Published by :
https://www.ijert.org/
An International Peer-Reviewed Journal

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 04 , April - 2026

Pharmasphere - 360° Control Over

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Abstract - PharmaSphere is a web-based system designed for managing pharmaceutical businesses in a smart way, with a centralized system for managing pharmaceutical inventory, suppliers, and sales. Conventional systems may involve manual intervention in the form of data input, which may cause issues in managing pharmaceutical inventory, suppliers, and sales. Manual intervention may cause issues such as mismatched pharmaceutical inventory, expired drugs, and poor record management. The new system includes a 360-degree control dashboard, enabling the automated management of pharmaceutical inventory, suppliers, product management, and sales in real-time. Other features include AI tools, such as an AI Assistant, AI Insights, and an AI Label Scanner, which enhance decision-making, improve efficiency, and reduce human error in pharmaceutical management. PharmaSphere is developed as a web application with a structured dashboard, along with proper management of users. The results indicate that the system improves the accuracy of pharmaceutical inventory management and reduces manual intervention in pharmaceutical operations. PharmaSphere is a prime example of the benefits that can be achieved by using AI in managing pharmaceutical businesses, resulting in smart and reliable healthcare systems.

Keywords - Pharmacy Management System, Inventory Automation, Artificial Intelligence, Healthcare Informatics, Web Application

I. INTRODUCTION

Pharmacies are a vital part of the healthcare supply chain, ensuring the availability of medicines and medical products while effectively managing the same. However, a majority of pharmacies still rely on conventional methods of inventory management, which are mostly based on manual systems or even basic computer systems. These systems are not based on intelligent technology, which might result in issues such as ineffective inventory management, distribution of expired medicines, and improper tracking of sales. To address such issues, this research aims at introducing a web-based system called PharmaSphere, which is based on a pharmacy management system to effectively simplify the operations of a pharmacy. The system includes a dashboard with AI-based features, which are helpful in effectively managing the operations of a pharmacy, including inventory, medicine expiration, supplier information, and other activities related to a pharmacy, thereby incorporating AI into pharmacy management systems.

II. LITERATURE REVIEW

PharmaSphere's development is based on three core research and technology domains that serve as the foundation of its intelligent pharmacy and inventory management system. The key domains include:

1. Pharmacy Inventory Management Systems

The focus of healthcare informatics research has been on the need for efficient inventory management systems in pharmaceutical settings. Evidence provided by [1] S. Kumar and R. Patel, "Pharmacy Inventory Management Systems in Healthcare," International Journal of Healthcare Informatics, 2021. It has indicated that traditional paper-based record-keeping methods at pharmacies frequently create inconsistency in stock, result in the expiration of medicines before they can be dispensed to patients and lead to overall operational inefficiency within pharmacies. Automated pharmacy management systems are replacing traditional record-keeping methods with improved accuracy of inventory records, reducing the potential for human error, and providing immediate access to information about availability of medicines at any given time. Therefore, these systems serve as the foundation for modern digital pharmacy infrastructure.

2. Intelligent Decision Support System in Healthcare

Significant interest has been generated over the last few years around the use of Artificial Intelligence (AI) within Healthcare Management. In the field of Intelligent Decision Support Systems research evidence exists to demonstrate the ability of AI-enabled analytic tools to assist with analyzing large amounts of operational data, resulting in actionable insights [2] J. Smith, "Artificial Intelligence for Healthcare Decision Support Systems," IEEE Healthcare Technology Journal, 2020. As well as allowing organisations to identify sales trends and optimise inventory management, such methods also provide organizations with the tools needed for data-driven decision-making. This is an approach embraced by PharmaSphere

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ISSN: 2278-0181
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through the incorporation of AI-derived insights into Pharmacy Management systems to enhance operational efficiencies.

3. Advancements in Computer Vision and Natural Language Processing Recent technological advances in Artificial Intelligence (AI) such as Image Recognition and Natural Language Processing (NLP) now allow for the automatic extraction of data and for users to interact with smart systems. A variety of studies have demonstrated the accuracy and reliability of modern techniques for using Images to recognize and understand Product Labels, Barcodes and Text in an Image. In addition to accessibility to images[3] Y. LeCun, Y. Bengio, and G. Hinton, "Deep Learning for Computer Vision and Image Recognition," Nature, 2015., NLP technology has made it easier for AI assistants to "ask" users questions using spoken natural language queries and also provide intelligent responses. By combining the capabilities of AI Technologies—AI Label Scanning and an AI Assistant—PharmaSphere is able to use these advancements to eliminate manual data entry and improve the usability of the systems in which the data resides.

III. METHODOLOGY

The PharmaSphere methodology provides a web-based pharmacy management system that will increase operational efficiency through automation and artificial intelligence.

A. System Architecture Design

The system operates on a client-server architecture, with the user connecting to the pharmacy management system via a web dashboard interface. The front-end application is a web browser that communicates to the back-end application (server) to process requests and to store and manage data within a central database.

B. Data Management and Inventory Control

The system maintains records of products, suppliers, users, and sales. Inventory is automatically updated when stock is added or a sale occurs, and it tracks expiration dates to ensure that expired medication is not distributed.

C. Application Modules

The core application modules will include Dashboard, User Management, Category Management, Supplier Management, Product Management, Sales Tracking, and Stock-In Operations and will interface with the central database.

