Comparative Analysis of User Requirement Design for Maternal Health and Midwives Mobile Application

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Abstract. The Indonesian government has made significant efforts to enhance health stability, focusing on maternal health. These efforts range from stunting prevention to reducing maternal and infant mortality rates. Midwives play a vital role in these endeavors. Pregnant women can receive health monitoring through direct midwife consultations or telemedicine. Noteworthy technological advancements in Indonesian healthcare include numerous maternal health apps that aid documentation and consultations. However, surveys show many apps lack user-centric features due to their foreign origins, not aligning with Indonesian pregnant women's needs. To address this problem, a comparative study to analyze user requirements for an integrated mobile application to monitor maternal health in collaboration with midwives in Indonesia. The study aims to design a user-oriented application that effectively meets the needs of its audience and validated for a solid foundation to create a widely applicable final product.

Keywords: *Comparative Study; User Experience Design; Mobile Application; Pregnant Women; Midwives*

1 Introduction

The present technological era caters to industrial needs and has extended its influence to other sectors that leverage technology to address issues [1]. Current technological advancements have entered the healthcare domain, including consultations and health monitoring carried out by the public through technologies like telemedicine and informative health recording [2]. In midwifery, particularly concerning maternal health, various maternal health recording applications have been developed to assist and accompany mothers during their pregnancy [3]. However, surveys of pregnant women who have used such applications indicate that many fail to meet user expectations. Literature has supported this result, indicating that many existing applications are adaptations from foreign contexts [4], occasionally lacking alignment with the habits and preferences of pregnant women in Indonesia, who prioritize local wisdom when engaging with such technologies. Furthermore, midwives' involvement in developing these applications is minimal in Indonesia [5], despite their crucial role in maternal healthcare. Therefore, there is a need to develop applications that cater to the expectations and needs of pregnant women and midwives in Indonesia.

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One potential solution to this issue is to design applications prioritizing the user experience (UX) aspect [6]. UX design involves creating physical or digital products that are useful, user-friendly, and provide exceptional experiences when interacting with the product [7]. Using a UX approach, the resulting product can align with user needs and desires, aiming to solve the issues of maternal health monitoring mobile applications and create a more user-friendly solution. Numerous researchers have developed software that prioritizes user needs and preferences.

This study will employ a comprehensive approach, combining qualitative and quantitative methods. The qualitative approach will initiate the process, utilizing surveys and interviews to evaluate existing applications, identify issues, and establish development goals. The quantitative approach will involve usability testing to validate the results. Based on the problems and needs identified through interviews with potential users, this development project aims to enhance features and design. A comparative study will be conducted to compare respondents' opinions regarding available applications, with the goal of identifying gaps that can be addressed and additions that respond to the specific expectations of local users.

Utilizing the comparative results, a subsequent analysis will be performed to evaluate user requirements for the subsequent design phase. Developing this user experience design will involve applying the design thinking methodology. Design thinking plays a crucial role in UX design, aiding in developing and enhancing skills to adapt to rapid changes in user behavior and the environment. Through design thinking, the team can conduct UX research, create prototypes, and conduct usability testing to discover new ways to meet user needs. The design thinking method aims to solve problems, design solutions, and create user-centered innovations [8] [9]. In this study, this method is suitable to address the dynamic changes in user dynamics and the local wisdom approach expected by users of mobile applications, particularly pregnant women in Indonesia because the ideology of Design Thinking, which offers a comprehensive, reliable and, above all, simple experience [10].

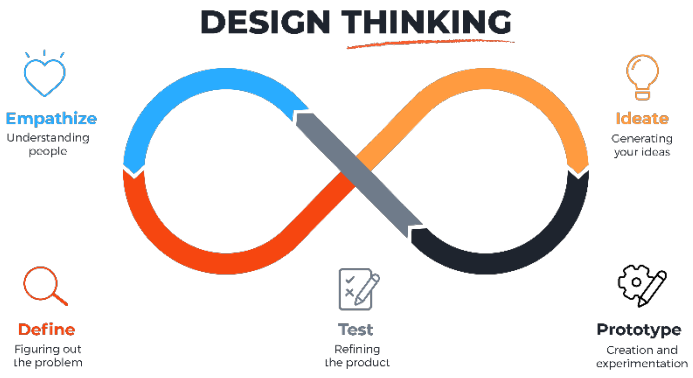

Fig. 1. Design thinking stages

The expected outcome of this research is the production of high-quality user requirements that can be promptly incorporated into a user experience design aligned with user expectations and desires, covering aspects ranging from appearance and features to utilization experience. The

project will undergo evaluation and validation according to supporting theoretical principles, resulting in a ready-to-use blueprint for future implementation.

