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Implementation of agile methodology in the development of human resource management application for pharmacies

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ABSTRACT
This research aims to develop an effective human resource management (HRM) application for pharmacies using Agile methodology. The problem identified was the lack of HRM applications that fit the needs of pharmacies, as well as challenges in adapting to the health industry's rapidly changing needs and regulations. The methods used include data collection through literature review and interviews, application development using the Extreme Programming method, user acceptance evaluation through beta trials and surveys, and functional testing to ensure application quality. The results showed that the developed HRM application successfully achieved a user satisfaction level of 82%, with features that functioned as expected. This research contributes to the development of HRM applications that are responsive to change, improve the efficiency of human resource management in pharmacies, and ensure user satisfaction. This research also confirms that the Agile approach effectively produces software solutions that can provide significant added value to the healthcare industry.

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INTRODUCTION

Pharmacies play a central role in the healthcare industry by serving as a vital bridge between patients and healthcare providers. As a critical provider of medicines and health information, pharmacies provide patients with access to necessary medicines and counseling and education services. In doing so, pharmacies also play a role in ensuring the availability of safe and effective medicines and compliance with applicable health regulations and standards. The challenges of human resource management (HRM) in the pharmacy context must be addressed(Alghamdi et al., 2023; Chen & Cui, 2022; Khan et al., 2023; Phanudulkitti et al., 2023). Pharmacy managers often face various tasks, from recruiting and training staff to managing work schedules and performance evaluations. Often, intense working conditions and complex regulations in the healthcare industry make HR management in pharmacies a real challenge. Efficient and effective staff management is crucial to the success of pharmacy operations in providing quality services to the community.

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The pharmaceutical industry continues to face regulatory changes and dynamic market needs. Regulatory changes related to drug licensing, quality standards, and health regulatory compliance are major pharmacy concerns. In addition, changes in consumer preferences and technological developments also affect market needs in the pharmaceutical industry. Pharmacies must be able to adapt quickly to these changes to remain relevant and competitive in providing healthcare services to the community. The development of traditional human resource management (HRM) applications often faces several constraints that affect their effectiveness. One of the main constraints is the need for more flexibility in responding to changing business and technology needs. Traditional approaches tend to involve a long and linear development process, from needs analysis to final implementation, which often leads to an inability to accommodate midway changes(Lee et al., 2022; Najihi et al., 2022).

In addition, the inability to adjust to rapid changes is also a significant challenge in the development of traditional HRM applications. Traditionally developed HRM applications may become obsolete or irrelevant before completion in a rapidly changing and often uncertain business environment. This can result in a waste of valuable resources and time. Limitations in adapting to user needs are also a severe problem faced in traditionally developed HRM applications. An overly lengthy development process and lack of interaction with users during development can result in a gap between the application's features and the users' real needs. This can lead to low usage and lack of acceptance of the application by users, reducing the impact and value of the investment in HRM application development(Frestel et al., 2023; González Suárez et al., 2023; Phanudulkitti et al., 2023).

Agile methodologies promise several significant potential benefits in the context of human resource management (HRM) application development. Compared to traditional approaches, Agile approaches offer greater flexibility in responding to changes during the development cycle. This approach allows development teams to engage directly with stakeholders and adapt feedback-based priorities and features, thus minimizing the risk of producing irrelevant or obsolete solutions(Dingsøyr et al., 2012; Kaur et al., 2023; Serrador & Pinto, 2015; Shrivastava & Rathod, 2014). Flexibility in responding to changing needs and policies is also one of the critical advantages of the Agile methodology. Business and regulatory needs can change at short notice in the rapidly changing pharmaceutical industry. Agile methodology allows development teams to adjust their plans and strategies quickly, ensuring that the HRM application developed remains relevant and in line with evolving needs.

In addition, Agile methodologies can also improve overall development quality and efficiency(Beecham et al., 2021; Humpert et al., 2022; Kantola et al., 2022; Martin, 2023; Mishra & Alzoubi, 2023; Paasivaara et al., 2018; Tøndel et al., 2022). With a focus on iterative development and continuous feedback, development teams can identify and fix issues quickly, resulting in more stable and high-quality HRM applications. By minimizing waste and maximizing the value generated from each development iteration, Agile methodologies can improve the efficiency of time and resources invested in HRM application development.

