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Agile approach for developing financial management application in pharmacies

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ABSTRACT
This research aims to develop financial management applications in pharmacies with the Extreme Programming (XP) approach to overcome the complexity and diversity of financial processes and the demands of a rapidly changing market and intense competition in the pharmaceutical industry. The research method consists of three stages: data collection, application development, and user acceptance evaluation. Data collection was conducted through interviews and a literature review. Application development used XP principles to enable flexibility and adaptability in responding to changing user needs. User acceptance evaluation was conducted to identify the advantages and disadvantages of the application as well as the level of user satisfaction. The results showed that the developed application successfully fulfilled most user needs, with the user satisfaction level reaching 85%. This research contributes to providing an effective solution for managing dispensary financial processes with the XP approach and a better understanding of user needs and expectations in the rapidly growing pharmaceutical industry.

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INTRODUCTION

In the world of pharmacy, financial processes are complex and multifaceted(Alghamdi et al., 2023; Phanudulkitti et al., 2023; Yong et al., 2023). Every day, pharmacies have to manage the purchase of drugs from various suppliers, maintain the right stock to fulfill customer demand and take care of payments to suppliers and receipts from customers. Also, there are other operational costs such as employee salaries, premises rent, and administrative costs. All this makes the financial processes in a pharmacy very diverse and often complicated.

The situation is further complicated by rapidly changing market demands and intensifying competition. Pharmacies must be able to adapt to changing health trends, government policies on medicines, and consumer preferences. They also have to compete with other pharmacies that offer competitive prices and better services. In the face of the complexity and diversity of financial processes and the demands of a fast-changing market, effective financial management has become crucial in dispensary operations. With sound financial management, pharmacies can manage cash flow, identify sales trends, and even

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meet payment obligations. Effective financial management also helps pharmacies to optimize expenses and improve profitability(Ali et al., 2024; Hohmeier et al., 2023; Lim et al., 2024; Prieto-Campo et al., 2024).

Amidst these challenges, information technology has become an invaluable ally in improving the efficiency of dispensary financial management. Computer-based financial management systems enable dispensaries to track transactions accurately, automatically generate financial reports, and conduct in-depth financial analyses. In addition, specialized applications and software for dispensary financial management can help automate some routine tasks, reduce the risk of human error, and speed up the decision-making process. By implementing information technology, pharmacies can improve their financial management efficiency, reduce operational costs, and increase customer satisfaction. This makes pharmacies more competitive in a fiercely competitive market and helps them maintain their business continuity in this digital age(Abeyaratne & Galbraith, n.d.; Baumgartner et al., n.d.; Lim et al., 2024; Park et al., n.d.).

Traditional software development methods, such as the waterfall approach, have been the standard in the information technology industry for many years(Alami et al., 2023; Almeida et al., 2022; Estrada-Esponda et al., 2024; Najihi et al., 2022). In this approach, software development is carried out linearly, starting from the planning stage, then design, implementation, testing, and maintenance. However, there are several constraints associated with the application of this method. Firstly, the waterfall approach tends to be less responsive to changing user needs. As all development phases are carried out sequentially, adjusting to changing needs during the development process becomes complex. This can result in a gap between the developed solution and the actual needs of the users and prolong the development time. Secondly, this traditional method has significant risks associated with software development. In the waterfall approach, the entire project must be thoroughly completed before producing the final product. This indicates that significant risks associated with project failure can arise if problems are not identified in the early phases of development. Moreover, due to the time it takes to achieve a testable final product, the risk of project failure can increase significantly(Hinderks et al., 2022; Leong et al., 2023; Martin, 2023; Wiechmann et al., 2022).

