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Development of a Mobile-Based Personal Health Record for Mothers and Children Using Glide App: A Usability Study

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Abstract.The increasing need for efficient personal health records (PHRs) for mothers and children has driven the development of innovative healthcare solutions. This study presents the development and evaluation of "SIKIA," a PHR application created using the Glide App. SIKIA aims to streamline health data management and enhance accessibility for mothers and children.The research methodology involved developing the SIKIA app, followed by user trials and an evaluation using the System Usability Scale (SUS). A group of mothers with young children, pregnant woman, and midwifes participated in the study, testing the application and providing feedback on its usability and functionality.The results indicate that SIKIA is well-received by users. The SUS scores demonstrate high user satisfaction, with users praising the app's ease of use, accessibility, and comprehensive health data management capabilities. The positive feedback highlights SIKIA's potential as a valuable tool in personal health record management, addressing the specific needs of mothers and children. This study underscores the importance of user-friendly PHRs in improving health outcomes and healthcare service efficiency. By providing a seamless platform for health data management, SIKIA can contribute significantly to the well-being of mothers and children. The findings suggest that further development and broader implementation of SIKIA could enhance healthcare delivery and patient engagement in personal health management.
Keywords:personal health record, mobile, mother and children

I.BACKGROUND

Corona Virus Disease 2019 (COVID-19) pandemic has greatly influenced health policies around the world [1]. Everyone focused on finding ways to deal with COVID-19, even though other health problems also need severe treatment [2].One of the government's current focuses in the health sector is accelerating the reduction of malnutrition in mothers and children. In line with the global targets contained in the Sustainable Development Goals (SDGs) in 2030, namely the target to eliminate all forms of malnutrition in children under five, adolescent girls, pregnant and lactating mothers, and the elderly [3]. The data on maternal and child health can be documented through health records.Information and Communication Technology (ICT) has changed the management of healthcare around the world. One of the main drivers of this change is the existence of Electronic Medical Records (EMR). EMR is an electronic record containing information about an individual's health that is created, collected, managed, and consulted by physicians and authorized staff within a health care organization [4]. However, this EMR only reflects the view of data from health care providers without involving patients in controlling or interacting with their health data. But with the development of technology, as it is now, it is no longer impossible for health data in health care facilities to be accessed by patients. This data can be accessed by recording personal health [5]. The implementation of personal health records (PHR) increased exponentially. With the PHR, it is hoped that patients can monitor and directly access their health data to raise awareness of their health [6].

PHR can be physical or electronic, which includes all self-reported and self-generated health data, including health care data, vital signs records, medicines, calories, and activities recorded with personal devices such as smartphones [7] [8]. In this era of information technology, many innovators are developing mobile-based applications related to maternal and child health [9]. Based on this background, considering the importance of personally monitoring the health of mothers and children and applications in circulation, there is still some lack of menus, features, and data items in similar applications currently circulating. The authors are interested in designing a mobile health record application. Personal maternal and child with menus, features, and data items that make it easier for users. This design intends to create an application for personal recording of maternal and child health conditions to determine whether the user is indicated to be malnourished or not. The author-designed application records will be inputted independently by the patient after an independent examination. Besides that, this application is integrated with other applications used by health workers so that the user (mother) can access her medical data or her child's medical data. The more people care about their nutritional needs, the higher the chances of achieving the SDGs targets.This paper aims to design and build a mobile-based application for personal health records for maternal and children. Meanwhile, the specific objectives include: (1) Analyzing user requirements; (2) Creating a Unified Modeling

Language (UML) consisting of use cases and activity diagrams, as well as databases and user interface designs; (3) Creating a personal health record application using the glide app; (4) Conduct product trials; and (5) Conduct product evaluation.

II.METHOD

The method in this design uses the waterfall model method. The waterfall method is systematic and sequential from the system development process, which means a series of processes whose output conditions are influenced by previous input conditions where the process is sequential according to time. The graphical representation of the waterfall method can be seen in Figure 1.