D. Artificial Intelligence Integration

- AI Assistant - assists users by answering their inquiries
- AI Insights - generates insights based on sales and
- stock analysis
- AI Label Scan - extracts product information from labels

E. System Flow Representation

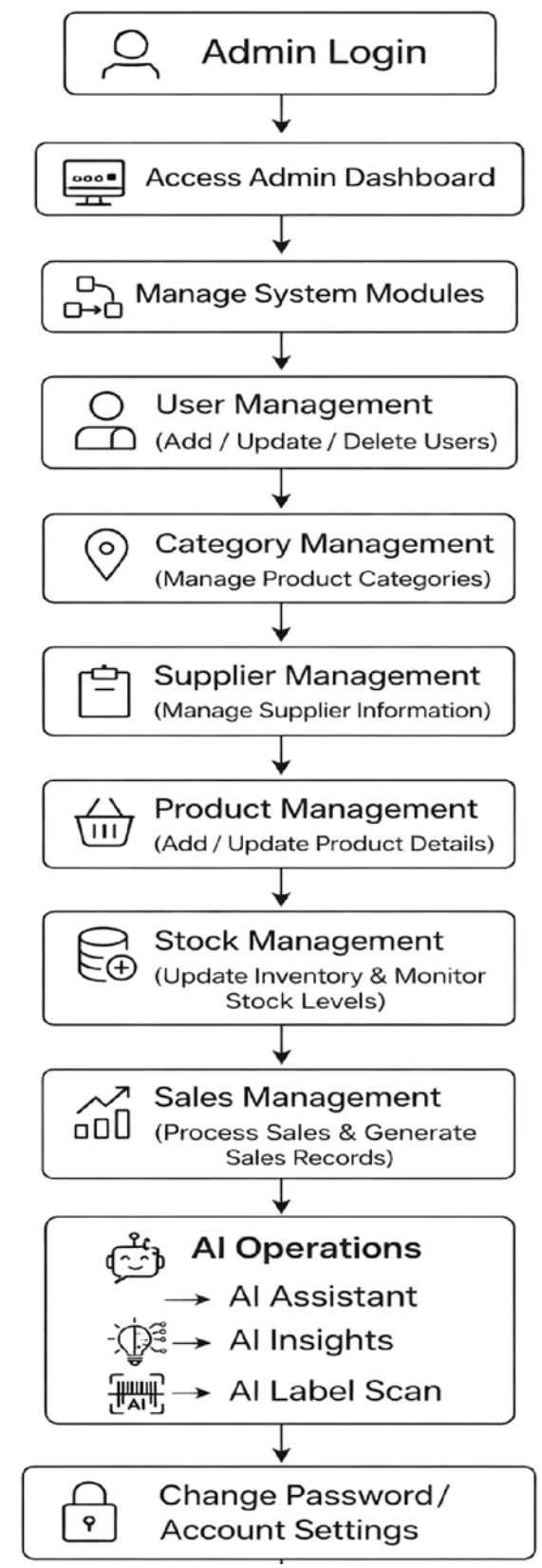

Fig.1.Overall system architecture of PharmaSphere"360° control over"

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IV. RESULTS AND DISCUSSION

The process of designing and testing the PharmaSphere system was successful in terms of technical as well as operational objectives as demonstrated by the following progress made to date in each area:

1. **Inventory Accuracy**: The automated inventory management support provided by the PharmaSphere system has minimized the likelihood of any manual input errors occurring due to a sale or stock in and resulted in accurate and current records for all inventories.
2. **System Response Time**: The average time to access and retrieve data from the PharmaSphere dashboard has consistently been between 2 -4 seconds resulting in seamless data interaction and effective management of workflows.
3. **Performance of AI Modules**: The use of the PharmaSphere AI Assistant and AI Insights modules has provided users with accurate, timely information to help identify trends in sales and to identify real-time inventory levels.
4. **Data Security and Reliability**: The use of centralized database architecture along with regular backup of the database to protect against data loss has created a secure storage facility for all data maintained by the PharmaSphere system.
5. **Operation Efficiency**: The use of an integrated dashboard makes it easier to manage suppliers, product types and categories, and historical sales data resulting in a significant increase in overall operational efficiency for the pharmacy.

Discussion: PharmaSphere's main accomplishment is achieving automated pharmacy inventory and management via a centralized dashboard. The PharmaSphere automated pharmacy inventory management system allows pharmacies to track their stock in real-time, automatically update their inventory after a sale has occurred, and manage products, suppliers, and categories in an organized manner. The use of artificial intelligence (AI) features, such as the AI Assistant and AI Insights, aids pharmacists by allowing them to make quicker decisions and reduce their workload associated with manually processing data or transactions. One limitation of the current system is its reliance on connectivity to the back end of the application and the integration of application programming interfaces (APIs) for AI features, which creates latency in response times. Another limitation is that the system currently only processes structured data as well as text-based interactions and does not yet have the functionality to perform advanced predictive analysis etc. Thus, developing the recommended enhancements are necessary processes moving forward.

V. CONCLUSION AND FUTURE WORK

Conclusion:
PharmaSphere is a cloud-based software product that automates managing pharmacy inventory, sales and supplier management via a central dashboard. PharmaSphere improves efficiency by allowing real-time stock updates and reducing the potential for errors that stem from manually keeping track of inventory. PharmaSphere has multiple AI features, specifically: AI Assistant, AI Insights, and AI Label Scan; this enhances the usability of PharmaSphere and allows users to make better decisions.

Future Work:
Enhance the performance of the back-end and overall speed of the system. Implement predictive analytics as it pertains to forecasting the demand for specific medicines. Implement technology that can recognize barcodes or images of products quicker. Develop a mobile app version of PharmaSphere.

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