Another challenge is the potential for project failure. In the waterfall approach, projects often need help meeting the set schedule and budget. The inability to adjust to changing user needs and high development risks can lead to projects failing to achieve the desired goals successfully. In this context, it is essential to consider alternative, more responsive, and adaptive software development methods. Iterative and agile approaches have proven more effective in overcoming the challenges associated with traditional methods, such as the waterfall approach. By applying these approaches, developers can have greater flexibility to adapt the product to changing user needs and reduce significant development risks(Bomström et al., 2023; Dingsøyr et al., 2012; Kaur et al., 2023; Rindell et al., 2021).

Extreme Programming (XP) is a software development method that aims to improve product quality, responsiveness to change, and productivity of development teams. The

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main principles of XP include intensive communication, rapid feedback, continuous testing, and iterative development. The advantage of XP lies in its ability to develop software that is adaptive and responsive to change. Using this approach, developers can focus on meeting changing customer needs and respond quickly to changing requirements. Software development is done in short iterations, allowing changes to be implemented easily whenever necessary.

The relevance of XP in the context of developing financial management applications at dispensaries is significant. Dispensary financial management applications require high adaptability to accommodate regulatory changes, customer needs, and market trends. By applying XP, developers can effectively address these challenges by adopting an iterative and incremental development approach. The link between XP and dispensary financial management application development occurs in several ways. Firstly, XP supports iterative and incremental development, where application features can be developed incrementally and tested continuously. Secondly, XP facilitates intensive team collaboration and active client involvement, which are critical in ensuring that the developed app matches the needs and expectations of stakeholders. However, specific challenges can also arise in applying XP in the context of dispensary financial management applications, such as fitting complex business needs with simple XP principles and maintaining a balance between flexibility in development and the resulting quality.

METHODS

The research consisted of three main stages, as show in Figure 1. The first stage involved collecting data related to user needs, financial processes in dispensaries, and challenges faced in financial management. The second stage was the development of a financial management application for dispensaries using the Extreme Programming (XP) method, which allows flexibility and adaptability in application development. The final stage is the user acceptance evaluation of the developed application, which involves testing with potential users to identify strengths and weaknesses and receiving feedback for further improvement. Through these stages, the research aims to investigate the effectiveness and user acceptance of a financial management application for dispensaries developed using the Extreme Programming method.

Figure 1. Research stages.

Data Collection

The first stage involves collecting data related to user needs, dispensaries' financial processes, and financial management challenges. This data can be obtained through

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interviews with dispensary owners, employees, and potential users and through a literature review on best practices in dispensary financial management and app development.

Application Development

The second stage is the development of financial management applications for dispensaries using the Extreme Programming (XP) method, one of the methods in the Agile framework. This process includes planning, design, implementation, and iterative application testing. XP enables flexibility and adaptability in application development, allowing teams to respond quickly to changing user needs.

User acceptance evaluation

The final stage is the user acceptance evaluation of the developed application. This involves testing the application with potential users to identify strengths and weaknesses and receiving helpful feedback for further improvement. User acceptance evaluation can be done through field trials, surveys, or user interviews.

RESULTS AND DISCUSSION

Data Collection

The results of the data collection phase, table 1, demonstrated an in-depth understanding of user needs, existing financial processes at the dispensary, and challenges faced in financial management. These data were obtained through interviews with dispensary owners, employees, and potential users. In addition, the literature review conducted also provided insights into best practices in dispensary financial management and app development. From the results of this data collection, it can be seen that several critical needs should be considered in the development of a financial management app for dispensaries, including the need for an easy-to-use system, good integration with existing financial processes, as well as the ability to accommodate regulatory changes and changing market needs.

