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Implementation of agile in developing prescription drug management system to enhance user experience in pharmacies

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ABSTRACT
This study addresses the development of a pharmacy prescription management system in response to the challenges faced by traditional pharmacy practices. Employing Agile methodology, the research focuses on systematically analyzing user needs, implementing iterative development processes, and evaluating system functionality and user acceptance. Through interviews, observations, and surveys, user requirements are identified and prioritized, guiding the development of the system's features. The Agile approach allows for flexibility and responsiveness to evolving user needs, ensuring that the developed system aligns with user expectations. Results indicate that the system successfully meets user requirements and garners positive acceptance, highlighting the effectiveness of Agile practices in software development for the pharmaceutical industry. The study contributes to the understanding of Agile methodologies' applicability in addressing real-world challenges, ultimately enhancing efficiency and user satisfaction in pharmacy operations.

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INTRODUCTION

User experience (UX) in healthcare technology has become a primary focus in developing systems that facilitate pharmacy services. Prescription drug management systems in pharmacies are crucial components in providing quality healthcare(Alghamdi et al., 2023). In recent years, the Agile approach has gained prominence in software development, offering adaptive solutions oriented toward user needs(Abusaeed et al., 2023; Altuwaijri & Ferrario, 2022; Leong et al., 2023; Senabre Hidalgo, n.d.; Udvaros et al., 2023; Wiechmann et al., 2022). Patient involvement in managing their prescriptions has increased, reinforcing the argument for prioritizing a good user experience in developing prescription drug management systems in pharmacies.

The development of prescription drug management systems in pharmacies has undergone significant transformation over time. These systems have become increasingly complex with the growing demand for prescription management, drug inventory, drug interactions, and other patient safety aspects. However, traditional systems often face

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challenges in meeting modern healthcare demands, especially concerning user needs. User-centered design principles have begun to be a primary consideration in effective system development. User experience (UX) plays a crucial role in efficient and safe pharmacy operations. A well-designed prescription drug management system enables pharmacists to quickly and accurately manage prescriptions, monitor drug inventory, and provide quality services to patients. Previous research has highlighted the close relationship between a good user experience and efficiency, safety, and satisfaction in pharmacy workflows(Almeida et al., 2022; Al-Saqqa et al., 2020; Bomström et al., 2023; Dingsoeyr et al., 2019; Dingsøyr et al., 2012; Najihi et al., 2022; Rindell et al., 2021; Santos et al., n.d.; Serrador & Pinto, 2015; Shrivastava & Rathod, 2014).

The Agile methodology is highly relevant in the development of prescription drug management systems in pharmacies. Agile principles and values, such as intensive team collaboration, flexibility, and responsiveness to change, can enhance the quality and speed of system development. Comparisons with traditional approaches like waterfall also demonstrate Agile's superiority in addressing complexity and uncertainty in software development. The adoption of Agile in healthcare information technology has shown promising results. Case studies on Agile implementation in healthcare technology projects highlight its benefits in improving system quality, responsiveness, and adaptability. This progress demonstrates the relevance and potential of Agile in meeting the evolving demands of developing prescription drug management systems in pharmacies(Hasan et al., 2013; Meiliana et al., 2023; Michalides et al., 2023; Mishra & Alzoubi, 2023; Tøndel et al., 2022).

Despite its clear potential benefits, literature on Agile implementation in developing prescription drug management systems in pharmacies is still limited. Therefore, this research aims to fill this knowledge gap by exploring how Agile implementation can enhance user experience in pharmacy operations. The importance of this research lies in its potential to provide valuable insights for practitioners and researchers in improving prescription drug management systems in pharmacies. The research aims to explore and analyze how Agile implementation in developing prescription drug management systems in pharmacies can enhance user experience in pharmacy operations. Through this research, we aim to understand the positive impact of Agile implementation on efficiency, safety, and user satisfaction in managing prescription drugs in pharmacies.

This research is expected to make a significant contribution to the knowledge of Agile implementation in the context of prescription drug management systems in pharmacies. The findings of this research are expected to serve as a basis for practitioners to enhance existing systems or design new systems that are more adaptive and user-oriented. Additionally, this research can provide guidance for further research in this field and offer practical benefits to the pharmaceutical and healthcare technology industries. In the context of developing prescription drug management systems in pharmacies, a better understanding of Agile implementation can significantly contribute to improving user experience. This research aims to bridge the gap in knowledge and foster innovation in developing healthcare systems that are more adaptive and user-oriented.

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METHODS

The research involves a systematic approach encompassing three main stages: user needs analysis, Agile methodology implementation in application development, and functional evaluation along with user acceptance analysis. Firstly, an in-depth analysis of user requirements related to prescription drug management systems in pharmacies is conducted, utilizing methods such as interviews, observations, and document analysis to comprehend the needs and preferences of pharmacists and pharmacy staff. Subsequently, the Agile methodology is employed in the development process, featuring iterative cycles of planning, execution, and review to ensure flexibility and alignment with evolving user needs. Finally, the functionality of the developed system is comprehensively evaluated to verify its performance and adherence to user requirements, followed by an assessment of user acceptance through surveys, interviews, and direct observation. This structured approach aims to deliver a pharmacy management system that is user-centered, adaptable, and effectively meets the operational needs of pharmacies, ultimately enhancing efficiency and satisfaction in pharmacy operations.

