Jurnal Ekonomi
Volume 13 , Number 02, 2024, DOI 10.54209/ekonomi.v13i02
ESSN 2721-9879 (Online)
https://ejournal.seaninstitute.or.id/index.php/Ekonomi

# Implementation Of Agile Methodology In Patient Medical Records Management At Dental Clinics: Analysis Of Pilot Testing And User Acceptance Evaluation

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**Article Info**
**Keywords:**
Patient Records Management,
Agile Methodology,
Dental Clinics.

**ABSTRACT**
This research aims to identify and analyze Agile solutions in patient medical record management at dental clinics. With a focus on developing Agile-based applications, this research involves stages of user needs analysis, application development, and user acceptance evaluation. A pilot test method is employed to test the application in randomly selected dental clinic environments. At the same time, user acceptance evaluation is conducted to measure the system's effectiveness in meeting user needs and improving workflow efficiency. The research findings indicate that implementing Agile solutions significantly enhances system responsiveness to changes, improves communication between clinic staff and patients, and enhances overall user satisfaction. This study makes a significant contribution to the development of information technology solutions focusing on user needs in the healthcare sector.



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## INTRODUCTION

Patient medical record management is a crucial aspect of the healthcare industry, including within the context of dental clinics(Al-Hassan & AlQahtani, 2019; Boonstra et al., 2021; Horita et al., 2023). In dental health, medical records serve as vital information foundations for practitioners to deliver quality services. These medical data encompass patient health history, examination results, diagnoses, treatment plans, and clinical condition progress notes. The importance of patient medical record management in dental clinics is evident from several perspectives(Al-Hassan & AlQahtani, 2019; Cheng et al., 2024; Ramli et al., 2023; Sachedina et al., 2023; Song et al., 2024). First, medical information's accuracy and well-documented nature ensure precise and efficient diagnostic processes. This is the basis for dentists to establish treatment plans tailored to patients' needs.

Medical record management also plays a significant role in legal and ethical contexts. Protecting patients' data and complying with healthcare privacy regulations are responsibilities of dental clinics. By securing patients' medical information, dental clinics maintain the integrity and trust of patients in the services provided. Another equally important aspect is

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holistic care coordination. Structured and integrated medical record data facilitate collaboration among various medical professionals, such as dentists, nutritionists, and other specialists. This enables medical teams to provide coordinated and comprehensive care for patients(Hossain et al., 2023; Ishimaru et al., 2023; Joda et al., 2020; Karunakaran et al., 2024; Kouhi et al., 2024; Pourhajibagher et al., 2023).

Therefore, this research aims to identify the main challenges in dental clinic patient records management and provide adaptive and practical solutions. Through a deep understanding of the importance of managing patient medical records, this research is expected to significantly enhance efficiency, data security, and service quality in dental clinics. In healthcare information system development, the Agile approach offers several significant advantages. First, flexibility in responding to user needs or changes in the business environment allows information systems to remain relevant and effective in supporting dental clinic operations(Altuwaijri & Ferrario, 2022; Behutiye et al., 2022; Dingsøyr & Lassenius, 2016; Gutierrez et al., 2019; Hinderks et al., 2022; Leong et al., 2023; López et al., 2022; Ouriques et al., 2023; Sarhadi et al., 2022; Senabre Hidalgo, n.d.; Wiechmann et al., 2022). Furthermore, a focus on intensive collaboration and communication among developers, stakeholders, and end-users helps ensure that the developed information systems genuinely meet user needs and expectations.

Implementing iterative development cycles in Agile, such as sprints and iterative testing, also allows for quick adjustments based on user feedback. This helps minimize the risk of errors or mismatches with actual needs. Thus, a comprehensive understanding of Agile concepts in information system development is crucial in this research. This research aims to combine the advantages of the Agile approach with the specific needs of patient medical record management in dental clinics to produce adaptive, practical solutions that continuously enhance efficiency and service quality.