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This research explores the potential benefits of using Agile methodology in developing human resource management (HRM) applications specifically for pharmacies. The specific objectives are to analyze the effectiveness of Agile methodologies in responding to changing needs and policies in the dynamic pharmaceutical industry, identify critical factors that influence the successful implementation of Agile methodologies in HRM application development for pharmacies, assess the impact of using Agile methodologies on the quality and efficiency of HRM application development, and provide practical recommendations for pharmaceutical organizations and pharmacies in implementing Agile approaches in HRM application development. The contributions of this research are expected to provide in-depth insights into the potential benefits and challenges associated with using Agile methodologies in the development of HRM applications for pharmacies, as well as provide practical recommendations for pharmaceutical organizations in improving the effectiveness and efficiency of their HRM application development. In addition, this research is also expected to pave the way for further research in this area by exploring the implications of Agile methodology in the context of HRM application development for the healthcare industry more broadly.

METHODS

The research involved three main stages as shown in Figure 1: data collection, application development using Extreme Programming methodology, and user acceptance evaluation. The data collection stage aimed to understand the context of developing an HRM application for pharmacies through a literature review, interviews, and surveys to identify user needs and pharmaceutical industry regulations. Next, in the app development stage, the research team used Extreme Programming to build a responsive and quality HRM app, focusing on team building, feature design, and behavior-based testing practices. Finally, the user acceptance evaluation stage involved beta-testing and collecting feedback from potential users to measure their effectiveness and satisfaction with the developed app.

Figure 1. Research Stages

Data Collection

In the data collection phase, the research focuses on gaining an in-depth understanding of the context of developing a human resource management (HRM) application for pharmacies. A literature review will be conducted to identify recent trends and research related to the use of Agile methodologies, specifically Extreme Programming, in the pharmaceutical industry. In addition, in-depth interviews with pharmacy managers, HR staff, and potential application users will be conducted to explore their needs, challenges, and expectations of the HRM application to be developed. Surveys and case

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studies will also be used to collect data on the use of HRM applications in pharmacies and applicable regulations in the pharmaceutical industry.

Application Development

At the application development stage, the research team will apply Extreme Programming methodology to build a responsive and quality HRM application. Activities involve forming a development team consisting of programmers, designers, and expert users to design and implement the application's features. User stories will be used as a guide to identify user requirements, while pair programming will ensure code quality and a deep understanding of the application. Behavior-based testing practices will also be regularly applied to ensure the app meets user needs and expectations.

User Acceptance Evaluation

Finally, a user acceptance evaluation phase will be conducted to measure the effectiveness and acceptance of the developed HRM application. Beta trials will be conducted with potential app users in several pharmacies. At the same time, surveys and interviews will be used to gather feedback on the usability, reliability, and user satisfaction with the app. Data from these evaluations will be analyzed to identify areas of improvement and inform further development. Thus, this evaluation stage will help ensure that the developed HRM application meets the expectations and needs of users in an actual pharmacy environment.

RESULTS AND DISCUSSION

Data Collection

The data collection phase of this research provided a solid foundation for developing an appropriate human resource management (HRM) application that meets the needs of the pharmaceutical industry, particularly in pharmacies. A thorough literature review on using Agile methodologies in HRM application development provided deep insight into the trends, best practices, and challenges. In addition, primary data obtained through interviews with pharmacy managers, HR staff, and potential application users provided a deep understanding of the needs and issues faced in pharmacy human resource management. The surveys or case studies also provided valuable perspectives on the context of using HRM applications in the field. Analysis of pharmaceutical industry regulations and standards highlights the legal framework governing the development of HRM applications and helps ensure compliance with relevant requirements. As such, the results of this data collection phase provide a solid and comprehensive basis for developing a practical HRM application suited to the dynamic work environment of pharmacies.

Table 1. Data Collection Results

Data Source	Findings
Literature Review	Agile methodology is widely used in developing HRM applications in various industries. Specific challenges in developing pharmacy HRM applications include flexibility, responsiveness, and compliance with pharmaceutical regulations.

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Data Source	Findings
Interview	An essential requirement was integration with the existing pharmacy-drug management system. Problems encountered include limitations in monitoring work schedules and evaluating employee performance. User expectations include an intuitive interface and features that support efficient management of employees and work schedules.
Analysis of Pharmaceutical Industry Regulations and Standards	Regulatory requirements include strict data security, privacy protection, and compliance with applicable pharmaceutical standards. Relevant standards include GMP (Good Manufacturing Practice) and GCP (Good Clinical Practice).