3 Research Methodology

The research method for developing a user experience design for a mobile application aimed at monitoring maternal health by Indonesian midwives consists of several phases, as illustrated in Figure 2.

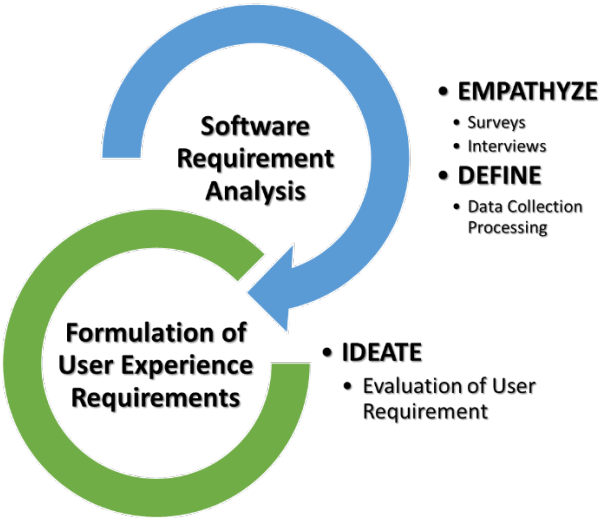

Fig. 2. Research methodology

In more detail, the phases of this research method can be explained as follows on Figure 2, adapting the execution stages to encompass the two aspects of the design thinking methodology: Empathize, Define, and Ideate.

- Phase 1: Software Requirement Analysis

The initial phase of the proposed research involves analyzing the expected needs of potential users, specifically pregnant mothers, using the Empathize and Define methods of Design Thinking. Various approaches, such as field surveys and interviews, are employed in this phase. When comparing the comfort of existing applications, certain aspects of this phase were previously undertaken. However, this phase was revisited due to the distinct contexts guided by the principles of gathering requirements through design thinking. The outcome of this phase is raw data comprising opinions, hopes, and desires of potential users for the application's future utilization upon completion.

- Phase 2: Formulation of User Experience Requirements

This phase contains further sub-phases aligned with the stages of design thinking, particularly Ideate, which will ultimately produce an initial Blueprint, serving as one of the research objectives.

4 Result and Evaluation

In conducting user requirements analysis for the development of desired user experience design in a mobile application, a survey was conducted among various users to assess a comparative perspective on prior user experiences, particularly those proficient in utilizing similar applications for pregnancy health recording and monitoring. To ascertain the expected features by prospective users, namely pregnant women, and midwives, interviews were conducted with several individuals serving as primary respondents, delving into their anticipations and potential utilization of the ongoing application development.

This direct engagement occurred with 5 midwives and 5 pregnant women over a period of approximately 3 weeks, employing the user persona concept. The selection of respondents in this study is carried out through random sampling based on the population of pregnant mothers in the city of Pekanbaru. Additionally, another prerequisite is the behavior of pregnant women who seek consultations with midwives, not just obstetricians.

As for the midwives chosen to be respondents, they are midwives residing in the vicinity of Pekanbaru who are currently active in practicing midwifery in private clinics or hospitals. These respondents then represent potential users in obtaining user personas.

The outcomes of the user persona activities revealed the identification of several anticipated needs, as illustrated in Table 1 below.

Table 1. Requirement list based on user persona

User	Requirements
Midwife	• Comprehensive Pregnancy Recording • Pregnancy Consultation Services • Consultation/Visit Scheduling • Pregnancy History • Information on Pregnancy Issues • Stunting-Related Information • Immunization Information and Services
Pregnant Women	• Comprehensive Pregnancy Recording • Pregnancy Information in Audio-Visual Format • Pregnancy Nutrition Information • Visualization of Fetal Development Process • Consultation Services with Midwives

Presented data in table 1 revealed several pivotal needs, which are the expected prominent features in the application's developmental phase. Consequently, a comparative analysis was conducted through an online questionnaire survey distributed to the entire Indonesian population spesificly in Pekanbaru City for user sample, mainly targeting women who have

been pregnant and potential users of reproductive age with the likelihood of future pregnancies. This analysis evaluated the degree to which similar applications incorporated these expected features. In this study, four representative application types were selected based on the survey outcomes. To ensure the security and confidentiality of these applications, ID codes are being used as substitutes for their actual application names. Table 2 below displays the comparative outcomes of these applications.

