

# Mobile App for Dental Patient Feedback and Satisfaction Surveys: an Agile Development Perspective

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Article Info	ABSTRACT
<p><b>Keywords:</b> Patient Feedback, Agile Methodology, Dental Clinics.</p>	<p>This research examines the development of a dental patient feedback application using the Agile Development approach, focusing on collecting and analyzing patient feedback to enhance the quality of dental healthcare services. The research problem investigates the challenges in effectively collecting and analyzing patient feedback and the need for responsive and adaptive solutions. The research methodology includes user needs analysis, Agile-based application development, user acceptance evaluation through beta testing, and user feedback data analysis. The research findings indicate that using Agile Development can produce an application that effectively supports the collection of patient feedback and receives positive user acceptance. This research contributes to developing an application that can enhance the quality of dental healthcare services through responsive integration of patient feedback and the use of an adaptive and flexible development approach.</p>
<p>This is an open access article under the <a href="https://creativecommons.org/licenses/by-nc/4.0/">CC BY-NC</a> license</p> 	<p><b>Corresponding Author:</b> Denny Jean Cross Sihombing Atma Jaya Catholic University of Indonesia Jakarta, Indonesia <a href="mailto:denny.jean@atmajaya.ac.id">denny.jean@atmajaya.ac.id</a></p>

## INTRODUCTION

In recent decades, the advancement of information technology has transformed various fields, including the healthcare industry (Bhat et al., 2023; Das et al., 2021; Mahdi et al., 2023). Amidst this digital revolution, mobile applications have become a primary means of providing more affordable and accessible healthcare services to the public. In dental care, mobile application technology offers significant potential to enhance interaction between patients and dental practitioners. Patient feedback is crucial in improving the quality of healthcare services, including dental care. By understanding patients' expectations, needs, and experiences, dental practitioners can enhance their practices and provide more effective and meaningful services (Kouhi et al., 2024; Nitschke et al., 2024; Phanudulkitti et al., 2023). However, challenges arise in effectively and efficiently collecting and analyzing patient feedback comprehensively.

One of the main challenges dental practitioners face is collecting and analyzing patient feedback effectively. It is often difficult for patients to provide feedback directly in busy environments. Additionally, there is a need for an effective system to manage and analyze this feedback data to provide valuable insights to practitioners. Recognizing these

challenges, there is a strong desire to develop effective and responsive solutions for collecting and analyzing dental patient feedback. In the current digital era, mobile application technology is one promising approach to facilitate this process. Mobile applications can serve as efficient means to collect feedback data in real-time and provide quick responses to patient needs.

The main objective of this research is to develop a mobile application that can assist dental practitioners in collecting, analyzing, and responding to patient feedback more effectively. This application is designed to provide a better patient experience by providing feedback and providing dental practitioners with relevant data to improve their services. The primary benefits of developing this mobile application are enhancing patient satisfaction and overall efficiency of dental healthcare services. By collecting feedback regularly and comprehensively, dental practitioners can better respond to patient needs, improve service processes, and enhance the overall patient experience. Patient feedback plays a crucial role in improving the quality of dental care services. Dental practitioners can provide more personalized and effective care by understanding patients' preferences and needs (Al-Hassan & AlQahtani, 2019; Chau et al., 2024; Cheng et al., 2023; Sachedina et al., 2023; Song et al., 2024). Therefore, it is essential to have adequate means for collecting and analyzing this feedback. The Agile Development approach is utilized to develop a mobile application for dental patient feedback. This method emphasizes flexibility, responsiveness, and collaboration between developers and users. Thus, the application can be developed iteratively, allowing changes based on user feedback and market needs (Dingsøyr et al., 2012; Santos et al., n.d.; Serrador & Pinto, 2015).

