"Designing a Web-Based Application Using Human-Centered Design to Enhance Postpartum Mental Health Support for Parents of Children with Special Needs"

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Abstract. Postpartum mental health challenges are a significant concern for mothers, particularly for those caring for children with special needs. These mothers often experience heightened levels of stress, anxiety, and emotional distress, which can adversely affect their well-being and their ability to provide care. This research focuses on designing and developing a web-based application to enhance mental health support specifically for this demographic, using a Human-Centered Design (HCD) approach to recognize these challenges. The design process commenced with a comprehensive user requirement analysis, utilizing qualitative methods such as interviews and quantitative surveys to gather insights directly from mothers. This engagement allowed us to identify their unique needs, preferences, and pain points. Through collaborative discussions, we pinpointed essential features that would make the application user-friendly and effectively support their mental health. The design development phase incorporated iterative feedback loops, refining the application based on real user experiences and suggestions. Each iteration was guided by established HCD success indicators, ensuring alignment with users' expectations. The current goal of this research is to produce a prototype of the web application that addresses the mental health challenges faced by postpartum mothers. By integrating functionalities that promote emotional well-being and provide access to relevant resources, this application aims to empower mothers and foster a supportive community, ultimately contributing positively to their lives and caregiving experiences.

Keywords: Postpartum Mental Health, Human-Centered Design (HCD), Web-Based Application, Mothers of Children with Special Needs

INTRODUCTION

Postpartum mental health has become a crucial issue, especially for mothers raising children with special needs. The postpartum period is often accompanied by stress, anxiety, and even depression, caused by biological, psychological, and social changes. For mothers of children with special needs, the emotional and physical burden is amplified by additional caregiving challenges. Previous studies show that these pressures can negatively affect maternal well-being and directly impact the mother-child relationship and the child's development. In Pekanbaru, this issue becomes even more relevant due to the limited availability of mental health services specifically designed for postpartum mothers, particularly those with special needs children.

As a metropolitan city in Riau Province, Pekanbaru has seen a rise in the number of children with special needs requiring intensive care. However, access to consistent mental health support services, including counseling, community support, and digital platforms, remains limited. This situation leaves many mothers feeling isolated and

struggling to find emotional support. Technology-based solutions, such as web applications, have the potential to become effective alternatives for providing accessible and tailored mental health support. Through such an application, mothers can access information, engage in self-guided relaxation sessions, connect with other mothers through communities, and access relevant resources without needing to leave their homes.

However, ensuring the optimal functionality of such an application requires a Human-Centered Design (HCD) approach. HCD is a method that emphasizes a deep understanding of users' needs, experiences, and preferences through an iterative process. In this context, the application must not only fulfill functional needs but also consider mothers' time constraints, psychological conditions, and technological abilities in Pekanbaru. Therefore, this study focuses on applying HCD to explore the specific needs of users and ensure that the resulting application is relevant, easy to use, and delivers a positive impact.

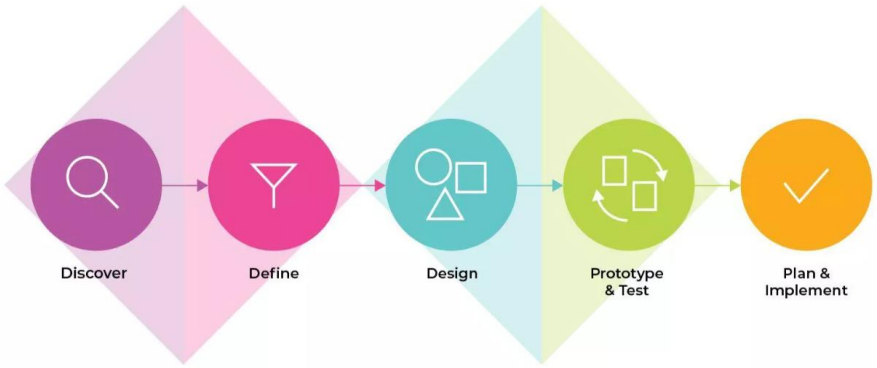


FIGURE 1. HCD Method

Based on these issues, the research aims to answer two main questions: How can a web-based application be effectively designed to support the mental health of postpartum mothers in Pekanbaru, especially those raising children with special needs and How can the application of HCD help identify user requirements and preferences at each stage of development

