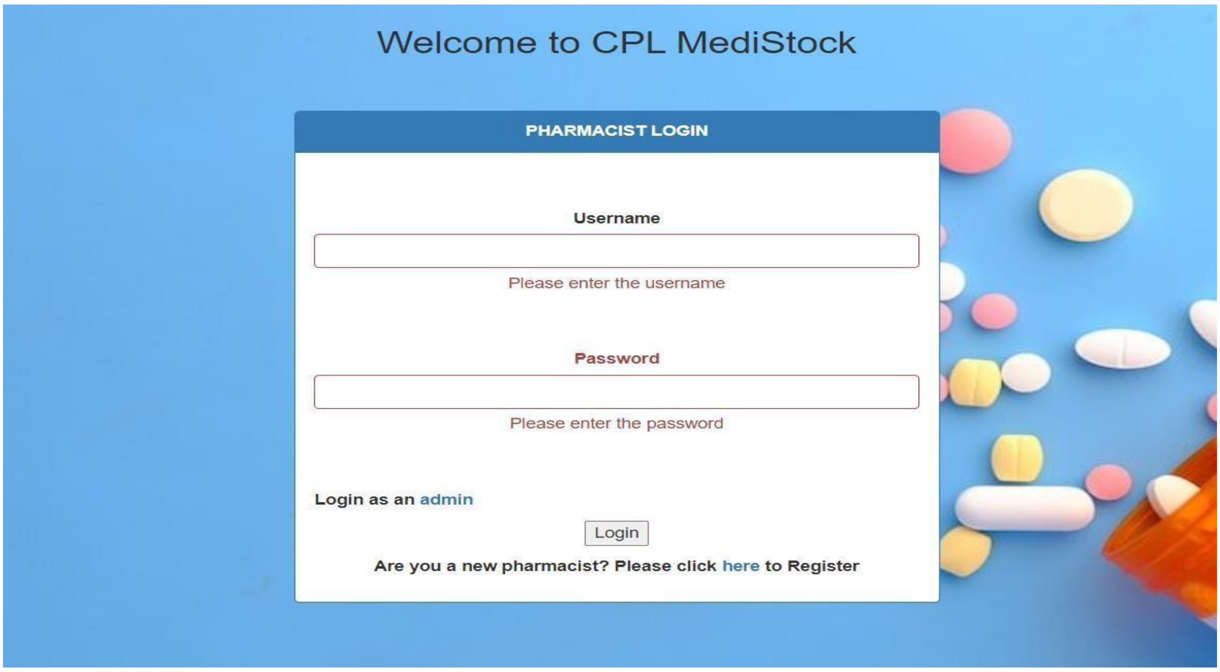
### A.(4) Code For Checking whether the Medicine is expired or not

```
<?php
use PHPMailer\PHPMailer\PHPMailer;
use PHPMailer\PHPMailer\SMTP;
use PHPMailer\PHPMailer\Exception;

require_once_DIR_ . '/vendor/phpmailer/src/Exception.php';
require_once __DIR___. '/vendor/phpmailer/src/PHPMailer.php';
require_once DIR .'/vendor/phpmailer/src/SMTP.php';

$mail = new PHPMailer(true);

$mail->SMTPDebug = 0;
$mail->isSMTP();
$mail->Host = "sandbox.smtp.mailtrap.io";
$mail->SMTPAuth = true;
$mail->SMTPSecure = "tls";
$mail->Port = 2525;

$mail->mailer = "smtp";

$mail->Username = "66411f91d32a06";
$mail->Password = "f73ab06e528556";


//checking date
$host = "localhost";
$username = "root";
$password = "";
$database = "cplmedistock";
$connect =  mysqli_connect($host,$username,$password, $database);

if(!$connect)
{
    die("Connection failed: " . mysqli_connect_error());
}

    $date = date('Y-m-d');
    $select_count = "SELECT quantity,product_and_combination_name from
cpl_stock WHERE expiry_date<"$date"";

    $result = $connect->query($select_count);

    while ($row = $result->fetch_assoc()) {

        $item_name =  $row["product_and_combination_name"];
        $body_content = '<p>Hi,<p>

                    <p> Your medicine '.$item_name.' is expired.
```