The main advantage of the Agile Development approach is its ability to quickly and efficiently respond to changes in user needs (Alami et al., 2022, 2023; Batliner et al., 2022; Beecham et al., 2021; Estrada-Esponda et al., 2024; Mero et al., 2022; Ouriques et al., 2023; Paasivaara et al., 2018; Sarhadi et al., 2022; Tøndel et al., 2022; Udvaros et al., 2023). This enables developers to produce products that align with user expectations, reduce project failure risks, and enhance end-user satisfaction. Mobile applications have brought significant healthcare monitoring and treatment benefits, including dental care. Patients can easily monitor their dental care schedules, receive reminders, and even consult with dental practitioners remotely. This not only improves service accessibility but also gives patients greater control over their dental health. In designing a mobile application for dental patient feedback, several key features include easily accessible feedback forms, appointment reminders, information about dental care, and online consultation services. These features are designed to provide a pleasant and beneficial experience for application users. Aside from existing features, it is essential to consider technical and security aspects when developing this mobile application. A robust technical architecture and strong data protection will be top priorities to ensure that users safely use this application and preserve patients' information privacy.

In implementing Agile Development, various methods and tools will be used to support the iterative development of the mobile application. This includes using Scrum methodology, project management tools such as Jira, and continuous testing to ensure applica-

tion quality and security. The collected patient feedback data will be statistically analyzed to gain deeper insights into patient preferences, needs, and satisfaction levels. This analysis will be the basis for evaluating the application's success in meeting its predefined goals. The developed mobile application will have an intuitive user interface, easily accessible features, and a responsive user experience. This aims to increase the application's user adoption and ensure effective use in collecting patient feedback. This research is expected to contribute meaningfully to developing healthcare applications, particularly dental care. Furthermore, the successful use of Agile Development in developing this application will provide valuable insights and lessons for other practitioners and developers in adopting responsive and flexible methods in software development.

## METHODS

This research encompasses three main stages: user needs analysis, application development, and user acceptance evaluation, focusing on developing a mobile application for collecting dental patient feedback. The user needs analysis stage involves surveys and in-depth analysis of user expectations, needs, and challenges. Application development involves iterative design, development, and testing to ensure the application has features that align with user needs. User acceptance evaluation is conducted through beta testing and user feedback analysis to evaluate the application's effectiveness and feasibility. The results of this research are expected to significantly contribute to improving the quality of dental healthcare services through responsive and effective mobile application technology.

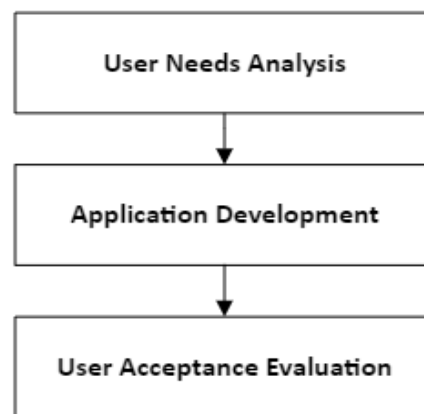


Figure 1. Research Stages

### User Needs Analysis

In the initial stage of this research, an in-depth analysis of user needs, particularly those of dental patients and practitioners, was conducted. A preliminary survey was carried out to identify the expectations, requirements, and challenges faced in collecting dental patient feedback. Both quantitative and qualitative data were collected through interviews, questionnaires, and direct observations. A thorough analysis of this data was performed to identify common patterns and desired preferences of both parties. A comprehensive report of the user needs analysis findings, recommendations, and guidelines was compiled to serve as the basis for further development of the mobile application.

### Application Development

Upon gaining a deep understanding of user needs, the second stage focused on developing a responsive mobile application. Wireframes and initial prototypes were created based on the results of the user needs analysis. Key features such as feedback forms, appointment reminders, and treatment history were meticulously designed. The development process involved iterations and internal testing to ensure optimal functionality and security. Initial testing with a small number of beta users was conducted to gather feedback and address identified shortcomings.

