

Simplifying Glucosee Apps: Enhancing Usability and Accessibility for Older Adults

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Abstract

This application aims to redesign the Glucosee, a mobile application to make it more user-friendly, particularly for elderly users. The approach emphasizes simplifying the user interface to improve usability, enhancing the user experience through a more intuitive and efficient flow, and providing features such as clearer blood sugar data visualization and practical information-sharing functionality with medical professionals. Ultimately, this application is expected to help improve the quality of life for elderly individuals with diabetes in Indonesia while also delivering more accurate data to support medical decision-making. This research adopts a human-centered design approach. The process begins with a needs analysis to understand the challenges faced by elderly users in utilizing technology. Subsequently, a prototype of the application is developed, focusing on ease of access and accessibility. This prototype is then tested with elderly users to gather feedback that can be used to refine the design. This iterative process ensures that the solution effectively meets the users' needs. The outcomes of this application are expected to demonstrate that the redesigned Glucosee application significantly improves usability and accessibility for elderly users. The developed prototype will facilitate blood sugar tracking, present data in more understandable visual formats, and provide practical data-sharing functions with medical professionals. These results are anticipated to not only assist users in managing their health but also positively impact their overall quality of life.

Keywords: Glucosee, elderly, accessibility, diabetes, application, prototype

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1. Introduction

Diabetes is a chronic condition that requires ongoing monitoring, particularly among the elderly. According to 2021 data from the International Diabetes Federation (IDF), Indonesia ranks seventh globally in terms of the number of people with diabetes, with approximately 19.5 million cases. Of this total, about 8 million are elderly individuals over the age of 60. Data from the 2018 Riskesdas survey indicates that the prevalence of diabetes among the elderly reaches 10.9%. This figure underscores that diabetes is not merely an individual health issue but also a major challenge for the national healthcare system, particularly in addressing a rapidly aging population.

Therefore, regular monitoring of blood sugar levels is crucial to prevent serious complications such as diabetic neuropathy, cardiovascular disease, and diabetic retinopathy (Indonesian Ministry of Health, 2021). However, it is ironic that, according to a survey by the Indonesian Endocrinology Association (PERKENI), only 30% of people with diabetes regularly record their blood sugar levels. The majority of older adults still use manual methods that are prone to recording errors or data loss. This indicates a gap between the need for consistent monitoring and actual practices in the field. This gap can lead to delayed detection of complications and suboptimal medical decision-making.

In addition, older adults face other challenges when monitoring their blood sugar levels. These challenges are related to limited access to technology. Older adults often face obstacles such as declining vision, limited motor skills, and low digital literacy. In a study conducted by the University of Indonesia in 2020, it was found that only 25% of older adults in Indonesia feel comfortable using digital health apps. These limitations make most older adults reluctant or unable to utilize health technologies that could actually help them. As a result, the responsibility for monitoring blood sugar and recording data often falls on younger generations, such as their children or grandchildren, who are more tech-savvy. They help record test results, monitor changes in blood sugar levels, and share this data with healthcare providers. While this approach can be helpful, reliance on other

risks diminishing older adults' independence in managing their own health.

With advances in technology, blood sugar tracking apps like Glucosee have emerged to offer better solutions. These apps are designed to simplify blood sugar tracking, present data in more easily understandable visualizations, and provide features for sharing data with healthcare professionals. However, based on interviews with doctors, while patients' blood sugar levels are monitored, that is not the only important aspect. Diabetes patients often must visit various doctors, such as dietitians and physical therapists. Therefore, an app needs to do more than just track blood sugar levels; it should also record the patient's physical activity history, medication intake, and dietary patterns to provide a more comprehensive picture of their health. This holistic approach allows healthcare professionals to understand the patient's condition comprehensively and develop a more targeted treatment plan.

In this context, a human-centered design approach becomes highly relevant. Human-centered design (HCD) emphasizes a deep understanding of users' needs, limitations, and preferences. By directly involving older adults in the design process, applications can be developed in line with their capabilities, rather than simply based on the assumptions of designers or developers. The research process typically begins with a needs analysis to understand the challenges older adults face when using technology. Next, an application prototype is developed with a focus on ease of access and accessibility. This prototype is then tested with older adults to gather feedback that can be used to refine the design. This iterative process aims to ensure that the designed solution truly meets users' needs.

In addition, accessibility is a key factor in the development of health apps for older adults. Accessibility encompasses not only ease of navigation but also the use of larger fonts, clear color contrast, and buttons that are easy to press for those with motor impairments. Research shows that apps with simple and intuitive designs are more readily accepted by older adults than apps with complex, confusing features. Therefore, simplifying the user interface is one of the key strategies in the redesign of the Glucosee app. With a simpler interface, older adults can feel more confident using the app without having to rely on assistance from others.

Data visualization features also play a key role in helping users better understand their health status. Blood sugar data displayed in the form of simple graphs or color indicators can help older adults grasp their health trends more quickly. For example, using green for normal blood sugar levels, yellow for warnings, and red for dangerous conditions can provide easily recognizable visual cues. As a result, older adults not only record the data but can also take more appropriate actions based on the information they understand.

The ability to share data with healthcare providers is another key feature of the redesigned app. Older adults often struggle to bring paper records to their doctor's appointments or forget to record their test results. With the digital data-sharing feature, doctors can access patients' health histories more accurately and in real time. This enables faster evaluations and more precise medical decision-making. Additionally, the integrated data can also be used for epidemiological research and the development of more effective health policies.

From a social perspective, senior-friendly apps can also improve their quality of life. With tools that make it easier to monitor their health, seniors can feel more independent and confident in managing their conditions. This independence is crucial for maintaining self-esteem and reducing the psychological burden often experienced by those with chronic illnesses. Additionally, user-friendly apps can strengthen the bond between seniors and their families. Younger generations who help monitor the health of their parents or grandparents can collaborate more easily through integrated digital platforms.