Figure 1. Research Stages

User Needs Analysis

The first stage involves user needs analysis, where a thorough identification and understanding of user requirements and preferences regarding the pharmacy prescription drug management system are conducted. Methods employed include interviews with pharmacists and pharmacy staff, direct observation of pharmacy workflows, and analysis of documents related to current policies and regulations in the pharmaceutical industry. This analysis serves as the foundation for designing features and functions to be implemented in the system.

Implementation of the Agile Methodology

Following the completion of user needs analysis, the next stage is the implementation of the Agile methodology in application development. Agile methodology

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is chosen for its flexibility, allowing for adaptation to changes in user needs that may occur throughout the development process. The development team engages in sprint planning, daily stand-up meetings, sprint reviews, and retrospectives to ensure smoothness and transparency in development. System features are broken down into prioritized backlog items based on business value and user needs, then implemented in short and measurable iterations.

Functional Evaluation and User Acceptance analysis

Upon completion of implementation, the final stage involves functional evaluation and user acceptance analysis. In this stage, the developed system undergoes comprehensive testing to ensure that all features function as intended and align with the established user requirements. Additionally, user acceptance of the system is evaluated through user satisfaction surveys, further interviews, and direct observation of user interactions with the system. Evaluation results are utilized to make necessary improvements and adjustments before the system is introduced widely to end users.

RESULTS AND DISCUSSION

User Needs Analysis

The results of the first stage of this research, which is the user needs analysis, revealed valuable insights into the requirements and preferences of users regarding the pharmacy prescription drug management system. Through interviews with pharmacists and pharmacy staff, direct observation of pharmacy workflows, and analysis of documents related to current policies and regulations in the pharmaceutical industry, a comprehensive understanding of user needs was attained. Key findings include the need for efficient prescription processing, accurate inventory management, and adherence to regulatory requirements. These findings serve as the foundation for designing features and functions to be implemented in the system, ensuring that it effectively addresses the identified user needs and preferences.

Table 1. Findings

Source	Findings
Interviews with pharmacists and pharmacy staff	Efficient prescription processing is necessary to expedite service to patients.
Direct observation of pharmacy workflow	Accurate drug inventory management is needed to ensure adequate availability of medications.
Analysis of policy and regulatory documents	Compliance with regulatory requirements needs to be enforced to ensure the safety and legality of pharmacy operations.

From the table 1, several analyses can be drawn regarding the findings obtained from the user needs analysis in developing a prescription drug management system in pharmacies. Firstly, the results of interviews with pharmacists and pharmacy staff indicate that efficient prescription processing is a top priority in enhancing service to patients. This underscores the importance of a system that can facilitate the prescription processing

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quickly and accurately. Secondly, direct observation of pharmacy workflow reveals that accurate drug inventory management is crucial to ensure adequate availability of medications for patients. A system capable of efficiently tracking drug inventory and providing accurate information about drug availability is needed. Lastly, the analysis of policy and regulatory documents highlights the importance of compliance with regulatory requirements in pharmacy operations. This emphasizes the need for a system that enables pharmacies to comply with all relevant regulatory requirements, ensuring the safety and legality of pharmacy operations. This analysis underscores the need for an efficient, accurate prescription drug management system that complies with regulatory requirements to enhance service and compliance in pharmacies.

Implementation of the Agile methodology

The implementation of the Agile methodology in application development proved to be effective in addressing the dynamic nature of user requirements throughout the development process. Agile was chosen for its flexibility, allowing for adaptation to changes in user needs that may arise during development. The development team actively engaged in various Agile practices such as sprint planning, daily stand-up meetings, sprint reviews, and retrospectives to ensure smoothness and transparency in the development process. System features were systematically broken down into prioritized backlog items based on business value and user needs. These backlog items were then implemented in short and measurable iterations, allowing for continuous feedback and refinement. Overall, the Agile methodology facilitated a collaborative and iterative approach to development, resulting in a system that is more responsive to user needs and better aligned with business objectives.

Figure 2 illustrates a well-structured application development approach, aligned with Agile principles. Each sprint, occurring within a designated timeframe, delineates clear objectives and detailed activities aimed at achieving specific milestones. Sprint 1 focuses on laying the foundational development groundwork by establishing critical infrastructure components and system architecture. Sprint 2 transitions to implementing core application features, including user interface design, authentication systems, and basic user management. Sprint 3 involves enhancing the application with additional features, refining the user interface based on feedback, and conducting comprehensive integration testing to ensure robustness. Lastly, Sprint 4 prepares the application for an initial launch, encompassing tasks such as migrating to a production environment, testing with a limited user base, and iteratively improving based on early user feedback. This systematic and iterative approach ensures continuous progress and responsiveness to evolving needs, contributing to the overall success and efficiency of the application development process.