### User Acceptance Evaluation

The final stage of this research involved evaluating user acceptance of the developed mobile application. Beta testing was conducted with a large number of users to measure user acceptance and satisfaction with the application. Feedback received regarding the user experience, usability of features, and improvement suggestions were analyzed in-depth. The results of this evaluation were used to assess the success of the application in meeting user needs and identify areas for improvement or enhancement for future versions. A detailed report of the user acceptance evaluation was prepared, containing findings, recommendations, and conclusions regarding the feasibility and effectiveness of the developed mobile application.

## RESULTS AND DISCUSSION

### User Needs Analysis

The results of the User Needs Analysis stage showed that the initial survey conducted with dental patients and practitioners provided a deep understanding of the needs and expectations related to patient feedback. From this survey, it was revealed that patients expect an easily accessible means to provide feedback about their experiences during dental care. Meanwhile, dental practitioners hope to receive feedback that can help improve the quality of services they provide. The collection of quantitative and qualitative data through interviews, questionnaires, and direct observations also provided valuable insights. The data analysis successfully identified common patterns, preferences, and challenges faced by patients and dental practitioners in giving and receiving feedback. Based on the analysis findings, a report of the user needs analysis was compiled, including findings, recommendations, and guidelines for the development of the mobile application. This report serves as a strong foundation for further development in creating a responsive mobile application that meets user needs in the context of dental patient feedback.

**Table 1.** Data Collection Results

Stakeholder	Primary Needs	Challenges Addressed	Expectations and Desires
Patients	Easily accessible means to provide feedback	Time constraints and accessibility limitations in providing direct feedback	Real-time and user-friendly feedback mechanism to enhance dental care experience
Dental Practi-	Feedback to im-	Challenges in effectively	Feedback that aids in im-

Stakeholder	Primary Needs	Challenges Addressed	Expectations and Desires
tioners	prove service quality	managing and implementing patient feedback	proving service effectiveness and patient satisfaction

### Application Development

Based on the results of the user needs analysis, a wireframe design and initial mobile application prototype were developed. The wireframe, as depicted in Figure 2, serves as the foundation for illustrating the layout and navigation of the application. At the same time, the initial prototype provides a more concrete visual representation of the critical features to be included in the application.

The development process of the mobile application is carried out with a focus on features that support the collection of patient feedback, such as easily accessible feedback forms, appointment reminders to assist patients in scheduling treatments, and treatment history features to monitor patients' dental treatment history systematically. The Entity-Relationship Diagram (ERD) prepared for the dental patient feedback application demonstrates a complex database structure to support application functionalities, as depicted in Figure 3. There are five main entities interconnected in this ERD: the Patient entity, Dentist entity, Appointment entity, Feedback entity, and DentalOffice entity.

The Patient entity stores patients' personal and contact information, such as name, date of birth, gender, contact number, email address, home address, city, province, and postal code. This information is crucial for effectively identifying and managing patient data within the application. The Dentist entity records information about dentists, including specialization, contact number, practice address, and other contact information. This entity enables the management of information about dentists involved in patient care services.