Table 1. Data Collection Results

No	Data Type	Data Sources	Information obtained
1	User Needs	Interviews with dispensary owners, employees, potential users	User preferences for app features, problems encountered in financial management, user expectations of the new app
2	Financial Processes in Pharmacies	Interview with dispensary owner, employees	Financial process steps, sources, and flows of funds are needed for integration with other systems.
3	Challenges in Financial Management	Interviews with dispensary owners, employees	Barriers and challenges faced in financial management, the need for efficiency and cost reduction
4	Literature Review	Literature search on dispensary financial management and application development	Best practices in dispensary financial management, effective software development methods

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Table 1 presents an analysis of data obtained from various sources, including interviews with dispensary owners, employees, and potential users, as well as a literature review on best practices in dispensary financial management and app development, yielding valuable insights for the development of a financial management app in dispensaries. The data revealed that users must focus on app features that simplify financial management processes, such as stock tracking, transaction management, and accurate financial reporting. Financial processes in dispensaries were identified as complex and requiring good integration with other systems, as well as the need for in-depth analysis of the flow of funds. Challenges faced in financial management include administrative barriers, bureaucracy, and the need to improve efficiency and reduce costs. The literature review provided an in-depth understanding of best practices and practical approaches to developing dispensary financial management applications. By comprehensively analyzing the data, critical needs, challenges that need to be addressed, and opportunities to improve efficiency and effectiveness in financial management in dispensaries can be identified.

Application Development

The results of the application development phase show the creation of a financial management application for dispensaries using the Extreme Programming (XP) method as its framework, which was applied in the planning, design, implementation, and iterative testing of the application. XP allows for flexibility and adaptability in development, enabling the team to respond quickly to changing user needs during the development process. This process ensures that applications are developed iteratively, emphasizing continuous user testing and feedback, thus ensuring the quality and suitability of applications to changing user needs. By applying XP methods, development teams can produce adaptive and responsive solutions that conform to agile principles and meet user expectations more effectively.

Table 2. Features Application

Features	Function
Transaction Management	This feature lets users record all sales and purchase transactions in the dispensary with complete details. Users can record transaction dates, number of items sold or purchased, price, and payment method. The recorded transaction data will help track cash flow, manage goods inventory, and ease the process of tax recording and financial reporting.
Financial Reporting	This feature provides detailed financial reports, including profit and loss, balance sheet, and cash flow. These reports clearly show the dispensary's financial performance in a given period. Users can identify trends, measure profitability, and make strategic business decisions by analyzing financial statements. Accurate and detailed financial reports are essential for managing dispensary finances effectively and efficiently.
Performance Monitoring	This feature provides real-time performance monitoring of dispensary operations, including sales, purchases, and stock items. Users can view

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Features	Function
	performance data directly from the app, such as daily sales graphs, stock changes within a certain period, or profit margin percentages. Real-time performance monitoring allows users to identify trends, respond quickly to market changes, and make timely decisions.
Integration with Payment System	This feature enables integration with various commonly used payment systems, such as credit cards or digital payments. Integration with payment systems eases the process of customer payment transactions at the dispensary, increases customer convenience, and reduces the risk of errors in the payment process. With an integrated payment system, users can track payments more efficiently and speed up the process.

The financial management app for dispensaries offers a range of features, table 2, including transaction management, financial reporting, performance monitoring, and integration with payment systems. The transaction management feature allows users to record sales and purchase transactions in detail, making it easier to track cash flow and inventory of goods. Financial reporting provides detailed financial reports that help in financial performance analysis and strategic decision-making. Meanwhile, performance monitoring provides real-time information on sales, purchases, and stock items to identify trends and respond quickly to market changes.