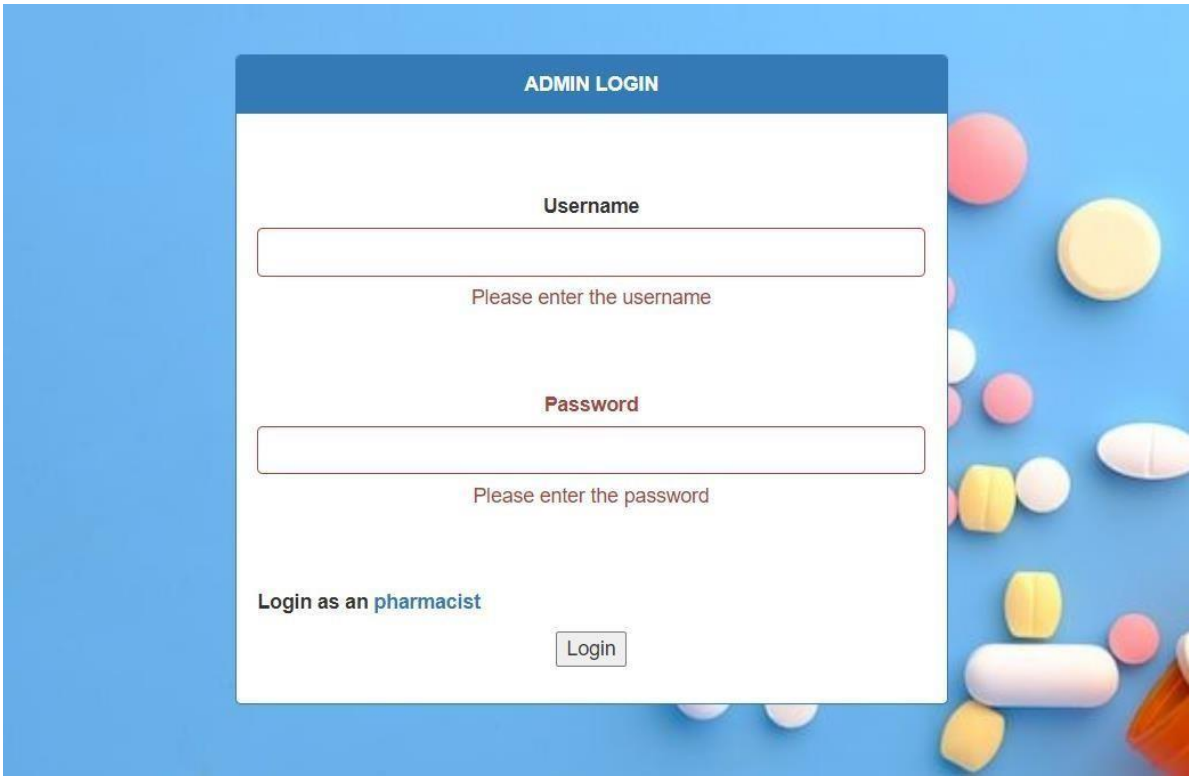
```
                    </p>
                    </br>
                    Thanks</br>
                    Admin";

        // Sender and recipient address
        $mail->SetFrom('company@gmail.com', 'Company');
        $mail->addAddress('adminemail@gmail.com', "Admin");
        $mail->addReplyTo('adminemail@gmail.com', "Admin");

        // Setting the subject and body
        $mail->IsHTML(true);
        $mail->Subject = "Medicine expired";
        $mail->Body = $body_content;

        $mail->send();

    }



?>
```

