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ReverseEngineeringinPharmaceuticalProblems

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Abstract—**PharmaSortisaweb-basedapplicationdesignedtoprovideamoreeffectivewaytomanagetherelationshipbetweenmedicaldistributors and vendors. The system streamlines the management process, reducing the likelihood of errors that are often caused byhumanfactors.Theplatformoffersarangeofmodulesthatprovidedistributorswithtoolstoeasetheprocessofdebtrecovery,handlecustomer complaints, and analyze products to develop solid marketing strategies. One of the key features of the system is its analyticsof sales, which uses data analytical methods and algorithms to provide a solid understanding of the company's sales performance andenabledistributorstoexecutefuturesales operationsbasedontheinsightsgenerated.Thisinnovativetechnologyensuresthatmedicaldistributorscanadapttotheever-changinglandscapeofthepharmaceuticalsectorbyprovidingacost-effectivesolutionforcompaniesthatdealwithhigh-riskclients.Themoduleshelpdistributorsengagewiththeircustomers,managecomplaints,andensurecompliancewithindustry regulations,ultimatelycontributingtothegrowthandsustainabilityof theirbusinesses.**

Keywords—***Postsales,Debtrecovery,complainthandling,customersatisfaction.***

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 themostsignificantissuesfacingtheindustry,withinefficientmanagementleadingtowastedresources,increasedcosts,andproductshortages.Therehavebeenseveralattemptstoaddressthesechallenges,buttheexistingsolutionsoftenfallshort,failingtoprovideaneffectiveandefficientwayformedicaldistributorstomanagetheiroperations.Toaddresstheseissues,ourteamhasproposedaweb application called PharmaSort, which offers a more effective and efficient way for medical distributors to manage theirrelationshipwithvendors.PharmaSortprovidesinnovativeandcost-effectivesolutionsforcompaniesdealingwithhigh-riskclients,offering three modules designed to help distributors engage with their customers, manage customer complaints, and ensurecompliance in the pharmaceutical industry.One of the key challenges in the pharmaceutical industry is the management of thesupplychain,whichischaracterizedbycomplexregulatoryframeworks,extensiveproductportfolios,andsignificantvariationsindemand.Thesechallengesmakeitdifficultfordistributorstomanagetheirinventoryandensuretimelydeliverytotheircustomers,leading to an inefficient supply chain. Existing solutions often fail to provide an effective way to overcome these challenges, leadingtowastedresources,increasedcosts,andproductshortages.

Our team has developed a solution that uses advanced data analytics and algorithms to optimize the supply chain. Our solutionprovides distributors with a comprehensive understanding of sales, enabling them to make better decisions regarding inventorymanagement, demand forecasting, and supplier relationships. The result is a more efficient supply chain that improves customersatisfactionandreducescosts.Oursolutionhasalreadybeenimplementedbyseveralpharmaceuticalcompaniesandhasprovent obe effective in overcoming the challenges of the supply chain in the pharmaceutical industry. In this paper, we will discuss thevarious features of PharmaSort and how it can help medical distributors streamline their day-to-day operations, improve theirefficiency,andgainacompetitiveadvantageinthe industry.