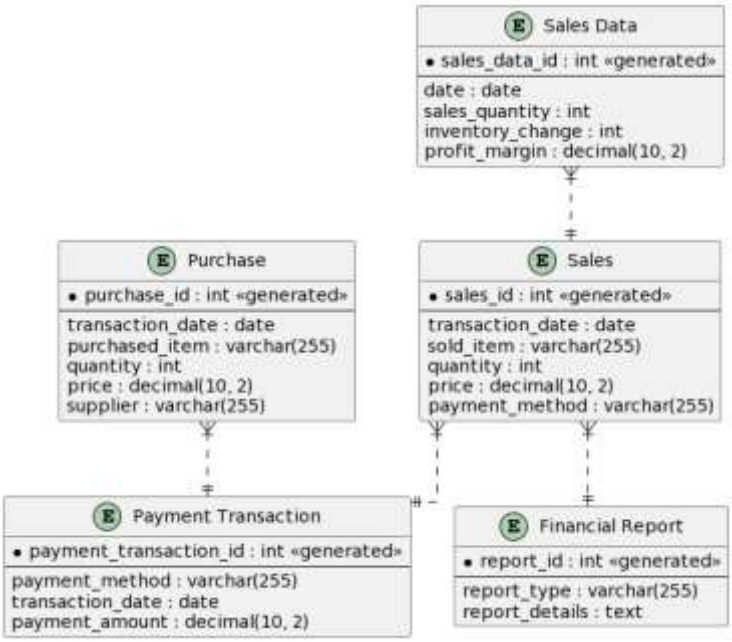

Figure 2. Data Modeling

Figure 2 illustrates a robust data structure designed for financial management within a dispensary setting. The structure comprises several key entities: "Sales," which encompasses transaction details such as date, items sold, quantity, price, and payment method; "Purchase," which mirrors similar attributes for purchase transactions alongside

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supplier information; "Financial Statement," housing comprehensive financial records including profit and loss, balance sheet, and cash flow, with detailed breakdowns of income, expenses, assets, and liabilities; "Sales Data," tasked with capturing essential data for daily sales performance monitoring, such as sales quantities, inventory changes, and profit margins; and "Payment Transactions," responsible for tracking payment specifics like method, date, and amount. This structured model serves as a robust foundation for effectively managing transactions, generating financial reports, monitoring performance metrics, and tracking payments within dispensary operations.

User Acceptance Evaluation

The user acceptance evaluation stage results showed that most users gave positive feedback on the developed application. They expressed satisfaction with the intuitive user interface, complete functionality, and overall ease of application use. Some users also highlighted additional handy features, such as robust reporting capabilities and seamless integration with payment systems. However, some feedback was also received on areas for improvement, such as improving performance during slow network access and adding additional features to increase the app's flexibility. With this feedback in mind, the development team is committed to continuously improving the quality and user experience of the dispensary finance app.

Table 3. User Acceptance Evaluation

Aspect Evaluation	Results
User Interface	Intuitive and easy-to-use interface
Functionality	Functionality is complete and in line with user requirements.
Performance	Responsive performance, but requires improvement on slow network access
Additional Features	Useful additional features, however, some additional features are desired to increase the flexibility of the ap
Reporting	Robust reporting capabilities and ease of financial management processes
Integration with Payment System	Seamless integration with payment systems is an added value
User Satisfaction	85% of users expressed satisfaction with the app

Analysis of the user evaluation results table 3 shows a positive picture of user acceptance and satisfaction with the developed application. Most aspects of the evaluation, such as user interface, functionality, reporting, and integration with payment systems, received good scores and were considered to fulfill or even exceed user expectations. However, some easements, such as the app's responsive performance, which still requires improvement for slow network access, and the need for some additional uses to increase the app's flexibility. Nonetheless, the high level of user satisfaction, with 85% of users expressing satisfaction with the app, indicates that the app has successfully met most users' needs and expectations. Thus, the feedback from these user evaluations can be a

valuable guideline for the development team in making further improvements and enhancements to the dispensary finance app.

CONCLUSION

Developing a financial management application at a pharmacy using the Extreme Programming (XP) approach has resulted in an application that can fulfill most user needs. The application has successfully integrated vital features such as transaction management, financial reporting, performance monitoring, and integration with payment systems through data collection, application development, and user acceptance evaluation. User evaluation results showed high satisfaction, with 85% of users expressing satisfaction with the application. Nonetheless, some areas require improvement, such as responsive application performance and additional features to increase application flexibility. This conclusion confirms that using the Extreme Programming approach in developing financial management applications in dispensaries has the potential to produce effective solutions that are acceptable to users. This research makes a valuable contribution to understanding and developing better applications for the pharmaceutical industry.

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