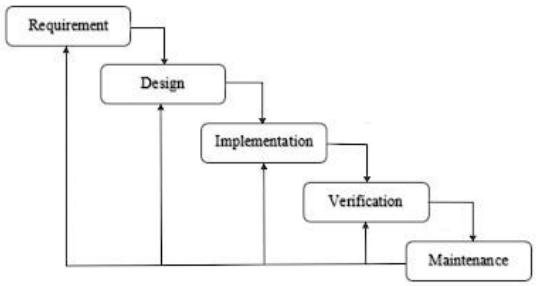


Figure 1. Waterfall Model

III.RESULTS AND DISCUSSION

Subject and Object

The subjects in the design of this application consisted of seven informants, including two midwives, two medical recorders, and three mothers as direct users of this application. The design subject criteria for midwives and medical recorders are those who work in primary health care facilities. The selected midwives are stakeholders directly related to the maternal and child health program. Then medical recorders are chosen with the criteria of understanding the implementation of personal medical records. At the same time, the requirements for the design subject for mothers are pregnant women and mothers who already have children under six years of age. As for the object of design are several applications similar to the topic of this research.

Requirements

The first step in this design is to analyze user needs. Requirements analysis was obtained by observing similar applications, studying maternal and child health books documentation, and conducting interviews with participants. The results of the requirements process that the maternal and child health application (SIKIA) consisted of a homepage menu, self-medication, medical records, supporting examinations, graphics, integrated ANC, pregnancy risk checks, development checks, immunizations, reminders, education, location of health facilities, and profiles. Requirements analysis is the initial stage that describes the system services, constraints, and goals to be achieved by determining the needs using user deliberation [10]. The results are collected and used as system specifications. The requirements were obtained from the 2020 edition of the MCH Handbook published by the Ministry of Health and JICA (2020). Then the independent screening of pregnant women was obtained from the Scoring of Early Detection of Risks for Pregnant Women, to reduce maternal and infant mortality. In addition, this application also contains a child development screening menu which divides the developmental status of children into three categories, namely "age-appropriate", "doubtful", and "deviant".

Design

This process design creates a Unified Modeling Language (UML) [11], consisting of one factor and 16 use cases seen in Figure 2. UML was created using draw.io online application tools, the database was created using a google spreadsheet, and the user interface was created using Figma [12] to design application icons and logos and use the glide app. The application display can be seen in Figure 3.