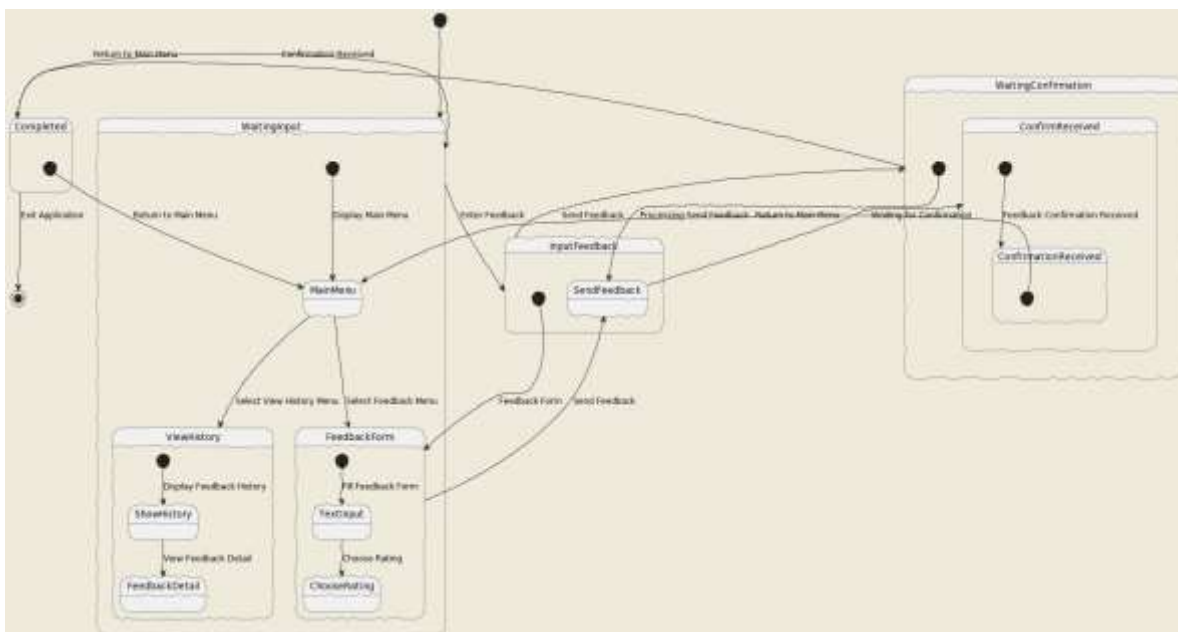


Figure 2. Wireframe

The Appointment entity records details of appointments between patients and dentists, such as date, time, procedure type, appointment status, and additional notes. This information aids in scheduling and managing dental care services. The Feedback entity stores feedback provided by patients regarding dental care services. This feedback data includes date, feedback text, rating score, and related information about patients and their associated appointments.

The DentalOffice entity records information about dental offices or practices, such as office name, address, city, province, postal code, and contact number. This information assists in managing practice locations and service scheduling. This ERD shows that the dental patient feedback application has a robust and well-organized database structure to support critical functions such as patient management, appointment scheduling, feedback management, and information about dentists and their offices. This ERD analysis provides a clear insight into the relationships between the leading entities in the application, enabling the design and development of an efficient and responsive database system to meet user needs.