This study aims to design and develop a web application prototype specifically to support the mental health of postpartum mothers in Pekanbaru. The development process uses an HCD approach, involving mothers directly through interviews, surveys, and prototype testing. The practical contribution of this research is expected to help mothers improve their mental well-being and build a strong support community. Theoretically, this study aims to contribute to the body of knowledge on health application design using HCD and provide new insights into how technology can address postpartum mental health challenges in urban areas like Pekanbaru.

METHODS

Postpartum Mental Health and Special Needs and HCD

Postpartum mental health is a crucial issue affecting mothers after childbirth, especially those caring for children with special needs. These mothers face dual challenges—adapting to their new role as parents while managing the additional demands of raising children with conditions such as autism spectrum disorder (ASD), ADHD, or cerebral palsy. Research indicates that mothers of children with special needs are at higher risk of depression, anxiety, and burnout compared to the general population [1]. Poor mental health not only impacts the mother personally but can also deteriorate family relationships and hinder the child's development. Continuous and appropriate interventions are essential to support mothers' mental well-being during the postpartum period.

Technology-based interventions are increasingly seen as innovative solutions to support mental health due to their flexibility and accessibility. Web-based applications offer services that can be accessed anytime without requiring physical presence, such as online counseling, relaxation programs, and community forums. Studies suggest that well-designed mental health applications can effectively reduce symptoms of depression and anxiety in mothers [2]. Moreover, digital platforms foster social support by connecting mothers with others facing similar challenges, creating a sense of community that can enhance their well-being. However, the effectiveness of these applications

relies heavily on the relevance of their features and their ability to meet users' specific needs—particularly in cities like Pekanbaru, where limited access to formal mental health services presents a significant challenge.

Human-centered design (HCD) is a design approach that focuses on deeply understanding users' needs, expectations, and constraints. The HCD process involves several key stages: exploring users' needs through interviews and surveys, developing prototype solutions, and conducting iterative testing with direct feedback from users until the solution aligns with their expectations [3]. In health application development, applying HCD ensures that the resulting product functions technically provide a positive user experience and address emotional needs.

Several studies have demonstrated the success of HCD in designing mental health applications. For example, Al-Hawamdeh et al. found that mental health applications built using HCD principles improved user engagement, especially among vulnerable populations like postpartum mothers [4]. This approach ensures that every feature and interface is designed according to the user's preferences and abilities while accommodating limitations, such as time constraints and emotional stress. In this study, HCD is applied explicitly to postpartum mothers in Pekanbaru to develop a prototype application that aligns with their needs. By involving mothers as active partners throughout the development process, the application aims to function as a support tool and as a means to enhance the quality of their lives.

By combining web-based technology and HCD, this research aims to develop an innovative solution to support postpartum mental health effectively. This is especially important in Pekanbaru, where an application responsive to the needs of mothers raising children with special needs could serve as a strategic solution to address the limited availability of formal mental health services.

Web Application Design Stages Using HCD

This study employs a mixed-methods approach that combines both qualitative and quantitative methods. Qualitative methods involve in-depth interviews to explore the needs, challenges, and experiences of postpartum mothers raising children with special needs in Pekanbaru. The interviews aim to gain comprehensive insights into their psychological conditions, caregiving challenges, and expectations for a mental health application.

Additionally, quantitative methods are used through surveys to identify general patterns related to user requirements, feature preferences, and barriers to technology use. The survey provides broader statistical data to complement the qualitative findings. This combination of approaches is expected to offer both an in-depth understanding and accurate, measurable data for application design.