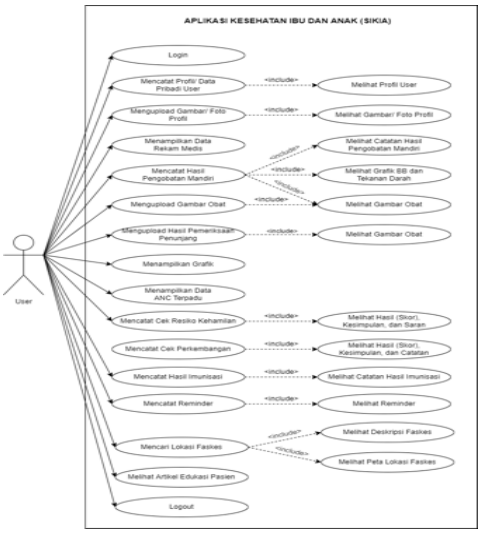
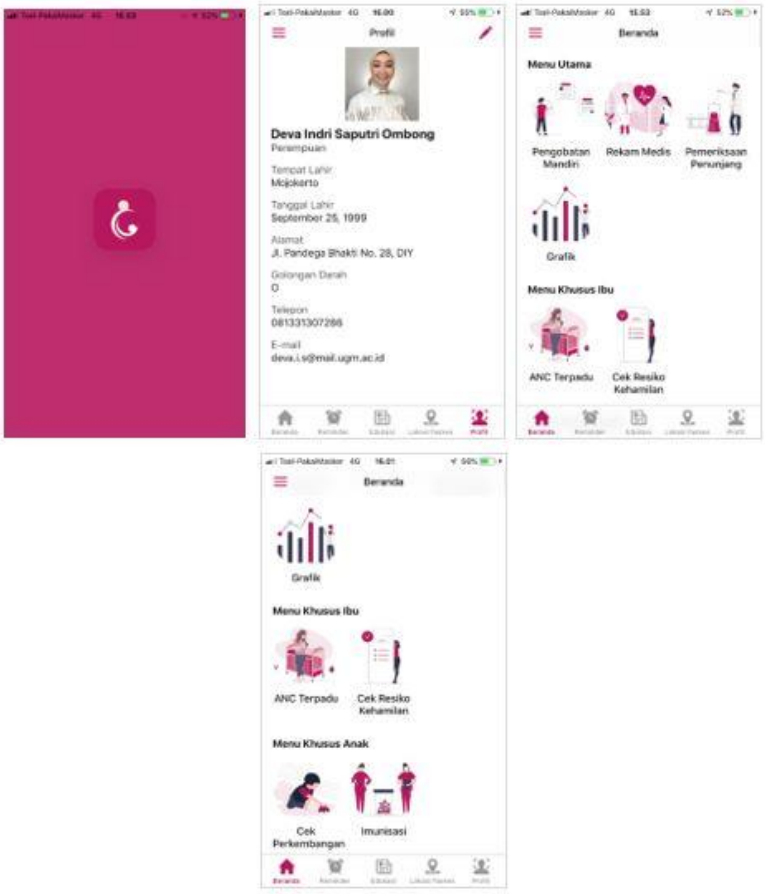


Figure 2. Use Case Diagram

The SIKIA application is designed by considering the principles of user interface design which include user familiarity, consistency, minimal surprise, recoverability, user guidance, and user diversity [13]. This design uses the glide app that can be accessed on the glideapps.com page, where it is possible to create an application that must have the same account between glide apps, google drive, and google spreadsheets to integrate data and utilize google sheets as a database or storage. The glide app is used to create an application because it is easy and allows sharing of projects with the public.