Table 1 shows some significant findings from each data source collected during the data collection stage. From the literature review, it was revealed that Agile methodologies have proven effective in the development of HRM applications in various industries. However, specific challenges related to HRM application development for pharmacies include flexibility, responsiveness, and compliance with pharmaceutical regulations. Interviews with pharmacy managers, HR staff, and potential users of the app highlighted critical needs for HRM app integration with existing pharmacy-drug management systems, as well as issues in work schedule management and employee performance evaluation. Surveys or case studies revealed the low adoption of HRM applications in pharmacies today and the interest of potential users in using HRM applications if they can fulfill their operational needs well. In addition, analysis of pharmaceutical industry regulations and standards highlighted stringent regulatory requirements, including data security and compliance with applicable pharmaceutical standards. Overall, these findings emphasize the importance of considering the pharmaceutical industry's unique context, specific operational needs, and regulatory requirements in developing HRM applications for pharmacies. By understanding these findings, research can proceed to the next stage in developing practical HRM applications that meet market needs.

Application Development

The application development phase using Extreme Programming (XP) produces essential outcomes to ensure successful application development. First, forming a development team of programmers, designers, and expert users ensured a diverse skill set and comprehensive perspective within the team. This step is a necessary foundation to ensure holistic app development that is responsive to user needs. Furthermore, creating user stories based on the results of data collection and user needs provides a clear and measurable direction for the development of each app feature. Pair programming plans and daily stand-up meetings provide structure and transparency in the development process,

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allowing the team to monitor progress and identify bottlenecks effectively. In addition, behavior-driven testing practices ensure that each app feature functions according to user expectations, improving the overall quality and reliability of the app. Finally, regular integration of changes and periodic testing of the entire application confirmed the team's commitment to quality and consistency in application development. By combining these steps, the application development phase using Extreme Programming (XP) significantly impacted the creation of a robust, responsive, and user-friendly application solution.

Table 2. Application Features

Features	Function
Employee Data Management	Allows users to record and manage employee information, including personal data, employment history, qualifications, and performance appraisals.
Automated Work Schedule	Generate work schedules based on pharmacy needs, employee availability, and predefined work rules, allowing users to manage schedule changes easily.
Leave and Absence Management	Enable employees to apply for leave and absence online, notify managers for approval, and automatically integrate leave and absence information into work schedules.
Employee Performance Reporting	Provide tools to evaluate employee performance, record achievements, set goals, and provide regular feedback to aid employee development.
Training and Development Management	Manage employee training and development programs, provide access to online courses, seminars, and other learning resources, and track training progress.

The analysis of the features shown in Table 2 illustrates various essential aspects of pharmacy human resource management. Employee data management enables comprehensive management of employee information, providing a basis for effective decision-making regarding human resource management. Meanwhile, automated work schedules and leave and absence management help optimize employee schedule and attendance management, reducing potential errors and schedule conflicts. The employee performance reporting feature provides a tool for systematic performance evaluation, which can be used as a basis for career development and employee-related decision-making.

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Furthermore, training and development management provides a means to enhance employee skills and knowledge through customized training programs, helping to strengthen workforce capacity and improve productivity. By integrating these features in HRM applications, pharmacies can increase operational efficiency, improve human resource management, and enhance organizational performance.