The application development in this study follows a Human-Centered Design (HCD) approach, actively involving users in several stages:

- Stage 1: Exploring User requirements
  In this stage, in-depth interviews and surveys are conducted to understand the needs and challenges of postpartum mothers in Pekanbaru. The insights gathered will be analyzed to identify essential features for the application, such as community support, access to mental health resources, or self-care tools.
- Stage 2: Developing Feature Designs
  Based on the needs analysis, an initial prototype of the application will be developed. The design will include the user interface and core features identified during the interviews and surveys. The focus will be on ensuring the application is accessible and relevant to users' constraints.
- Stage 3: Iterative Prototyping and Testing
  The initial prototype will be tested by users (postpartum mothers) to gather feedback. This process will involve multiple iterations, with each version of the prototype refined based on user input until it aligns with their expectations and needs. This stage aims to ensure that the application meets critical quality indicators in HCD, such as usability and user experience.

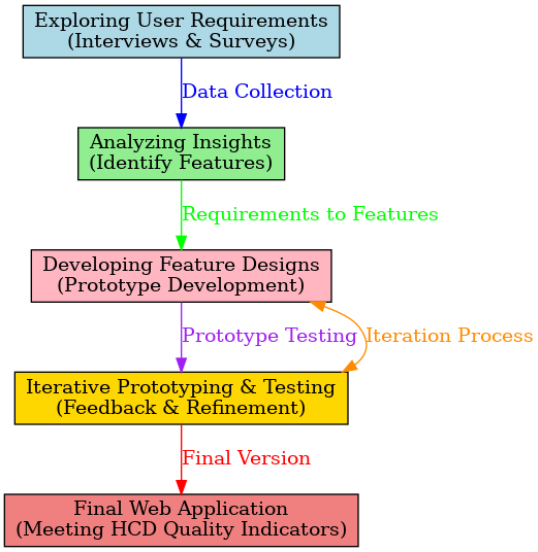


FIGURE 2. Research Methodology

This study employs several key instruments for data collection and analysis. The survey instruments will gather information on user requirements, feature preferences, and barriers to application use, utilizing a Likert scale to assess mothers' satisfaction and expectations regarding the proposed services. For qualitative insights, interview guidelines will include open-ended questions addressing postpartum mental health challenges and caregiving experiences with special needs children; these interviews will be recorded and transcribed for further analysis. The data analysis techniques will involve thematic analysis to identify key themes from the interview transcripts. In contrast, quantitative survey data will be analyzed using descriptive statistics to uncover relevant patterns or trends. By integrating qualitative and quantitative data, the study aims to design a web-based application that fulfills technical requirements and effectively addresses the emotional and practical needs of postpartum mothers in Pekanbaru.

RESULTS AND DISCUSSION

User Requirement Identification

This study successfully identified the needs and preferences of users through in-depth interviews and surveys involving ten postpartum mothers with special needs children in Pekanbaru. The findings are consistent with previous studies indicating that parents of children with special needs face higher risks of depression, anxiety, and chronic stress [3][6]. The mothers reported challenges in balancing the emotional and physical demands of caregiving, while access to mental health services in Pekanbaru remains limited.

The survey revealed that users desired an application that functions as an informational tool and provides emotional and social support. Critical needs and preferences identified include:

- Online Community Space: Users emphasized the importance of connecting with a community that shares similar experiences to alleviate isolation and enhance social support. Research by Naslund et al. [8] highlights that online forums play a crucial role in improving emotional well-being by allowing users to share experiences and receive moral support.
- Access to Mental Health Resources: Users expressed a need for credible and practical information, such as articles on self-care, parenting tips for children with special needs, and directories of counseling services. This aligns with findings in the telehealth field, where technology-based applications facilitate access to mental health information for individuals facing barriers to in-person services [7].
- Relaxation and Meditation Features: Users indicated that relaxation features, such as meditation and breathing exercises, significantly reduced daily stress. This is consistent with previous research showing that

mindfulness and relaxation practices can decrease symptoms of depression and anxiety in postpartum mothers [9].