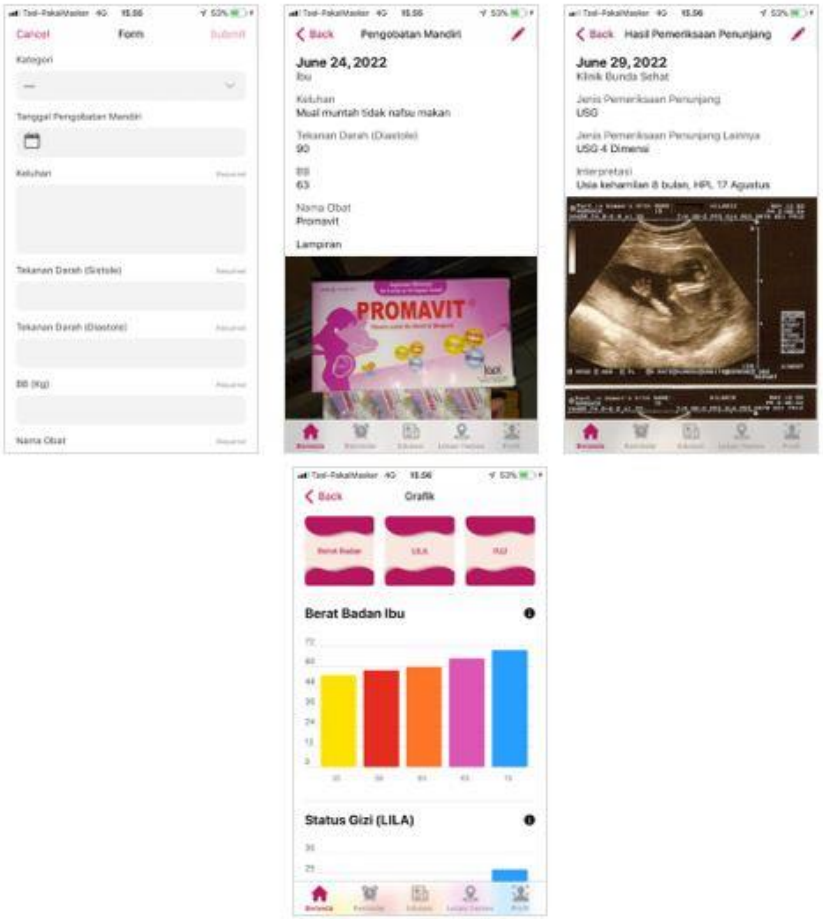


Figure 3. User Interface SIKIA

Trial Product

The product trial was carried out by design informants consisting of two midwives, two medical recorders, and three direct users of the application: one pregnant woman and two mothers with children. The SKIA trial begins by sharing a YouTube link in the form of a video tutorial on using the SIKIA application to informants who wish to conduct an online trial. The video tutorial can be accessed at the link bit.ly/TutorialSIKIA. All participants were asked to download the application on their respective smartphones via the link sikia.glideapp.io. Then asked to input data, edit data, delete data, and try all menus and features contained in the application. Product trials in this design can generally be defined as a form of activity in testing the functionality, usability, and consistency of the structure of an application. In this design, product trials conclude by asking research subjects to install applications, change data, delete data, and try menus and app features [14]. The designer made a video tutorial on using the SIKIA application using YouTube media to make it easier for potential users to test the product. A video feature can increase the level of individual understanding of mastering something.

Evaluation

The design subject's product evaluation uses the System Usability Scale (SUS) method [15]. The evaluation results with the original score can be seen in Table 1, which is then processed according to the calculation rules of the SUS method to produce a final score as in Table 2.

Table 1. Original Score of Evaluation With SUS Method

Informant	Original Score									
	Q1	Q1	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
A	5	1	5	1	5	1	5	1	5	1
B	4	2	4	2	4	3	4	1	4	4
C	4	1	5	1	5	1	5	1	5	2
D	4	2	5	1	4	1	4	2	5	3
E	5	1	5	1	5	1	5	1	5	3
F	5	1	5	1	5	1	5	1	5	2
G	4	2	5	3	5	2	5	1	4	3

Table 2. Final Score of Evaluation With SUS Method

Informant	Calculated Score										Total	Value (Total x 2.5)
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		
A	4	4	4	4	4	4	4	4	4	3	39	98
B	3	3	3	3	3	2	3	4	3	1	28	70
C	3	4	4	4	4	4	4	4	4	3	38	95
D	3	3	4	4	3	4	3	3	4	2	33	83
E	4	4	4	4	4	4	4	4	4	2	38	95
F	4	4	4	4	4	4	4	4	4	3	39	98
G	3	3	4	2	3	3	4	4	3	2	31	78
Final Average Score												87.86

Q1 to Q10 are ten evaluation questions using the SUS method. From the results of Table 2, it concluded that the average score of the final SIKIA evaluation reached 87.86, which is already above the SUS standard score of 68. It can be said that the SIKIA application design is good.The SUS model is one of the testing methods to determine whether the application design made is easy enough for users who will use the application [16]. SUS is included in a valid and reliable usability test tool even with a small sample. The results of the SUS score on the maternal and child health application (SIKIA) of 87.86, which means the adjective rating is excellent, and the category of grade scale is B. The category of acceptability ranges is included in the acceptable category, which means the level of the acceptance is relatively high; in other words, the SIKIA application is easy for users to accept.

IV.CONCLUSIONS AND SUGGESTIONS

The maternal and child health record application (SIKIA) is available for users to monitor the personal health of a mother and her child. The SIKIA application is designed by considering user needs in the field to produce suitable menus and features that user can easily accept. SIKIA underscores the importance of user-friendly PHRs in improving health outcomes and healthcare service efficiency. By providing a seamless platform for health data management, SIKIA can contribute significantly to the well-being of mothers and children. The findings suggest that further development and broader implementation of SIKIA could enhance healthcare delivery and patient engagement in personal health management.

