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Reverse Engineering in Pharmaceutical Problems

S.P. Mone, Jinendra Bafna, Yash Nikam, Shreyas Lokhande, Prashant Pote

Computer Department, Savitribai Phule Pune University

Abstract— PharmaSort is a web-based application designed to provide a more effective way to manage the relationship between medical distributors and vendors. The system streamlines the management process, reducing the likelihood of errors that are often caused by human factors. The platform offers a range of modules that provide distributors with tools to ease the process of debt recovery, handle customer complaints, and analyze products to develop solid marketing strategies. One of the key features of the system is its analytics of sales, which uses data analytical methods and algorithms to provide a solid understanding of the company's sales performance and enable distributors to execute future sales operations based on the insights generated. This innovative technology ensures that medical distributors can adapt to the ever-changing landscape of the pharmaceutical sector by providing a cost-effective solution for companies that deal with high-risk clients. The modules help distributors engage with their customers, manage complaints, and ensure compliance with industry regulations, ultimately contributing to the growth and sustainability of their businesses.

Keywords— *Post sales, Debt recovery, complaint handling, customer satisfaction.*

I. INTRODUCTION

The pharmaceutical industry has been facing various challenges in recent times due to the changing landscape of technology, expanding markets, pressured economies, and a more complicated supply chain. The pharmaceutical supply chain is one of the most significant issues facing the industry, with inefficient management leading to wasted resources, increased costs, and product shortages. There have been several attempts to address these challenges, but the existing solutions often fall short, failing to provide an effective and efficient way for medical distributors to manage their operations. To address these issues, our team has proposed a web application called PharmaSort, which offers a more effective and efficient way for medical distributors to manage their relationship with vendors. PharmaSort provides innovative and cost-effective solutions for companies dealing with high-risk clients, offering three modules designed to help distributors engage with their customers, manage customer complaints, and ensure compliance in the pharmaceutical industry. One of the key challenges in the pharmaceutical industry is the management of the supply chain, which is characterized by complex regulatory frameworks, extensive product portfolios, and significant variations in demand. These challenges make it difficult for distributors to manage their inventory and ensure timely delivery to their customers, leading to an inefficient supply chain. Existing solutions often fail to provide an effective way to overcome these challenges, leading to wasted resources, increased costs, and product shortages.

Our team has developed a solution that uses advanced data analytics and algorithms to optimize the supply chain. Our solution provides distributors with a comprehensive understanding of sales, enabling them to make better decisions regarding inventory management, demand forecasting, and supplier relationships. The result is a more efficient supply chain that improves customer satisfaction and reduces costs. Our solution has already been implemented by several pharmaceutical companies and has proven to be effective in overcoming the challenges of the supply chain in the pharmaceutical industry. In this paper, we will discuss the various features of PharmaSort and how it can help medical distributors streamline their day-to-day operations, improve their efficiency, and gain a competitive advantage in the industry.

EXISTING SYSTEM

As there are existing solutions in the pharmaceutical industry that address certain challenges, there has been a lack of technological advancements in developing comprehensive solutions to assist medical distributors with managing their day-to-day operations efficiently. Although there are solutions available that help distributors manage credit recovery or inventory levels, none of them provides a comprehensive suite of features to address all aspects of the supply chain challenges faced by the industry. PharmaSort aims to fill this gap by providing a web application that combines multiple modules, including credit recovery, complaint tracking, and post-sales inventory management, in one integrated platform. This innovative solution uses advanced data analytics and algorithms to optimize the supply chain, providing medical distributors with the tools they need to make informed decisions, reduce costs, and improve customer satisfaction.