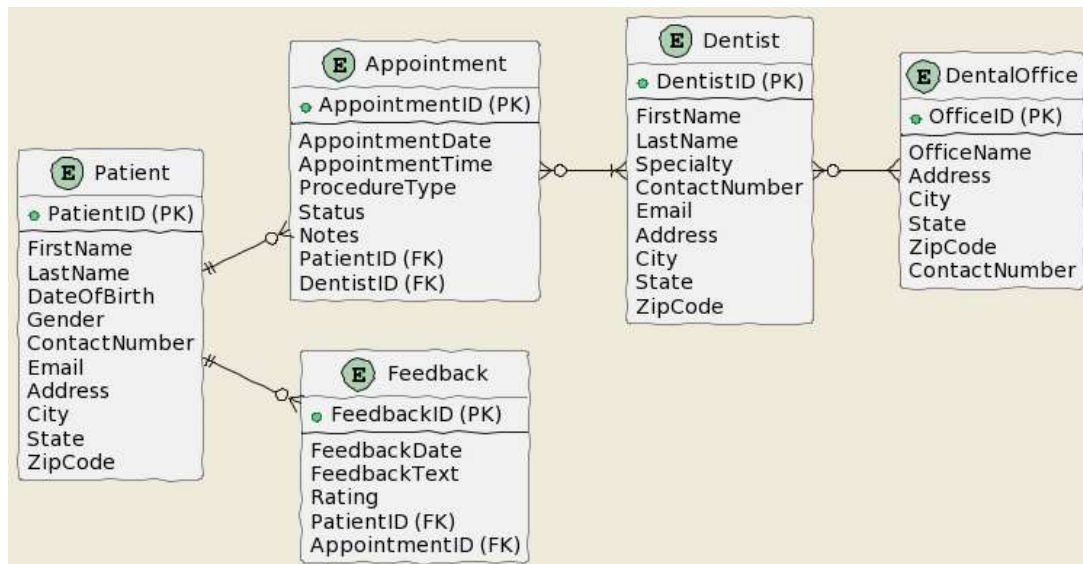


Figure 3. ERD

### User Acceptance Evaluation

Beta testing of the application with many users has been conducted to measure user acceptance and satisfaction. In this beta testing phase, many users from diverse backgrounds and experiences were utilized to identify potential issues and assess the success of application features. During the beta testing, feedback was collected from users regarding their experience with the application, usability of features, and improvement suggestions. Users were asked to provide input directly through surveys, interviews, and observations of their interactions with the application. User feedback data was then comprehensively analyzed to evaluate the application's success meeting user needs and expectations. This analysis included application performance, user interface, feature usability, satisfaction

level, and potential improvements or enhancements. Based on the results of the analysis, a user acceptance evaluation report was prepared, including findings, improvement recommendations, and conclusions regarding the feasibility and effectiveness of the mobile application. This report provides a clear overview of how users respond to and accept the application and provides guidance for further improvement or development steps to enhance user experience and overall dental health service quality.

## CONCLUSION

From the research on developing the dental patient feedback application from an Agile development perspective, this application has great potential to improve the quality of dental health services and strengthen the relationship between patients and dental practitioners. Several significant findings and conclusions can be identified based on the analysis conducted in the research stages, including user needs analysis, application development, user acceptance evaluation, and overall analysis. In the user acceptance evaluation stage, the beta testing results indicated a positive level of acceptance and satisfaction from a significant number of users, with feedback appreciating the usability of features, user-friendly interface, and overall application performance. Analysis of user feedback data also provided valuable insights into areas that can be improved or enhanced to enhance user experience and application effectiveness. Developing the dental patient feedback application with the Agile Development approach significantly impacts dental health care. By adhering to adaptive and responsive development principles and integrating continuous user feedback and evaluation, this application can become a highly effective tool in improving patient satisfaction, service efficiency, and overall dental care quality.

## REFERENCE

- Alami, A., Krancher, O., & Paasivaara, M. (2022). The journey to technical excellence in agile software development. *Information and Software Technology*, 150. <https://doi.org/10.1016/j.infsof.2022.106959>
- Alami, A., Zahedi, M., & Krancher, O. (2023). Antecedents of psychological safety in agile software development teams. *Information and Software Technology*, 162. <https://doi.org/10.1016/j.infsof.2023.107267>
- Al-Hassan, M., & AlQahtani, S. (2019). Preparedness of dental clinics for medical emergencies in Riyadh, Saudi Arabia. *Saudi Dental Journal*, 31(1), 115–121. <https://doi.org/10.1016/j.sdentj.2018.11.006>
- Batliner, M., Boës, S., Heck, J., & Meboldt, M. (2022). Linking Testing Activities with Success in Agile Development of Physical Products. *Procedia CIRP*, 109, 146–154. <https://doi.org/10.1016/j.procir.2022.05.228>
- 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>