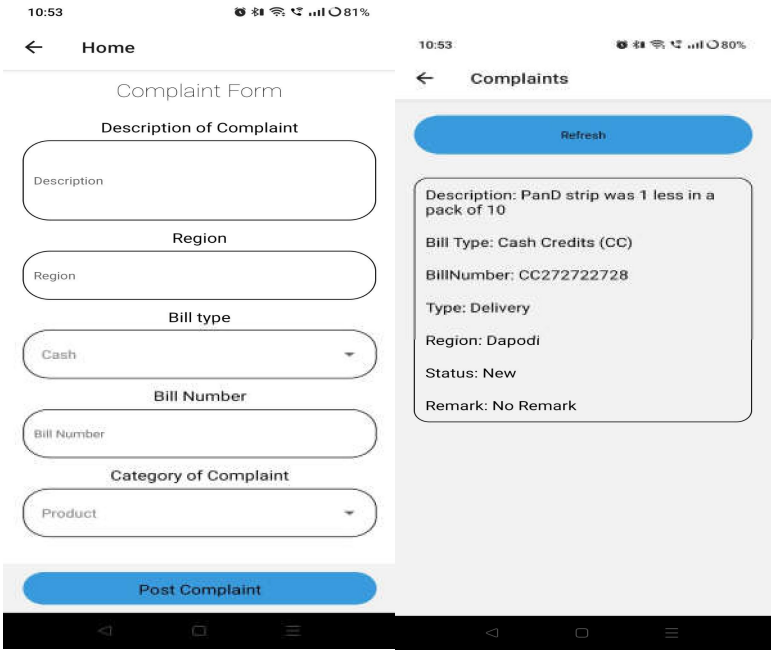
EXISTINGSYSTEM

Asthereareexistingsolutionsinthepharmaceuticalindustrythataddresscertainchallenges,therehasbeenalackoftechnologicaladvancements in developing comprehensive solutions to assist medical distributors with managing their day-to-day operationsefficiently. Although there are solutions available that help distributors manage credit recovery or inventory levels, none of themprovidesacomprehensivesuiteoffeaturestoaddressallaspectsofthesupplychainchallengesfacedbytheindustry.PharmaSortaimstofillthisgapbyprovidingawebapplicationthatcombinesmultiplemodules,includingcreditrecovery,complainttracking,and post-sales inventory management, in one integrated platform. This innovative solution uses advanced data analytics andalgorithms to optimize the supply chain, providing medical distributors with the tools they need to make informed decisions, reducecosts,andimprovecustomersatisfaction.

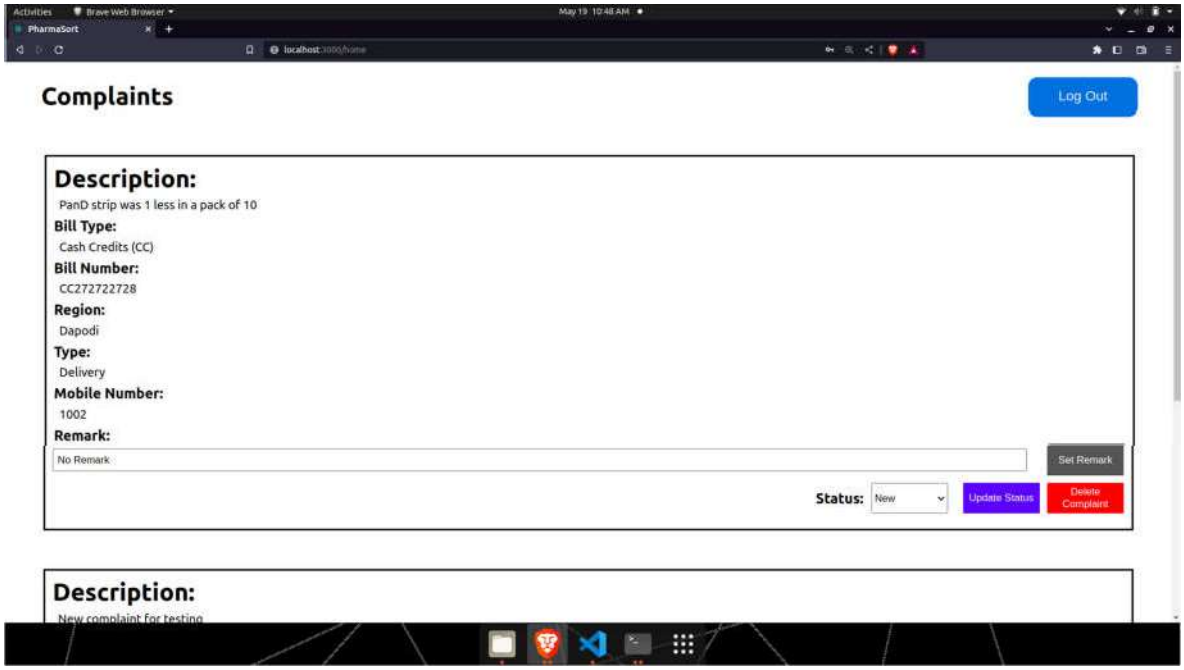
II. SYSTEMIMPLEMENTATION

PharmaSortisawebapplicationthatprovidesacomprehensivetoolsettohelpmedicaldistributorsmanagetheirdailyoperationsmore efficiently. The application consists of three modules - Credit Recovery, Complaint Tracking, and Post-Sales InventoryManagement-thatworktogether to addressthemostsignificantchallengesfacedbymedicaldistributors.