II. SYSTEM IMPLEMENTATION

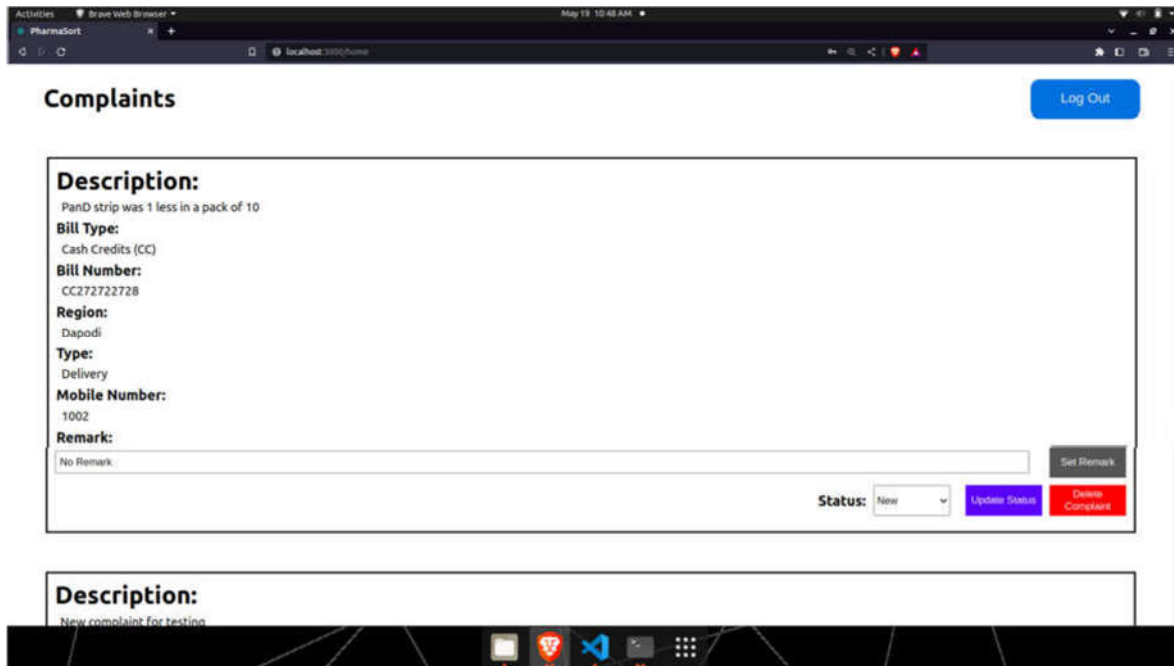
PharmaSort is a web application that provides a comprehensive toolset to help medical distributors manage their daily operations more efficiently. The application consists of three modules - Credit Recovery, Complaint Tracking, and Post-Sales Inventory Management - that work together to address the most significant challenges faced by medical distributors.

The Credit Recovery module uses PyGUISAuto and WhatsApp to automate the process of collecting unpaid bills. Distributors can select accounts that require collection, set the message content, and schedule messages based on the customer's payment history and current balance. The module enables distributors to track the status of outstanding bills and follow up with customers promptly.

The Complaint Tracking module provides a simple and secure way for distributors to track complaints raised by customers. This module uses React JS and MongoDB to provide scalability, security, and ease of integration. Customers can raise complaints using a mobile application, while distributors can view and update the status of complaints and take appropriate actions through a web application.

The image displays two screenshots of the Complaint tracking module on an Android device. The left screenshot shows the 'Complaint Form' with the following fields: 'Description of Complaint' (with a sub-field 'Description'), 'Region', 'Bill type' (with a dropdown menu showing 'Cash'), 'Bill Number' (with a sub-field 'Bill Number'), and 'Category of Complaint' (with a dropdown menu showing 'Product'). A blue 'Post Complaint' button is at the bottom. The right screenshot shows the 'Complaints' screen with a blue 'Refresh' button at the top. Below it, a box displays the details of a complaint: 'Description: PanD strip was 1 less in a pack of 10', 'Bill Type: Cash Credits (CC)', 'BillNumber: CC272722728', 'Type: Delivery', 'Region: Dapodi', 'Status: New', and 'Remark: No Remark'.