# B. SCREENSHOTS

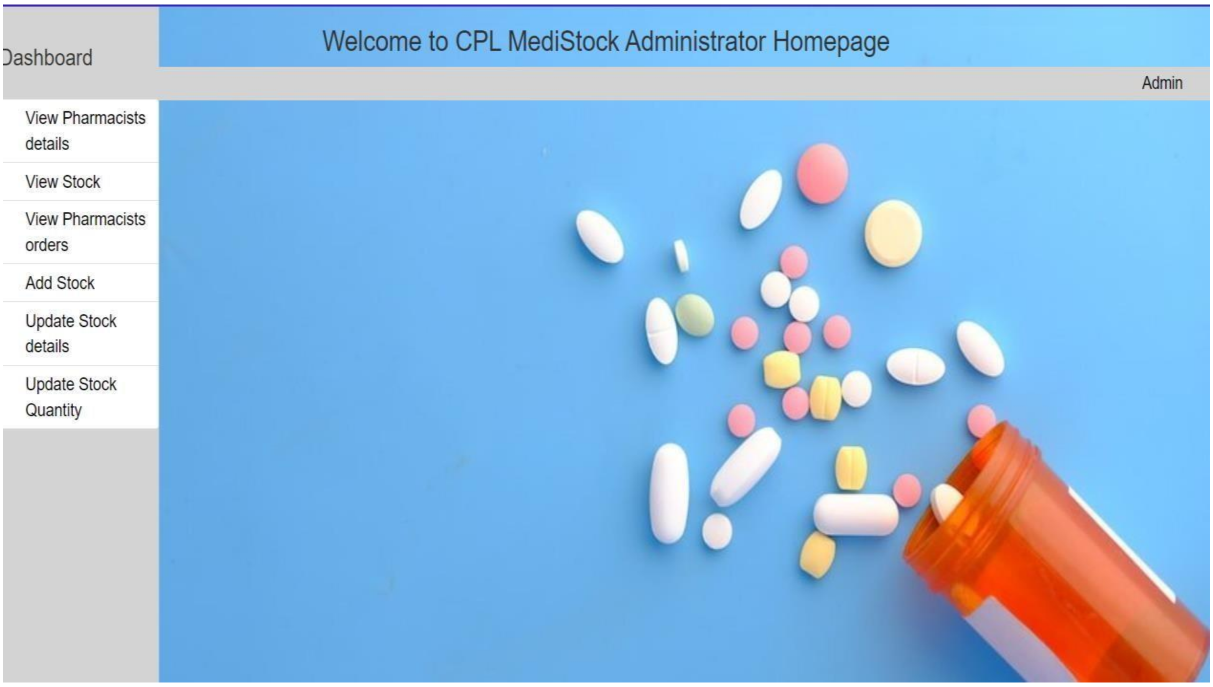
## B.(1) ADMIN PAGE



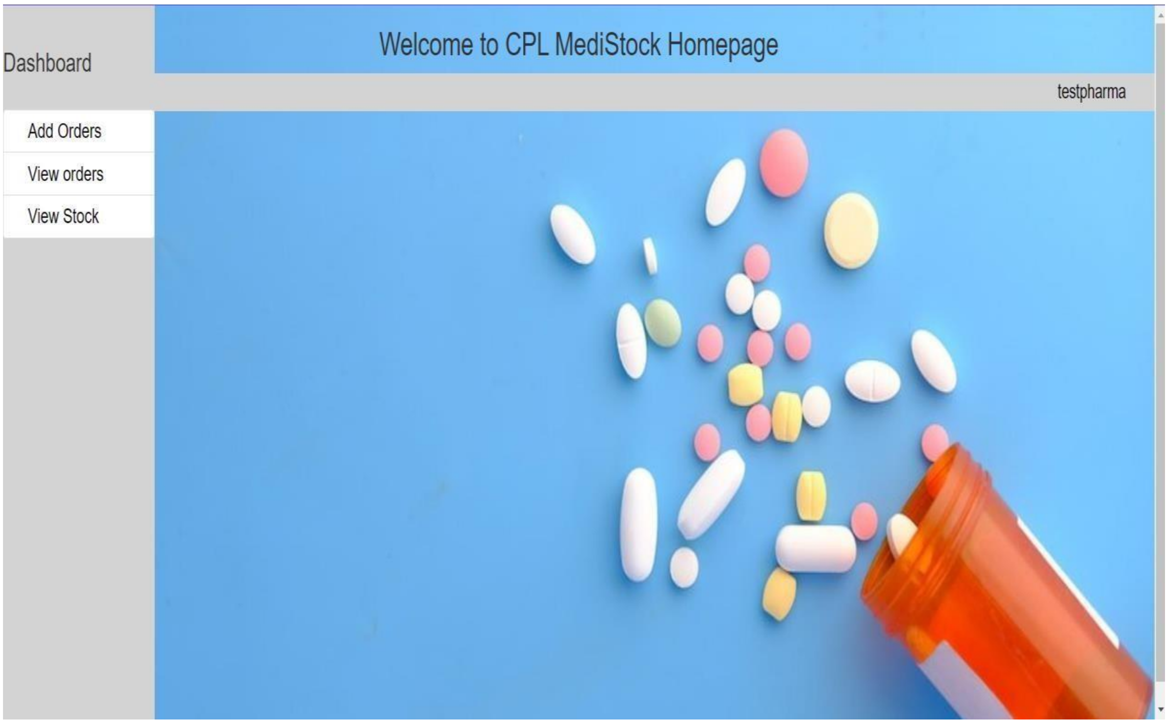

## B.(2) Pharmacist Login



## B.(3) Admin Panel




## B.(4) Pharmacist Panel



# MEDISTOCK: - MEDICAL INVENTORY MANAGEMENT SYSTEM

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**Abstract**. Effective inventory management is crucial for healthcare facilities to provide timely and high-quality patient care while minimizing costs. Medistock inventory management systems have been developed to optimize inventory control, but their implementation can be challenging due to various factors such as data inaccuracy, inadequate training, and lack of standardization. This literature review provides a comprehensive overview of the current research trends in medistock inventory management systems. The review highlights the importance of inventory management in healthcare facilities and discusses various techniques proposed to optimize inventory control, including the use of radio-frequency identification technology, artificial neural networks, and just-in-time inventory management systems. The review also examines the challenges associated with medistock inventory management systems and potential solutions to these challenges. The findings suggest that implementing effective medistock inventory management systems is crucial for healthcare facilities to optimize inventory control, reduce costs, and enhance patient care. However, a comprehensive understanding of the healthcare facility's unique needs and challenges is required to implement an effective inventory management system.

**Keywords.**

Healthcare operations, Inventory management techniques, Data inaccuracy, Inventory control, Just-in-Time (JIT) inventory management system.

## I. INTRODUCTION

Medical inventory management is a critical component of healthcare operations, as it ensures timely patient care, reduces costs, and improves profitability. Medistock inventory management systems are designed to help healthcare facilities manage their inventory efficiently, thereby enhancing patient care and reducing operational costs. With the advent of technology, various inventory management techniques have been developed to optimize inventory control in healthcare facilities. However, despite these advancements, healthcare facilities still face numerous challenges in managing their inventory effectively.

This literature review aims to explore the current research trends in medistock inventory management systems. The review will discuss the importance of inventory management in healthcare facilities, as well as the various techniques that have been proposed to optimize inventory control. It will also examine the challenges associated with medistock inventory management systems and the potential solutions to these challenges.