- Bhat, S., Birajdar, G. K., & Patil, M. D. (2023). A comprehensive survey of deep learning algorithms and applications in dental radiograph analysis. In *Healthcare Analytics* (Vol. 4). Elsevier Inc. <https://doi.org/10.1016/j.health.2023.100282>
- Chau, R. C. W., Thu, K. M., Yu, O. Y., Hsung, R. T. C., Lo, E. C. M., & Lam, W. Y. H. (2024). Performance of Generative Artificial Intelligence in Dental Licensing Examinations. *International Dental Journal*. <https://doi.org/10.1016/j.identj.2023.12.007>
- Cheng, F. C., Chang, W. C., & Chiang, C. P. (2023). Specific actions of Taiwan's dental community for the one health issue. In *Journal of Dental Sciences*. Association for Dental Sciences of the Republic of China. <https://doi.org/10.1016/j.jds.2023.12.014>
- Das, A. K., Islam, M. N., Billah, M. M., & Sarker, A. (2021). COVID-19 pandemic and healthcare solid waste management strategy – A mini-review. In *Science of the Total Environment* (Vol. 778). Elsevier B.V. <https://doi.org/10.1016/j.scitotenv.2021.146220>
- 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>
- Estrada-Esponda, R. D., López-Benítez, M., Matturro, G., & Osorio-Gómez, J. C. (2024). Selection of software agile practices using Analytic hierarchy process. *Heliyon*, 10(1). <https://doi.org/10.1016/j.heliyon.2023.e22948>
- Kouhi, M., de Souza Araújo, I. J., Asa'ad, F., Zeenat, L., Bojedla, S. S. R., Pati, F., Zolfagharian, A., Watts, D. C., Bottino, M. C., & Bodaghi, M. (2024). Recent advances in additive manufacturing of patient-specific devices for dental and maxillofacial rehabilitation. In *Dental Materials*. Elsevier Inc. <https://doi.org/10.1016/j.dental.2024.02.006>
- Mahdi, S. S., Battineni, G., Khawaja, M., Allana, R., Siddiqui, M. K., & Agha, D. (2023). How does artificial intelligence impact digital healthcare initiatives? A review of AI applications in dental healthcare. In *International Journal of Information Management Data Insights* (Vol. 3, Issue 1). Elsevier B.V. <https://doi.org/10.1016/j.jjime.2022.100144>
- Mero, J., Leinonen, M., Makkonen, H., & Karjaluo, H. (2022). Agile logic for SaaS implementation: Capitalizing on marketing automation software in a start-up. *Journal of Business Research*, 145, 583–594. <https://doi.org/10.1016/j.jbusres.2022.03.026>
- Nitschke, I., Slashcheva, L. D., John, M. T., & Jockusch, J. (2024). DENTAL PATIENT-REPORTED OUTCOMES IN GERIATRIC DENTISTRY: A call for clinical translation. *Journal of Evidence-Based Dental Practice*, 24(1). <https://doi.org/10.1016/j.jebdp.2023.101958>
- Ouriques, R., Wnuk, K., Gorschek, T., & Svensson, R. B. (2023). The role of knowledge-based resources in Agile Software Development contexts. *Journal of Systems and Software*, 197. <https://doi.org/10.1016/j.jss.2022.111572>
- 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>
- Sachedina, T., Sohal, K. S., Owibingire, S. S., & Hamza, O. J. M. (2023). Reasons for Delay in Seeking Treatment for Dental Caries in Tanzania. *International Dental Journal*, 73(2), 296–301. <https://doi.org/10.1016/j.identj.2022.07.012>
- Santos, R., Cunha, F., Rique, T., Perkusich, M., Almeida, H., Perkusich, A., & Icaro Costa, ' (n.d.). *A Comparative Analysis of Agile Teamwork Quality Instruments in Agile Software Development: A Qualitative Approach*. <https://doi.org/10.18293/DMSVIVA2023-217>
- Sarhadi, P., Naeem, W., Fraser, K., & Wilson, D. (2022). On the Application of Agile Project Management Techniques, V-Model and Recent Software Tools in Postgraduate Theses Supervision. *IFAC-PapersOnLine*, 55(17), 109–114. <https://doi.org/10.1016/j.ifacol.2022.09.233>
- 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>
- Song, C., Liu, R., Kong, B., Gu, Z., & Chen, G. (2024). Functional hydrogels for treatment of dental caries. In *Biomedical Technology* (Vol. 5, pp. 73–81). KeAi Communications Co. <https://doi.org/10.1016/j.bmt.2023.05.002>
- 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>
- Udvaros, J., Forman, N., & Avornicului, S. M. (2023). Agile Storyboard and Software Development Leveraging Smart Contract Technology in Order to Increase Stakeholder Confidence. *Electronics (Switzerland)*, 12(2). <https://doi.org/10.3390/electronics12020426>