One of the main challenges is the complexity of patient medical data in dental clinics, which includes information such as treatment history, examination results, treatment plans, and other health records. The availability of fast and accurate information is crucial to support precise diagnosis and effective treatment planning. Moreover, privacy and security of medical information are crucial issues that must be carefully addressed, given the sensitivity of patient medical data. On the other hand, the Agile concept in information system development offers a responsive, collaborative, and value-oriented approach to iterative delivery. Implementing Agile in the context of patient medical record management in dental clinics can improve operational efficiency, responsiveness to user needs, and overall service quality.

This research aims to identify the challenges faced in patient medical record management in dental clinics and to present adaptive and responsive solutions to change using the Agile approach. This research will likely significantly improve efficiency, service quality, and patient satisfaction in dental clinics by implementing innovative and measurable solutions.

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## METHODS

This research combines three critical stages in developing Agile solutions for patient medical record management in dental clinics as shown in Figure 1. The first stage is user needs analysis, where interviews and surveys are conducted to understand the challenges faced by clinic staff. The second stage involves Agile-based application development, which involves designing prototypes responsive to change and ensuring the implementation of key features such as data security and optimal accessibility. Finally, the user acceptance evaluation stage places the application in a pilot test in a clinic environment to observe user interactions and obtain feedback to improve and enhance the application overall. The entire process is designed to create adaptive, effective, and user-acceptable solutions for enhancing patient medical record management in dental clinics.

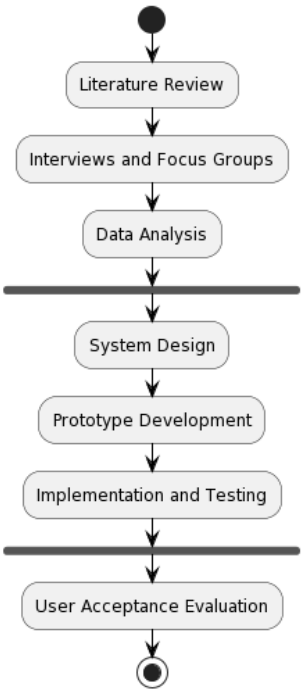


**Figure 1.** Research Stages

### User Needs Analysis

In the user needs analysis stage, this research involves in-depth interviews and surveys with dental clinic staff to understand the main challenges they face in patient medical record management. This analysis also includes tracing existing systems to identify shortcomings and strengths that can be improved. The results of this stage provide a comprehensive overview of user needs and issues to be addressed in the development of new solutions.

### Application Development

Next, in the application development stage, an Agile approach is applied by designing system prototypes that are responsive to change and taking into account the previously identified user needs. Software developers work collaboratively with experts and end-users to

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ensure that key features such as data security, accessibility, and user-friendliness are well-implemented in the developed application.

### User Acceptance Evaluation

The final stage is user acceptance evaluation. After the application is developed, we conduct beta testing sessions with a small group of potential users, including emergency dental patients and dentists, to test the functionality and usability of the application. Feedback and evaluations obtained from beta testing users are then used to iterate and improve the application before its official launch. Additionally, we also conduct a final evaluation of the application based on pre-established user acceptance criteria to determine the readiness of the application for widespread use in emergency dental care services. By following these stages systematically, we ensure that the emergency dental care application we develop can provide optimal benefits to users and meet expected quality standards.

## RESULTS AND DISCUSSION

### User Needs Analysis

The results of the user needs analysis stage reveal significant findings regarding patient medical record management in dental clinics. Based on interviews and surveys with dental clinic staff, including dentists, nurses, and administrative personnel, it was found that the main challenges faced are the complexity of medical data, limitations in real-time information accessibility, and the need for a more efficient and integrated system. Furthermore, analysis of existing medical record management systems in dental clinics revealed strengths such as relatively structured data management and weaknesses such as limitations in system integration and inadequate information availability. Feedback from patients also provides valuable perspectives, with many expressing expectations for faster information access, assured data privacy, and ease of access to their medical records. Data collected and analyzed from this stage indicate a clear need for more adaptive, responsive to change, and integrated solutions in patient medical record management in dental clinics. These findings serve as an important basis for the subsequent application development stage to design solutions that align with user needs and expectations.