Overall, this literature review seeks to provide a comprehensive understanding of medistock inventory management systems and their impact on healthcare operations. By reviewing the existing literature, this study aims to identify the most effective strategies for optimizing inventory control in healthcare facilities, thereby enhancing patient care and reducing operational costs.

In recent years, several studies have emphasized the importance of inventory management in healthcare facilities. Effective inventory management can lead to improved patient care, reduced healthcare costs, and financial stability for healthcare facilities. For instance, studies have demonstrated that effective inventory management can reduce medical waste, optimize resource utilization, and improve patient outcomes. Conversely, poor inventory management can result in stock outs, excess inventory, and higher operational costs, leading to suboptimal patient care and reduced profitability for healthcare facilities In conclusion, medistock inventory management systems are crucial for healthcare facilities to optimize inventory control, reduce costs, and enhance patient care. By providing a centralized and automated inventory management system, these systems enable healthcare facilities to improve inventory accuracy, minimize waste, and ensure that medical supplies are available when needed. However, implementing effective inventory management systems requires a comprehensive understanding of the healthcare facility's unique needs and challenges.

## II. Literature survey:

Effective inventory management is crucial for healthcare facilities to provide timely and high- quality patient care while minimizing costs. In recent years, medistock inventory management systems have been developed to optimize inventory control, reduce medical waste, and improve resource utilization in healthcare facilities. This literature survey aims to provide a comprehensive overview of the current research trends in medistock inventory management systems.

One of the primary challenges in inventory management is the accurate tracking of inventory levels. Radio-frequency identification (RFID) technology has been proposed as a solution to this challenge. RFID tags can be attached to medical supplies, enabling real-time tracking of inventory levels and reducing the risk of stock outs or overstocking. In a study by Ma et al. (2020), RFID technology was found to be effective in improving inventory accuracy and reducing the risk of stockouts in a hospital setting. The study also highlighted the need for standardized processes and training to ensure the successful implementation of RFID technology.