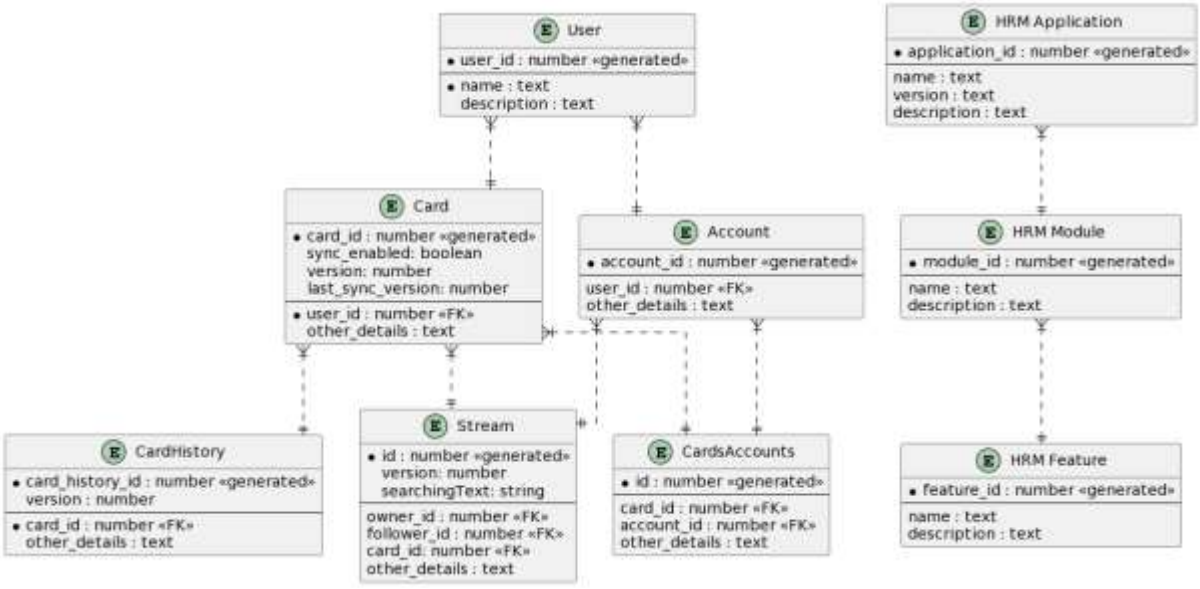

Figure 2. ER-Diagram

The Entity-Relationship Diagram (ERD), Figure 2, presents the data structure for the human resource management (HRM) application. This diagram includes main entities such as "User," "Card," "CardHistory," "CardsAccounts," "Account," and "Stream," as well as new entities such as "HRM Application," "HRM Module," and "HRM Feature." The data structure described includes attributes corresponding to the information that needs to be stored in the HRM application, and the relationships between the entities are reflected in the diagram. The modularity approach is also reflected through new entities that show the division of the application into separate modules and features. Overall, this diagram provides a comprehensive view of the structure and organization of data in the HRM application and helps in understanding the application architecture and the relationships between its components.

User Acceptance Evaluation

The outcome of the user acceptance evaluation phase is an essential step in the HRM application development cycle. Through beta trials with potential users in various pharmacies and surveys and interviews to gather feedback, this evaluation aimed to measure the effectiveness, usability, reliability, and user satisfaction with the developed application. Based on the data collected, the results showed that user satisfaction reached 82 percent. This information provides a positive picture of user acceptance and satisfaction with the app. In addition, functional testing has also been conducted to ensure that all application features function as expected. The evaluation data that has been thoroughly

analyzed is also used to identify possible areas of improvement and provide a basis for further development. Thus, this evaluation stage plays a crucial role in ensuring that the developed HRM application can meet the expectations and needs of users in an actual pharmacy environment, as well as supporting the success and wide adoption of the designed solution.

CONCLUSION

Developing a human resource management (HRM) application for pharmacies using Agile methodology has a significant positive impact. The HRM application was developed effectively through the stages of data collection, application development using the Extreme Programming method, user acceptance evaluation, and functional testing. The evaluation results showed that the user satisfaction rate reached 82%, indicating good application acceptance. In addition, functional testing has ensured that all features of the application function properly as expected. Thus, the use of Agile methodology in developing an HRM application for pharmacies provides flexibility in responding to changing needs and policies, improves the quality and efficiency of development, and ensures that the application meets the expectations and needs of users in the actual pharmacy environment. This conclusion confirms that the Agile approach effectively produces software solutions that can add significant value to the healthcare industry.