**Table 1.** Data Collection Results

| Stakeholder | Key Needs | Challenges Addressed | Expectations and Desires |
|---|---|---|---|
| Dentists | Quick access to patient records | - Complexity of medical data | - Structured system for easy data retrieval |
| | Efficient data entry and updating | - Integration with existing clinic systems | - Real-time information updates |
| | Secure data storage and privacy | - Data privacy and security | - Enhanced data security measures |

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| | | | |
|---|---|---|---|
| Nurses | Accurate and complete medical information | - Limited accessibility to patient records | - Integrated system for comprehensive patient data |
| | Easy retrieval of patient data | - Time-consuming data entry | - Streamlined data entry processes |
| | Efficient communication with other staff | - Communication gaps between departments | - Improved communication channels |
| Administrative Staff | Streamlined administrative processes | - Disjointed administrative systems | - Integrated administrative platform |
| | Easy access to patient records | - Access restrictions | - Enhanced user access permissions |
| | Effective data management and reporting | - Data accuracy and completeness | - Improved reporting capabilities |
| Patients | Accessible medical information | - Limited patient access to records | - User-friendly patient portal for accessing records |
| | Data privacy and confidentiality | - Privacy concerns | - Secure data storage and confidentiality measures |
| | Ability to communicate with healthcare providers | - Communication barriers | - Improved communication channels with healthcare providers |

The results of this stage are summarized in Table 1, which presents stakeholders' expectations in patient medical record management at dental clinics. It can be concluded that each stakeholder group has unique needs and different challenges. Dentists require a structured system, quick access to medical records, and robust data security, while nurses seek an integrated system for efficient data management and smooth communication. Administrative personnel are looking for an integrated and efficient administrative platform, while patients expect easy access to medical information, assured data privacy, and better communication with healthcare providers. Understanding and meeting these needs will enhance efficiency, data security, and user satisfaction in dental clinic patient medical record management.

**Application Development**

Based on Agile principles, the application development stage for patient medical record management systems at dental clinics begins with designing system prototypes based on user needs analysis. Subsequently, the collaboration process with the software development team involves implementing Agile principles such as iterative development, continuous feedback, and adaptability to changes to build the actual application. This stage also involves integrating key features such as secure data storage, easy access to patient medical records, real-time updates into the application, and implementing a user-friendly interface. Alpha and

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beta testing are conducted progressively to identify and fix bugs, usability issues, and functionality gaps before the official launch of the application, making the application development process systematic and measurable.

**Table 2**. Features

| Features | Function of the Feature |
|---|---|
| Secure Data Storage | Stores patient medical records securely and encrypted. |
| Easy Access to Patient Records | Enables clinic staff to quickly access patient medical records. |
| Real-time Updates | Provides real-time updates to medical data when changes occur. |
| Comprehensive Data Management | Allows for comprehensive and structured management of medical data. |
| Integration with Existing Systems | Integrates the application with other existing systems in the clinic. |
| Enhanced Data Security | Implements security measures to protect patient data privacy. |
| Efficient Communication Channels | Facilitates efficient communication between clinic staff and patients. |

Table 2 outlines the features of the patient medical record management application in dental clinics, along with their respective functions. The secure data storage feature aims to store and encrypt patient medical records securely. Subsequently, the easy access to patient medical records feature allows clinic staff to access patient medical data quickly. The real-time update feature provides the latest medical information as changes occur. The comprehensive data management feature also enables complete and structured medical data management. Integration with other systems in the clinic allows the application to interact with existing systems. The enhanced data security feature aims to protect patient data privacy, while the efficient communication channel feature helps facilitate smooth communication between clinic staff and patients. These features enhance efficiency, data security, and user experience in inpatient medical record management in the dental clinic environment.