Artificial neural networks (ANN) have also been proposed as a technique for improving inventory management in healthcare facilities. ANN can be used to predict demand for medical supplies, allowing for better inventory optimization and reduction of waste. In a study by Soman et al. (2019), ANN was found to be effective in predicting demand for medical supplies in a hospital setting. The study demonstrated that ANN could reduce inventory levels by up to 25%, resulting in significant cost savings for healthcare facilities.

Another technique proposed for optimizing inventory management is the just-in-time (JIT) inventory management system. JIT involves ordering medical supplies only when they are needed, reducing the risk of overstocking and minimizing waste. In a study by Rizwan et al. (2021), JIT was found to be effective in reducing inventory levels and improving resource utilization in a hospital setting. The study also highlighted the need for proper planning and forecasting to ensure the successful implementation of JIT.

Despite the benefits of medistock inventory management systems, healthcare facilities still face numerous challenges in implementing effective inventory management systems. One of the primary challenges is data inaccuracy, which can lead to overstocking or stock outs. In a study by Ng et al. (2021), data inaccuracy was found to be a significant challenge in implementing RFID technology for inventory management in healthcare facilities. The study highlighted the need for regular data validation and cleansing to ensure accurate inventory tracking.

Another challenge in implementing effective inventory management systems is inadequate training. In a study by Yin et al. (2020), inadequate training was identified as a significant barrier to the successful implementation of RFID technology for inventory management in a hospital setting.

## III. Data set:

1. Item Name: the name of the medical item in the inventory, such as syringes, bandages, or medication.
2. Item ID: a unique identifier for each item in the inventory.

3. Manufacturer: the name of the company that produces the item.
4. Quantity on Hand: the number of items currently in stock.
5. Minimum Stock Level: the minimum number of items required to ensure that the inventory level does not fall below a critical level.
6. Maximum Stock Level: the maximum number of items that can be stored in the inventory.
7. Reorder Point: the inventory level at which an order for additional items should be placed.
8. Cost per Item: the cost of purchasing each item from the manufacturer.
9. Supplier: the name of the company that supplies the items.
10. Lead Time: the time it takes for a supplier to deliver items after an order is placed.
11. Expiration Date: the date after which the item should not be used due to its decreased effectiveness or safety.
12. Location in Inventory: the physical location of the item in the inventory.
13. Usage Rate: the rate at which items are used in the healthcare facility.

These variables can be used to track inventory levels, predict demand, and optimize inventory control using various inventory management techniques such as RFID technology, ANN, and JIT. Proper data collection, validation, and cleansing can ensure the accuracy and reliability of the dataset for effective inventory management.

## IV. System Architecture and Methodology:

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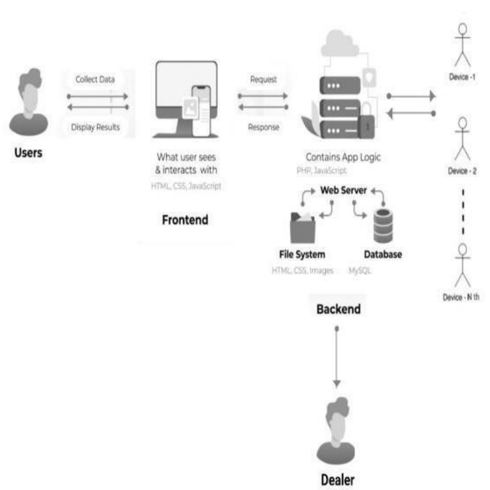


## V. Pre-Processing:

Pre-processing is an essential step in preparing data for analysis in medical inventory management systems. The following are some common pre-processing techniques that can be applied to medical inventory data:

1. Data cleaning: This involves removing or correcting errors in the dataset, such as missing data, duplicates, or incorrect values. This can be achieved by using tools such as data validation, data profiling, and data cleansing.
2. Data normalization: This involves transforming data into a standard format to reduce redundancy and inconsistency. For example, different spellings of the same item can be normalized to a standard spelling.
3. Data integration: This involves combining data from different sources into a single dataset. For example, data from different departments in a healthcare facility can be integrated to get a comprehensive inventory view.
4. Data transformation: This involves converting data into a different format to make it more suitable for analysis. For example, inventory data can be transformed into a time-series format to track trends over time.
5. Data reduction: This involves reducing the amount of data in the dataset to improve processing efficiency. For example, data can be summarized by category or time period to reduce the number of data points.
6. Data discretization: This involves converting continuous data into discrete categories to make it easier to analyse. For example, inventory levels can be categorized as high, medium, or low.
7. Outlier detection: This involves identifying and removing or correcting data points that are significantly different from the rest of the data. For example, inventory levels that are abnormally high or low can be flagged for further investigation.

These pre-processing techniques can improve the accuracy, completeness, and consistency of medical inventory data, making it easier to analyse and make informed decisions about inventory management. It is important to note that the specific pre-processing techniques used will depend on the nature of the data and the specific requirements of the inventory management system.

## VI. Algorithm Used in an Overview:

There are various algorithms that can be used in medical inventory management systems to optimize inventory control and improve patient care. Some of the commonly used algorithms are:

1. Economic Order Quantity (EOQ): This algorithm calculates the optimal order quantity for a specific item by considering factors such as item cost, ordering cost, and carrying cost. The goal is to minimize inventory costs while ensuring that enough items are available to meet demand.
2. Just-In-Time (JIT): This algorithm aims to minimize inventory levels by ensuring that items are delivered just in time to meet demand. JIT relies on accurate demand forecasting and efficient supply chain management to minimize inventory costs while ensuring that items are available when needed.
3. Minimum/Maximum (Min/Max) Inventory Control: This algorithm sets minimum and maximum inventory levels for each item in the inventory. When inventory levels fall below the minimum level, an order is placed to bring inventory levels back up to the maximum level. This algorithm ensures that inventory levels are always within a desired range, minimizing the risk of stock outs while also minimizing inventory costs.
4. Reorder Point (ROP): This algorithm calculates the inventory level at which an order should be placed to ensure that inventory levels do not fall below a critical level. The ROP takes into account factors such as lead time, usage rate, and safety stock to ensure that items are always available when needed.
5. Inventory Optimization: This algorithm uses advanced data analytics techniques such as machine learning and artificial intelligence to optimize inventory levels and improve demand forecasting. By analysing historical data and real-time inventory data, inventory optimization algorithms can predict future demand and adjust inventory levels accordingly.

These algorithms can be used individually or in combination to create a customized inventory management system that meets the specific needs of a healthcare facility. The choice of algorithm will depend on factors such as the nature of the inventory, the level of demand variability, and the desired level of inventory control.

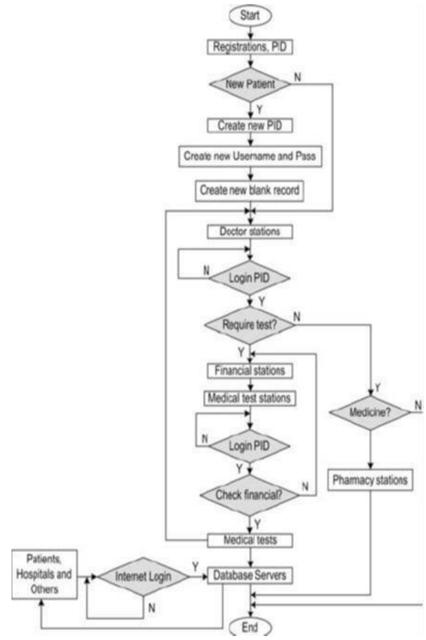


Figure 2.

## 7. Existing Related System and Proposed System:

**Existing Related System:**

1. The Fully Integrated Pharmacy Information Management system is a desktop software that offers a range of functionalities such as billing, inventory reporting, prescription management, and patient profiles for lab results. It includes inventory management features that can alert users when stock levels reach a certain point. The software can be installed by pharmacists or other users who have purchased it, and it allows users to modify stock details without management oversight. However, this could potentially lead to financial losses for hospitals or pharmacies. The software does not have an admin login and is intended for internal use by pharmacy staff.
2. The Med Star 19 Pharmacy Management System is a cloud-based software that is accessible globally to users. It offers various modules such as inventory management, centralized billing, Point-of-Sale (POS), and Material Movement tracking. The system is designed to be used by pharmacists, who are granted privileges to modify and update stock details. Unlike some other software, it does not have an admin login. The system is intended for personal use by pharmacies. The Liberty Software: is a

pharmacy management software that features three integrated modules, including pharmacy management and pharmacy POS. The pharmacy management module allows pharmacists to send refill reminders to patients, prepare prescriptions, and display wait alerts. Only pharmacists are authorized to use this software and modify the stock details. The software does not have an admin login and is intended for personal use by pharmacies.