Table 2. Comparison of similar applications

Features of Requirement	Application ID			
	ABC	HIJ	RTS	XYZ
Pregnancy Progress Recording	✓	✓	✓	✓
Fetal Form Simulation	✓	✗	✓	✓
Pregnancy Health Recommendations	✓	✗	✓	✗
Pregnancy Nutritional Information	✓	✗	✓	✗
General Health Information	✗	✓	✓	✓
Stunting Information	✗	✗	✗	✓
Health Graph Visualization	✗	✓	✓	✗
Online Consultation Services	✗	✗	✗	✗

Based on the information in Table 2, it is evident that several comparable applications have integrated unique features that users anticipate. However, stakeholders perceive certain features as incomplete and require alignment with the evolving needs of Indonesian society, which currently needs to improve in utilizing health-related technologies. Additionally, a pivotal feature remains a primary requirement that users seek – an online consultation service facilitating direct connections between pregnant women and Indonesian midwives.

Online health consultation services are already prevalent in various other applications in Indonesia, especially during the global COVID-19 pandemic. However, these services typically tailor to consultations with general practitioners and specialists, leaving specific consultations concerning pregnancy-related issues with midwives yet to be precisely addressed. This discrepancy constitutes a central concern in this study.

Consequently, the ensuing list encompasses user requirements derived from the preceding phases conducted, as follows as shown on table 3.

Table 3. Recommendation of User Requirement

Requirement ID	User Requirement
Req1	Midwives can conduct online pregnancy consultations.
Req2	Midwives can provide pregnancy-related information.
Req3	Midwives can issue alerts regarding pregnancy conditions.
Req4	Pregnant women can input comprehensive pregnancy data.
Req5	Pregnant women can access pregnancy health information.
Req6	Pregnant women can view fetal progress visualizations.
Req7	Pregnant women can observe pregnancy health graphs.
Req8	Pregnant women can receive pregnancy nutritional information.
Req9	Pregnant women can have online pregnancy consultations.

Based on the results at table 3, an evaluation and validation of the initial users targeted as user personas were conducted. This process aimed to establish the foundational user experience requirements, which would serve as the initial basis for prototype development. Figure 3 below displays the outcomes of the evaluation.

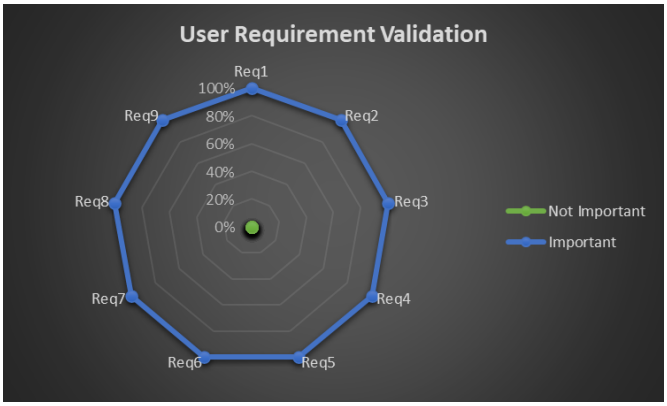

Fig. 3. Validation result of the user requirement

The outcomes presented in Figure 3 indicate that the entire list of user requirements has been acknowledged and deemed essential as a reference for the development of the anticipated mobile application. Another critical aspect to consider is the finer details associated with the anticipated vital features derived from the obtained user personas. It is advisable to conduct further validation to ensure the seamless advancement of the comprehensive application and its prototype form.

5. Concussion

The research analysis results affirm that adhering to the user requirement development phases in the design thinking methodology, specifically Emphasize, Define, and Ideate, facilitates the development of user requirement design. These findings provide valuable guidance for the subsequent stages, including prototype development and the creation of the final application, with the potential to benefit all users like to enhance the overall pregnancy and childbirth experience by providing easy access to information, support, and healthcare services.

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