REFERENCES

[1] M. Muselli, V. Cofini, G. Desideri, and S. Necozione, "Coronavirus (Covid-19) pandemic: How may communication strategies influence our behaviours?" *International Journal of Disaster Risk Reduction*, vol. 53, p. 101982, 2021.

[2] H. Harapan, N. Itoh, A. Yufika, W. Winardi, S. Keam, T. Te, et al., "Coronavirus disease 2019 (COVID-19): A literature review," *J Infect Public Health*, vol. 13, pp. 667–673, 2020.

[3] C. Allen, G. Metternicht, and T. Wiedmann, "National pathways to the Sustainable Development Goals (SDGs): A comparative review of scenario modelling tools," *Environ Sci Policy*, vol. 66, pp. 199–207, 2016.

[4] M. Abid and A. B. Schneider, "Clinical Informatics and the Electronic Medical Record," *Surgical Clinics of North America*, vol. 103, pp. 247–258, 2023.

[5] D. B. Lafky and T. A. Horan, "Personal health records," *Health Informatics J.*, vol. 17, pp. 63–71, 2011.

[6] J. Taha, S. J. Czaja, J. Sharit, and D. G. Morrow, "Factors affecting usage of a personal health record (PHR) to manage health," *Psychol Aging*, vol. 28, pp. 1124–1139, 2013.

[7] C. A. Caligtan and P. C. Dykes, "Electronic Health Records and Personal Health Records," *Semin Oncol Nurs.*, vol. 27, pp. 218–228, 2011.

[8] C. Z. Qiang, M. Yamamichi, V. Hausman, D. Altman, and Unit IS, "Mobile applications for the health sector," Washington: World Bank, vol. 2, 2011.

[9] P. Zhang, L. Dong, H. Chen, Y. Chai, and J. Liu, "The Rise and Need for Mobile Apps for Maternal and Child Health Care in China: Survey Based on App Markets," *JMIR Mhealth Uhealth*, vol. 6, p. e140, 2018.

[10] J. Floch, A. Zettl, L. Fricke, T. Weisser, T. Grut, T. Vilarinho, et al., "User Needs in the Development of a Health App Ecosystem for Self-Management of Cystic Fibrosis: User-Centered Development Approach," *JMIR Mhealth Uhealth*, vol. 6, p. e113, 2018.

[11] M. Elallaoui, K. Nafil, and R. Touahni, "Automatic Transformation of User Stories into UML Use Case Diagrams using NLP Techniques," *Procedia Comput Sci*, vol. 130, pp. 42–49, 2018.

[12] F. Staiano, *Designing and Prototyping Interfaces with Figma: Learn essential UX/UI design principles by creating interactive prototypes for mobile, tablet, and desktop*, Packt Publishing Ltd, 2022.

[13] R. Schnall, M. Rojas, S. Bakken, W. Brown, A. Carballo-Dieguez, M. Carry, et al., "A user-centered model for designing consumer mobile health (mHealth) applications (apps)," *J Biomed Inform*, vol. 60, pp. 243–251, 2016.

[14] B. Zuckerman, K. Edson, L. Mesite, C. Hatcher, and M. Rowe, "Small Moments, Big Impact: Pilot Trial of a Relational Health App for Primary Care," *Acad Pediatr.*, vol. 22, pp. 1437–1442, 2022.

[15] J. Brooke, "SUS: A 'Quick and Dirty' Usability Scale," in *Usability Evaluation In Industry*, 1st ed., CRC Press, 1996.

[16] R. Rezaei, T. K. Chiew, S. P. Lee, and Z. Shams Aliee, "Interoperability evaluation models: A systematic review," *Comput Ind.*, vol. 65, pp. 1–23, 2014.