3. The QS/1 Pharmacy Management System is designed to track changes in inventory quantity and help pharmacists replenish stock to meet prescription demand. The dashboard provides real-time information on prescription activity, and color coding is used to indicate stock levels. When stock levels are critically low, the color red is displayed, while yellow is used for average low levels. Pharmacists have the authority to modify and update stock details in this system, and it does not require an admin login. The QS/1 Pharmacy Management System is intended for personal use by pharmacies.

- **Proposed System**

The proposed system, MediStock, involves two users: an accountant and a pharmacist. The system allows pharmacists to view and order stocks, while the accountant has the privileges to edit and update the stock details. Unlike the existing systems mentioned earlier, the proposed system has an admin login, with the accountant serving as the admin. It is a web-based system that requires an internet connection to function. To prevent over-ordering, the system displays the expiry date of the stock. Expired stock can be disposed of by burning the medicine. Over-ordering can lead to a quick run-out of stock, which may result in losses for the company and waiting for the next shipment for months. The proposed system generates reports that can be saved as PDF files and converted into Excel files using a software called PDF Converter. Additionally, the system prevents sales representatives from dealing with stock orders from the pharmacy.

## VII. Methodology:

Implementing a successful medical inventory management system involves several key steps. The first step is to identify the inventory needs of the healthcare facility by reviewing past inventory usage and tracking trends in patient needs. Once the inventory needs are identified, appropriate data collection methods should be selected, such as manual or automated methods through barcode scanners technology. The next step is to select and set up an inventory management software that meets the needs of the healthcare facility. This includes inputting all relevant data into the system and configuring it to track inventory levels and generate alerts when inventory levels fall below a certain threshold. Once the inventory management system is set up, inventory control policies should be established, including setting minimum and maximum inventory levels, determining reorder points, and establishing procedures for inventory counting and auditing. Staff training should also be provided to ensure that staff members know how to use the system and follow inventory control policies. Finally, the performance of the medical inventory management system should be regularly monitored and evaluated, including tracking inventory levels, evaluating the effectiveness of inventory control policies, and making adjustments as needed to optimize system performance. By following this methodology, healthcare facilities can improve patient care and reduce inventory costs through efficient and effective medical inventory management.

## VIII. Conclusion:

The project has successfully achieved all the objectives, user requirements and aims set forth in the introduction. In order to enhance the project, future work will focus on implementing a secure online payment system and a secure website. If more time were available, it would have been possible to include a profile picture and details of the pharmacist. The project has enabled the development of knowledge in areas such as displaying or populating data on a form, reducing stock quantities and making use of user sessions. The proposed system (MediStock) may be demonstrated to pharmacists and company staff, and once their satisfaction is obtained, the system will be deployed to a real environment by hosting it on Google Cloud Platform and making it searchable.

A medical inventory management system is essential for healthcare facilities to operate efficiently and effectively. The system ensures that medical supplies are available in adequate quantities, at the right time, and at the right place. By implementing an inventory management system, healthcare providers can streamline their processes, reduce waste, and ultimately provide better patient care.

The system should be designed to include features such as automated inventory tracking, real-time data reporting, and supply chain management. It should also be user-friendly, accessible, and secure.

Overall, the benefits of a medical inventory management system are significant, including cost savings, improved efficiency, and enhanced patient safety. This system can help healthcare providers to reduce costs associated with stock outs, overstocking, and expired supplies. Furthermore, it can minimize the risk of medical errors caused by inadequate supplies, ensure regulatory compliance, and improve overall patient outcomes.

Therefore, healthcare providers should prioritize the implementation of a medical inventory management system as part of their efforts to improve patient care and reduce operational costs.

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