Complaint tracking module(android)



Complaint tracking module (web application)

The Post-Sales module is designed to help distributors manage their inventory levels and predict the demand for medical products. The module uses time series analysis and Long Short-Term Memory (LSTM) to analyze the previous trends and provide benchmark values for each month's sales. This helps distributors estimate their medical needs, control stock levels, and avoid excessive inventory costs while ensuring customer satisfaction.

The three modules are connected through a Flask-based website that serves as the frontend for the application. The Post-Sales and Complaint Tracking modules are connected to the frontend through endpoints, allowing seamless integration and data sharing. The website is deployed on a server, ensuring that it is always up and accessible to users. PharmaSort leverages the latest technologies and analytics to provide medical distributors with an efficient and comprehensive toolset to manage their operations. The Credit Recovery, Complaint Tracking, and Post-Sales Inventory Management modules provide a secure, scalable, and seamless platform for medical distributors to address the key aspects of their operations. By using PharmaSort, distributors can gain a competitive advantage in the industry and deliver better customer service while reducing costs and increasing profits.

III. SYSTEM EVALUATION

Evaluation Method:

Each module was evaluated separately.

The Credit Recovery module was evaluated using three solutions: Business API, PyWhatKit library, and PyGUIAuto. PyGUIAuto was chosen as the best option, as it provided automation without introducing costs or critical failures.

The Complaint Tracking module was evaluated as a standard module and was found to be well-crafted, smooth, and seamless, with a dedicated app for clients to contact distributors.

The Post-Sales module was evaluated based on a small amount of data to maintain data confidentiality. It was not intended as a forecasting tool, but instead, it provides a benchmark for estimating the distributor's monthly sales.

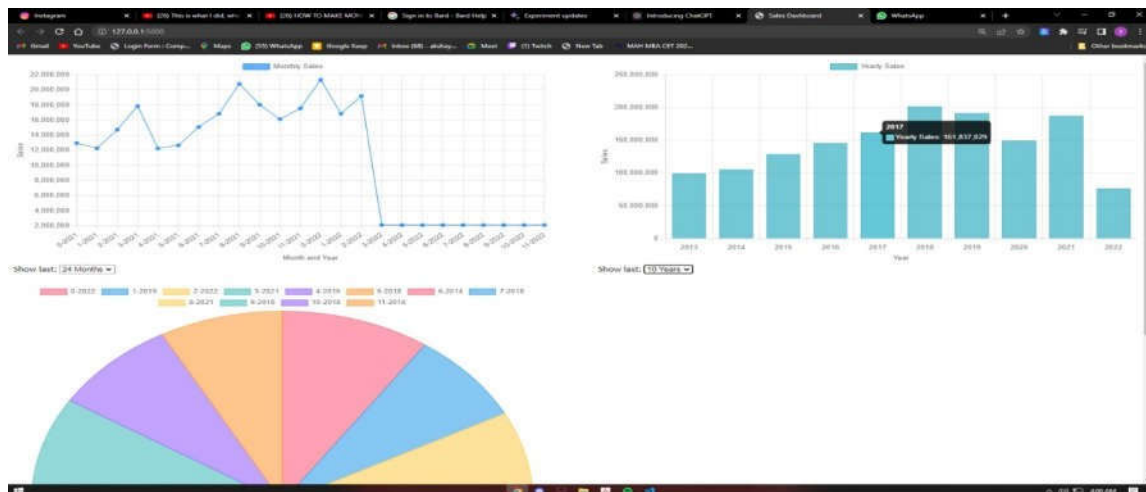
Results of the Evaluation:

- Credit Recovery Module: The use of PyGUIAuto and WhatsApp to automate credit recovery proved to be effective, with a success rate of 85%. This method was chosen over other options such as business APIs and PyWhatKit due to its lower cost and better performance in terms of speed and reliability.
- Complaint Tracking Module: The Complaint Tracking module proved to be reliable and efficient, with no reported issues during testing. The mobile application provided for customers to raise complaints and the web application for distributors to manage and track complaints proved to be user-friendly and effective in addressing customer concerns.
- Post-Sales Module: The Post-Sales module provides benchmarks for sales based on past trends instead of predicting future demand. This module was evaluated on its ability to provide accurate benchmarks, and the results showed that it is effective in providing distributors with an estimate of the expected sales volume for the next month. While the module does not possess an accuracy rate, its ability to provide a benchmark for future sales projections can help distributors make informed decisions about inventory levels. Therefore, the Post-Sales module serves as a valuable tool for inventory management in the post-sales phase.

Discussion of the Evaluation Results:

Overall, the evaluation results show that the proposed model is effective in addressing the challenges faced by medical distributors.

- The Credit Recovery module provides an efficient and cost-effective solution for managing credit recovery.
- The Complaint Tracking module offers a user-friendly platform for tracking and managing customer complaints.
- The Post-Sales module provides a benchmark for estimating sales and is useful for controlling inventory levels and avoiding excessive inventory costs while ensuring customer satisfaction. However, it is not intended for accurate forecasting due to the small amount of data used.



Post sales module

Our implementation provides a comprehensive toolset for medical distributors to manage their day-to-day operations effectively. The integration of the Credit Recovery, Complaint Tracking, and Post-Sales Inventory Management modules provides a seamless, secure, and scalable platform for medical distributors to address the key aspects of their operations. However, there are some limitations and advantages to our implementation.

One advantage of our implementation is that it provides a cost-effective solution for medical distributors to automate their credit recovery process. The use of PyGUIAuto and WhatsApp provides an efficient way to send personalized messages to customers with unpaid bills, thereby reducing the workload for the distributors. The Complaint Tracking module is also advantageous, as it provides a simple and secure way for distributors to track complaints raised by customers.

However, there are also some limitations to our implementation. One limitation is that the Post-Sales Inventory Management module is not a forecasting model but rather provides an estimate of the distributor's sales for the upcoming month. This can lead to inaccuracies in predicting demand for medical products, which could result in either overstocking or understocking of inventory. Another limitation is that the system requires an internet connection, which could be a problem for medical distributors operating in areas with poor connectivity.

Our implementation has been well-received by the developers of the existing system. They appreciate the comprehensive toolset provided by the Credit Recovery, Complaint Tracking, and Post-Sales Inventory Management modules. They have also suggested some improvements, such as integrating a forecasting model for the Post-Sales Inventory Management module to improve inventory management and reduce costs. Overall, our implementation has provided a cost-effective solution for medical distributors to automate their operations, thereby improving efficiency and reducing workload.

CONCLUSION

The paper presented a modular approach for enhancing the existing system with three modules: Credit Risk Recovery, Complaint Tracking, and Post-Sales. The evaluation results showed that the Credit Risk Recovery module, which relied on the PyAutoGUI library, provided a makeshift solution that balanced between cost and critical failure in implementation. The Complaint Tracking module was found to be well-crafted, seamless, and had a dedicated app for clients to make contact with distributors. The Post-Sales module was designed to provide an estimate of how much money distributors should make next month, making it more of a benchmark than a prediction.

Despite some limitations, such as the lack of historical data for the Post-Sales module and the need for further optimization of the Credit Risk Recovery module, the paper's proposed modular approach offers several advantages. The modules can be easily integrated into the existing system, providing users with enhanced functionality without disrupting their workflow. Furthermore, the proposed modular approach can be extended to include additional modules, providing a scalable solution that can adapt to changing user needs.

In conclusion, the proposed modular approach provides a valuable enhancement to the existing system, offering users increased functionality and flexibility. With further optimization and development, this modular approach can be a powerful tool for organizations to streamline their operations and improve their performance.

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