REFERENCE

Alghamdi, K. S., Petzold, M., Alsugoor, M. H., Makeen, H. A., Al Monif, K. H., & Hussain-Alkhateeb, L. (2023). Community pharmacists' perspectives towards automated pharmacy systems and extended community pharmacy services: An online cross-sectional study. *Exploratory Research in Clinical and Social Pharmacy*, *12*. https://doi.org/10.1016/j.rcsop.2023.100363

Beecham, S., Clear, T., Lal, R., & Noll, J. (2021). Do scaling agile frameworks address global software development risks? An empirical study. *Journal of Systems and Software*, *171*. https://doi.org/10.1016/j.jss.2020.110823

Chen, H., & Cui, X. (2022). Design and Implementation of Human Resource Management System Based on B/S Mode. *Procedia Computer Science*, *208*, 442–449. https://doi.org/10.1016/j.procs.2022.10.062

Dingsøyr, T., Nerur, S., Balijepally, V., & Moe, N. B. (2012). A decade of agile methodologies: Towards explaining agile software development. In *Journal of Systems and Software* (Vol. 85, Issue 6). https://doi.org/10.1016/j.jss.2012.02.033

Frestel, J., Teoh, S. W. K., Broderick, C., Dao, A., & Sajogo, M. (2023). A health integrated platform for pharmacy clinical intervention data management and intelligent visual analytics and reporting. *Exploratory Research in Clinical and Social Pharmacy*, *12*. https://doi.org/10.1016/j.rcsop.2023.100332

González Suárez, S., Marín Romero, A. M., Ballesteros Cabañas, G. I., Rial Domínguez, Y., Soy Muner, D., Juncos Pereira, R., Lesta Domene, C., & López-Cabezas, C. (2023).

Trazam project: A mobile application for the tracking of compounded preparations in a Pharmacy Department. *Farmacia Hospitalaria*. https://doi.org/10.1016/j.farma.2023.06.014

Kantola, K., Vanhanen, J., & Tolvanen, J. (2022). Mind the product owner: An action research project into agile release planning. *Information and Software Technology*, *147*. https://doi.org/10.1016/j.infsof.2022.106900

Kaur, J., Singh, O., Anand, A., & Agarwal, M. (2023). A goal programming approach for agile-based software development resource allocation. *Decision Analytics Journal*, *6*. https://doi.org/10.1016/j.dajour.2022.100146

Khan, O., Parvez, M., Kumari, P., Parvez, S., & Ahmad, S. (2023). The future of pharmacy: How AI is revolutionizing the industry. *Intelligent Pharmacy*, *1*(1), 32–40. https://doi.org/10.1016/j.ipha.2023.04.008

Lee, E. W. J., Lim, V. S. H., & Ng, C. J. K. (2022). Understanding public perceptions and intentions to adopt traditional versus emerging investment platforms: The effect of message framing and regulatory focus theory on the technology acceptance model. *Telematics and Informatics Reports*, *8*, 100024. https://doi.org/10.1016/j.teler.2022.100024

Martin, A. (2023). Introduction to an agile framework for the management of technology transfer projects. *Procedia Computer Science*, *219*, 1963–1968. https://doi.org/10.1016/j.procs.2023.01.496

Mishra, A., & Alzoubi, Y. I. (2023). Structured software development versus agile software development: a comparative analysis. *International Journal of System Assurance Engineering and Management*. https://doi.org/10.1007/s13198-023-01958-5

Najihi, S., Elhadi, S., Abdelouahid, R. A., & Marzak, A. (2022). Software Testing from an Agile and Traditional view. *Procedia Computer Science*, *203*, 775–782. https://doi.org/10.1016/j.procs.2022.07.116

Paasivaara, M., Behm, B., Lassenius, C., & Hallikainen, M. (2018). Large-scale agile transformation at Ericsson: a case study. *Empirical Software Engineering*, *23*(5). https://doi.org/10.1007/s10664-017-9555-8

Phanudulkitti, C., Puengrung, S., & Farris, K. B. (2023). Patient care and customer services during the COVID-19 pandemic at accredited pharmacies: Pharmacists and patients' perspectives. *Exploratory Research in Clinical and Social Pharmacy*, *12*. https://doi.org/10.1016/j.rcsop.2023.100336

Serrador, P., & Pinto, J. K. (2015). Does Agile work? - A quantitative analysis of agile project success. *International Journal of Project Management*, *33*(5). https://doi.org/10.1016/j.ijproman.2015.01.006

Shrivastava, S. V., & Rathod, U. (2014). Risks in Distributed Agile Development: A Review. *Procedia - Social and Behavioral Sciences*, *133*, 417–424. https://doi.org/10.1016/j.sbspro.2014.04.208

Tøndel, I. A., Cruzes, D. S., Jaatun, M. G., & Sindre, G. (2022). Influencing the security prioritisation of an agile software development project. *Computers and Security*, *118*. https://doi.org/10.1016/j.cose.2022.102744