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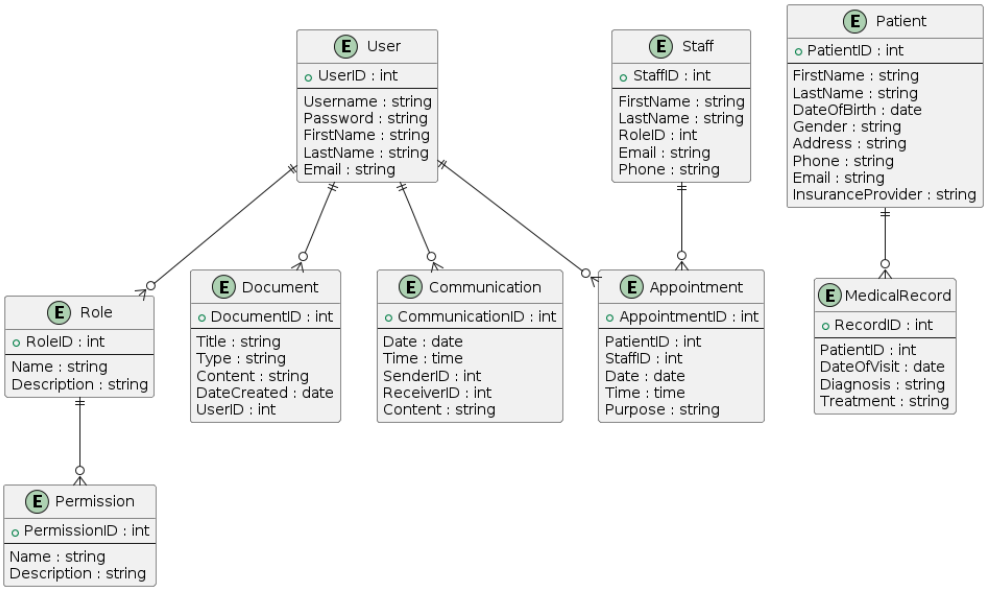


**Figure 3.** ERD

The entity Relationship Diagram (ERD) in Figure 2 reflects the structure and relationships between key entities in the application of patient medical record management at dental clinics. The "User" entity depicts user information such as username, password, and contact details, while "Role" and "Permission" provide an overview of the roles and access rights held by users in the system. Related entities handle medical documents, communications, and appointments to provide adequate data management and interaction within the application. Furthermore, the "Patient" and "MedicalRecord" entities represent patient medical information and their medical records, while "Staff" and "Appointment" manage clinic staff information and patient visit schedules. All entities are interconnected through relationships depicted in the ERD, creating a structured information flow and enabling efficient medical data management and effective communication within the dental clinic.

### User Acceptance Evaluation

The User Acceptance Evaluation stage results begin with implementing the developed application in a pilot test at one randomly selected dental clinic. During the one-month pilot test period, observations and feedback are collected from users, including clinic staff (dentists, nurses, and administrative personnel) and patients using the new system. After the pilot test period ends, user feedback and collected performance metrics are analyzed. This analysis aims to evaluate the system's effectiveness in meeting user needs, improving workflow efficiency, and enhancing overall user satisfaction. Based on the results of the analysis, iterative application improvements have been made. Improvements are made considering user feedback and making necessary adjustments to ensure optimal user acceptance and usability before the official launch of the application. This process ensures that the application can effectively address user needs and provide a satisfying user experience, thus supporting the successful implementation of the patient medical record management system at dental clinics.

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## CONCLUSION

Based on this research, implementing Agile solutions in patient medical record management at dental clinics significantly enhances efficiency, responsiveness to change, and overall user satisfaction. Through the Agile approach, clinics can develop more adaptive applications to user needs and the constantly changing medical environment. Pilot testing and user acceptance evaluation are essential to align the application with practical needs and user expectations. Integrating key features such as secure data storage, easy access to medical records, real-time updates, and user-friendly interfaces also supports improvements in medical information management and interaction between clinic staff and patients. Thus, implementing Agile solutions is expected to optimize patient medical record management and improve healthcare service quality at dental clinics.

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