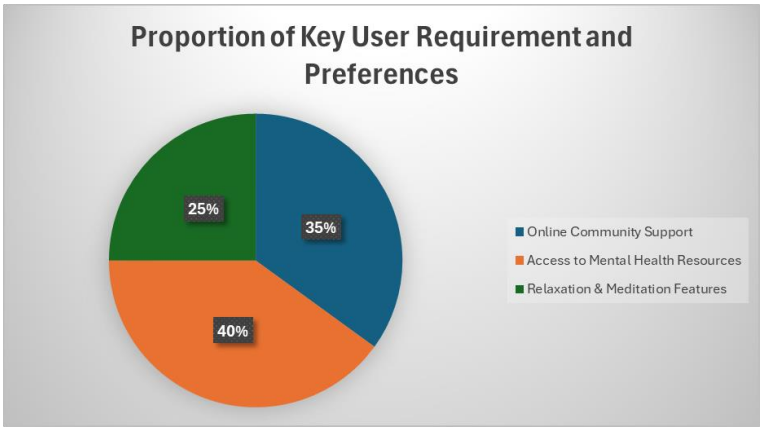


FIGURE 3. Proportion of Key User Requirements and Preferences

In addition to feature preferences, the mothers highlighted application challenges, particularly regarding time constraints and technological capabilities. This underscores the importance of designing an application that is simple and easily accessible.

Prototype Development and Iteration Process

The application development process consisted of three iterations focused on enhancing features and user experience in line with the Human-Centered Design (HCD) approach. Each iteration included prototype testing by respondents to gather direct feedback.

- Iteration 1: The initial prototype featured a community space, resource access, and relaxation features. Early feedback indicated that the app's layout and navigation still needed to be clarified for some users, particularly when accessing the main menu and specific features. These findings highlighted the importance of an intuitive interface to reduce users' cognitive load, as Norman explained [10].
- Iteration 2: In the second iteration, improvements were made to the layout and color schemes. Changes included enhanced text readability and consistent iconography. Additionally, the language used in the app was simplified to create a more friendly and personal experience. Testing results showed increased user engagement, with participants feeling more comfortable using the app for extended periods.
- Iteration 3: The final iteration emphasized aesthetic refinement and design consistency. The app's color palette was adjusted to create a calming atmosphere conducive to relaxation. The interface was retested to ensure smooth and responsive navigation between menus. The final design was agreed upon with users and is ready for further development.

This study demonstrates that an iterative approach within HCD effectively identifies and addresses design issues. Research by Al-Hawamdeh et al. [8] also emphasizes that iterations and user feedback are crucial in creating relevant and functional applications.