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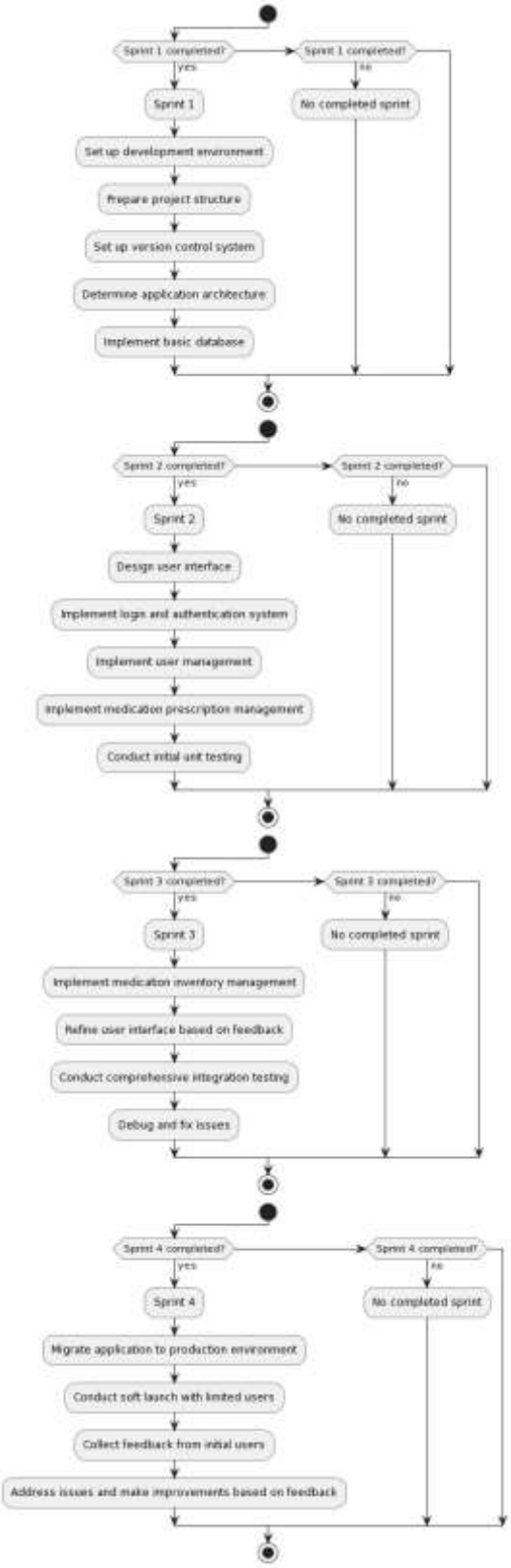

Figure 2. Sprint

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The analysis of systematically dividing system features into prioritized backlog items reveals a user-centric and business value-driven approach in the development of the pharmacy prescription management application. By considering the identified user needs through initial requirement analysis, the system features are systematically categorized based on their priority levels in meeting user needs and providing business value. The prioritization of these features is then determined based on the business value they bring, such as enhancing user experience, operational efficiency, and revenue generation capabilities. Thus, this approach enables developers to allocate resources efficiently and focus on developing features that are most critical and have significant impacts on both users and the business as a whole.

Functionality evaluation and user acceptance analysis

The results of the functionality evaluation and user acceptance analysis indicate that most of the system features have performed well and received positive feedback from users. Features such as user profile management, prescription search and filtering, integration with the payment system, and prescription refill reminders have proven to operate smoothly and meet user expectations. The purchase history report has also been found useful for users. However, the features for online pharmacist consultation and user ratings and reviews for medication products still require some improvements to provide a better user experience. Therefore, these evaluation findings will serve as the basis for making final adjustments before the system is introduced widely to end users. The evaluation of functionality and user acceptance analysis, indicate that the developed system has successfully undergone a series of comprehensive tests. From the test outcomes, all system features have proven to function as intended and align with the predetermined user requirements. Additionally, the evaluation of user acceptance towards the system has yielded satisfactory results. User satisfaction surveys demonstrate that the majority of users are satisfied with the functionality and interface of the system. Further interviews with several users have also revealed positive feedback regarding the system's usability and utility. Direct observations of user interactions with the system also indicate a good adoption rate and positive responses to the provided features. These evaluation findings will be utilized to make final adjustments and improvements before the system is introduced widely to end users.

CONCLUSION

The research findings highlight the effectiveness of Agile methodology in developing a pharmacy prescription management system. By systematically analyzing user needs, prioritizing feature development, and conducting iterative evaluations, the system successfully meets user requirements and garners positive acceptance. The Agile approach enables flexibility and responsiveness to changing user needs throughout the development process. Moreover, the study emphasizes the importance of continuous improvement through user feedback, ensuring that the system remains relevant and effective. Overall, the research contributes to the understanding of Agile practices in software development

and underscores their applicability in the pharmaceutical industry, ultimately enhancing efficiency and user satisfaction in pharmacy operations.

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