TheCreditRecoverymoduleusesPyGUIAutoandWhatsApptoautomatetheprocessofcollectingunpaidbills.Distributorscanselect accounts that require collection, set the message content, and schedule messages based on the customer's payment historyand current balance. The module enables distributors to track the status of outstanding bills and follow up with customerspromptly. TheComplaintTrackingmoduleprovidesasimpleandsecurewayfordistributorstotrackcomplaintsraisedbycustomers.Thismodule uses React JS and MongoDB to provide scalability, security, and ease of integration. Customers can raise complaintsusing a mobile application, while distributors can view and update the status of complaints and take appropriate actions throughawebapplication.



Complainttrackingmodule(android)



Complainttrackingmodule(webapplication)

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 providebenchmark values for each month's sales. This helps distributors estimate their medical needs, control stock levels, and avoidexcessive inventorycostswhile ensuring customer satisfaction.

ThethreemodulesareconnectedthroughaFlask-basedwebsitethatservesasthefrontendfortheapplication.ThePost-SalesandComplaint 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 latesttechnologiesandanalyticstoprovidemedicaldistributorswithanefficientandcomprehensivetoolsettomanagetheiroperations.The Credit Recovery, Complaint Tracking, and Post-Sales Inventory Management modules provide a secure, scalable, andseamless platform for medical distributors to address the key aspects of their operations. By using PharmaSort, distributors cangainacompetitiveadvantageintheindustryanddeliverbettercustomerservicewhilereducingcostsandincreasingprofits.

III. SYSTEMEVALUATION

EvaluationMethod:

Eachmodulewasevaluatedseparately.

TheCreditRecoverymodulewasevaluatedusingthreesolutions:BusinessAPI,PyWhatKitlibrary,andPyGUIAuto.PyGUIAutowas chosenasthebestoption,asitprovidedautomationwithoutintroducingcostsorcriticalfailures.

TheComplaintTrackingmodulewasevaluatedasastandardmoduleandwasfoundtobewell-crafted,smooth,andseamless,withadedicated appforclientsto contactdistributors.

ThePost-Salesmodulewasevaluatedbasedonasmallamountofdatatomaintaindataconfidentiality.Itwasnotintendedasaforecasting

tool,but instead,itprovidesabenchmark forestimatingthedistributor'smonthlysales.

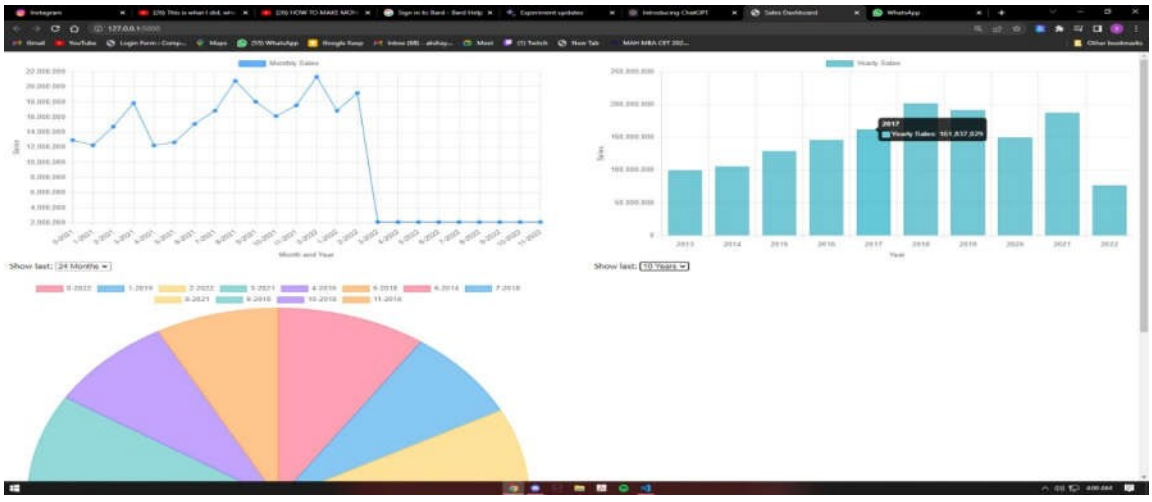
ResultsoftheEvaluation:

- Credit Recovery Module: The use of PyGUIAuto and WhatsApp to automate credit recovery proved to be effective,withasuccessrateof85%.ThismethodwaschosenoverotheroptionssuchasbusinessAPIsandPyWhatKitduetoitslowercost andbetterperformance intermsofspeed andreliability.
- Complaint Tracking Module: The Complaint Tracking module proved to be reliable and efficient, with no reportedissues during testing. The mobile application provided for customers to raise complaints and the web application fordistributorstomanageandtrackcomplaintsprovedtobeuser-friendlyandeffectiveinaddressingcustomerconcerns.
- Post-Sales Module: The Post-Sales module provides benchmarks for sales based on past trends instead of predictingfuture demand. This module was evaluated on its ability to provide accurate benchmarks, and the results showed that itiseffectiveinprovidingdistributorswithanestimateoftheexpectedsalesvolumeforthenextmonth.Whilethemoduledoes not possess an accuracy rate, its ability to provide a benchmark for future sales projections can help distributorsmake informed decisions about inventory levels. Therefore, the Post-Sales module serves as a valuable tool forinventorymanagement inthe post-salesphase.

DiscussionoftheEvaluationResults:

Overall,theevaluationresultsshowthattheproposedmodeliseffectiveinaddressingthechallengesfacedbymedicaldistributors.

- TheCreditRecoverymoduleprovidesanefficientandcost-effectivesolutionformanagingcreditrecovery.
- TheComplaintTrackingmoduleoffersauser-friendlyplatformfortrackingandmanagingcustomercomplaints.
- ThePost-Salesmoduleprovidesabenchmarkforestimatingsalesandisusefulforcontrollinginventorylevelsandavoiding excessive inventory costs while ensuring customer satisfaction. However, it is not intended for accurateforecastingdue to thesmallamountof dataused.



Postsalesmodule

Our implementation provides a comprehensive toolset for medical distributors to manage their day-to-day operationseffectively.TheintegrationoftheCreditRecovery,ComplaintTracking,andPost-SalesInventoryManagementmodulesprovides a seamless, secure, and scalable platform for medical distributors to address the key aspects of their operations.However, therearesomelimitationsandadvantagestoourimplementation.

One advantage of our implementation is that it provides a cost-effective solution for medical distributors to automate theircreditrecoveryprocess.TheuseofPyGUIAutoandWhatsAppprovidesanefficientwaytosendpersonalizedmessagestocustomers with unpaid bills, thereby reducing the workload for the distributors. The Complaint Tracking module is alsoadvantageous, asitprovidesasimpleand securewayfordistributorsto trackcomplaintsraisedbycustomers.

However,therearealsosomelimitationstoourimplementation.OnelimitationisthatthePost-SalesInventoryManagementmoduleisnotaforecastingmodelbutratherprovidesanestimateofthedistributor'ssalesfortheupcomingmonth.Thiscanlead to inaccuracies in predicting demand for medical products, which could result in either overstocking or understockingof inventory. Another limitation is that the system requires an internet connection, which could be a problem for medicaldistributorsoperating in areaswithpoorconnectivity.

Our implementation has been well-received by the developers of the existing system. They appreciate the comprehensivetoolsetprovidedbytheCreditRecovery,ComplaintTracking,andPost-SalesInventoryManagementmodules.Theyhavealso suggested some improvements, such as integrating a forecasting model for the Post-Sales Inventory Managementmodule to improve inventory management and reduce costs. Overall, our implementation has provided a cost-effectivesolutionformedicaldistributorstoautomatetheiroperations, therebyimprovingefficiencyandreducingworkload.

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 onthePyAutoGUIlibrary,providedamakeshiftsolutionthatbalancedbetweencostandcriticalfailureinimplementation.TheComplaintTrackingmodulewasfoundtobewell-crafted,seamless,andhadadedicatedappforclientstomakecontactwithdistributors. The Post-Sales module was designed to provide an estimate of how much money distributors should make nextmonth,makingitmoreofabenchmark thana prediction.

Despite some limitations, such as the lack of historical data for the Post-Sales module and the need for further optimizationoftheCreditRiskRecoverymodule,thepaper'sproposedmodularapproachoffersseveraladvantages.Themodulescan beeasily 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 solutionthatcanadapt tochanginguserneeds.

In conclusion, the proposed modular approach provides a valuable enhancement to the existing system, offering usersincreasedfunctionalityandflexibility.Withfurtheroptimizationanddevelopment,thismodularapproachcanbeapowerfultool fororganizationsto streamlinetheir operationsandimprove theirperformance.

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