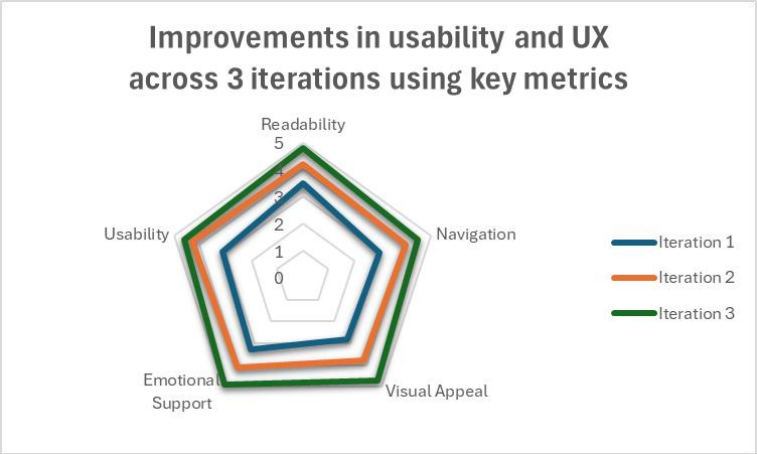


FIGURE 4. Proportion of Key User Requirements and Preferences

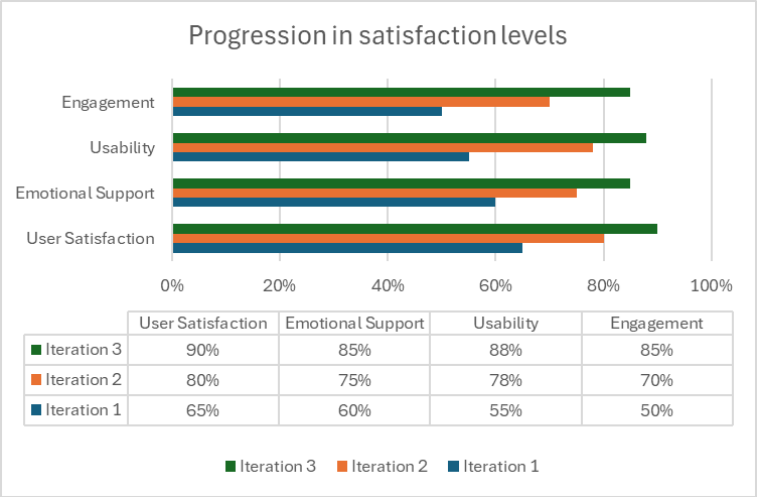
Prototype Quality Evaluation Based on HCD Indicators

The prototype evaluation measured user experience (UX) and usability as the leading indicators of success.

Based on post-iteration surveys, mothers reported that the app helped them feel more connected and supported. The online community feature was deemed highly effective in reducing feelings of isolation. They also appreciated the relaxation features, which assisted in managing daily stress. This aligns with the study by Naslund et al. [7], which states that positive experiences in mental health applications can enhance engagement and intervention success.

Usability assessments indicated that the app's interface met ease-of-use standards, and the time required for users to understand the main functions decreased in the final iteration. The more intuitive interface allowed users to access features quickly, even with limited time. Norman [10] emphasizes that applications with high usability minimize user errors and enhance overall satisfaction.

This evaluation indicates that the app successfully meets users' emotional and practical needs while providing an intuitive and comfortable experience. Users responded positively to the final design and expressed readiness to use the full version of the app in the future.



	User Satisfaction	Emotional Support	Usability	Engagement
Iteration 3	90%	85%	88%	85%
Iteration 2	80%	75%	78%	70%
Iteration 1	65%	60%	55%	50%

FIGURE 5. Progression in Satisfaction Levels

Overall, this research successfully produced an HCD-based application design ready for further development to support postpartum mental health in Pekanbaru. These findings align with previous literature emphasizing the importance of user-centered design in creating practical and relevant health technology solutions. With an agreed-upon design and smooth evaluations, this app is expected to significantly improve mothers' mental well-being and promote successful caregiving for children with special needs in Pekanbaru.

CONCLUSIONS

This research successfully designed and developed a web-based application prototype using a Human-Centered Design (HCD) approach to support the mental health of postpartum mothers with special needs children in Pekanbaru. The findings indicate that mothers in this situation face significant challenges, including stress, anxiety, and social isolation, necessitating solutions that integrate both emotional and practical support. The developed application provides essential features such as an online community space, access to mental health resources, and relaxation tools tailored to meet user requirements and preferences.

The application development process was carried out iteratively through three phases, with improvements focusing on interface aspects, color schemes, language, and design consistency. Active user involvement in each iteration effectively generated a relevant and functional prototype. Evaluation of the prototype based on HCD indicators showed that the application achieved satisfactory usability and user experience (UX), with intuitive navigation and features beneficial for the emotional well-being of mothers.

Overall, this research contributes practically by providing an application that is ready for further development to support the mental health of postpartum mothers. Theoretically, it underscores the importance of applying HCD in developing mental health applications, particularly for populations with special needs. This application design is expected to have a positive impact by reducing stress and anxiety, enhancing social connectivity, and strengthening mothers' roles in caregiving. The following steps involve broader development and implementation testing to ensure the sustainability of the benefits offered.

This study lays a strong foundation for developing user-centered technology solutions in the mental health field. It has the potential for broader adoption, especially in areas with limited access to mental health services.

ACKNOWLEDGMENTS

We want to express our sincere gratitude to Politeknik Caltex Riau for funding and support throughout this research project. We also want to extend our heartfelt thanks to the parents who participated in this study. Your willingness to share your experiences and insights has significantly contributed to the development of this research. Thank you for your invaluable contributions.

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