Overall, the redesign of the Glucosee app using a human-centered design approach is expected to address the challenges faced by older adults in monitoring their blood sugar levels. With a simple interface, clear data visualization, and practical information-sharing features, this app not only helps improve the quality of life for older adults with diabetes in Indonesia but also provides more accurate data to support medical decision-making. Furthermore, this app can serve as an example of how health technology can be developed inclusively, taking into account the needs of vulnerable groups such as the elderly. Innovations like this are crucial to ensuring that technological advancements truly benefit all segments of society, not just those who are digitally literate.

2. Literature Review

2.1 Diabetes in Older Adults: Challenges and Monitoring Needs

Diabetes mellitus is one of the chronic diseases with a high prevalence among older adults. Older adults with diabetes face a greater risk of complications compared to younger age groups, including neuropathy, nephropathy, retinopathy, and cardiovascular disease. According to the American Diabetes Association (ADA,

2020), routine blood glucose monitoring is a crucial step in preventing long-term complications. However, research indicates that older adults often struggle with self-monitoring due to physical and cognitive limitations (Chao et al., 2019).

In Indonesia, a study by PERKENI (2018) confirms that only a small proportion of older adults consistently monitor their blood sugar levels. This situation is exacerbated by low digital health literacy among older adults, leading them to rely on family members for assistance with monitoring. This situation creates an urgent need for technology solutions that are more user-friendly and tailored to the limitations of older adults.

2.2 Digital Technology in Health Monitoring

Advances in digital health technology have opened up significant opportunities for the management of chronic diseases. Mobile apps for diabetes, such as MySugr, Glucose Buddy, and Glucosee, are designed to help patients track blood sugar levels, monitor dietary patterns, and share data with healthcare providers. Research by Hou et al. (2021) indicates that the use of health apps can improve patient adherence to health data tracking and enhance communication with healthcare providers.

However, the main challenge lies in older adults' acceptance of technology. According to the Pew Research Center (2019), only about 42% of older adults over the age of 65 feel comfortable using smartphones for health apps. The barriers they face include limited vision, difficulty understanding complex interfaces, and fear of making mistakes. Therefore, health apps designed for older adults must prioritize accessibility, simplicity, and social support.

2.3 Human-Centered Design in Health Apps

Human-centered design (HCD) is a design approach that focuses on users' needs, limitations, and preferences. According to Norman (2013), HCD emphasizes the importance of involving users in every stage of product development, from needs analysis to prototype testing. In the context of health apps, HCD has been shown to increase technology adoption among vulnerable groups, including older adults.

A study by Zhang et al. (2020) indicates that health apps designed using HCD principles are easier for older adults to use because they account for factors such as font size, color contrast, simple navigation, and clear instructions. Additionally, involving older adults in the prototype testing process allows developers to obtain direct feedback to refine the design. Thus, HCD not only improves usability but also strengthens users' sense of ownership over the technology they use.

2.4. Data Visualization and Medical Decision-Making

Data visualization is a critical component of health applications. Older adults often struggle to understand complex numbers or tables, so the use of simple graphs, icons, or color indicators can help them grasp their health status more quickly. Research by Tufte (2006) emphasizes that effective visualization must present information clearly, concisely, and in a way that is easy to interpret.

In the context of diabetes, a study by Quinn et al. (2018) showed that patients using apps with data visualization features were better able to recognize patterns of blood sugar fluctuations and take preventive actions. Additionally, the ability to share data with healthcare providers allows doctors to obtain a more accurate and real-time picture of a patient's health. This supports more precise medical decision-making and the personalization of care plans.

2.5. Health Apps and Quality of Life for Older Adults

In addition to medical aspects, the use of health apps also impacts the quality of life for older adults. According to the WHO (2015), the quality of life for older adults is influenced by factors such as health, independence, and social support. Apps that make it easier for older adults to monitor their health can boost their self-confidence and independence. A study by Chen et al. (2021) found that older adults who use health apps feel more involved in managing their conditions and experience reduced anxiety levels related to chronic diseases.

In Indonesia, research by Prasetyo (2020) indicates that mobile health apps can strengthen the bond between older adults and their families. Younger generations who help monitor their parents' health through these apps

find it easier to collaborate, while older adults feel more supported in maintaining their health. Thus, health apps serve not only as medical tools but also as social platforms that strengthen family ties.

2.6. Research Gaps and Contributions of This Study

Although many studies have addressed health apps for diabetes, most still focus on the general population or patients of working age. Studies that specifically highlight the needs of older adults remain limited, particularly in the context of developing countries such as Indonesia. Furthermore, most existing apps have not fully integrated human-centered design principles into their development.

This study contributes by redesigning the Glucosee app to be more elderly-friendly, using an HCD approach that directly involves users. The research focuses not only on blood sugar tracking but also on easy-to-understand data visualization, features for sharing information with healthcare providers, and improved interface accessibility. Thus, this study is expected to fill a gap in the literature and provide practical solutions for older adults with diabetes in Indonesia.

2.7. UX Design Theory for Seniors

According to the article “Usability for Older Adults: Challenges and Changes” by the Nielsen Norman Group, interface design for seniors must take into account the physical, cognitive, and perceptual changes that occur with age. The journal highlights that seniors tend to face challenges in understanding complex navigation, small text, and elements with low contrast. To improve the user experience for this group, the journal suggests several key principles, such as: Improve readability: Use large text with high contrast to make it easier to read. Simplify navigation: Ensure navigation flows are easy to understand with a logical structure. Provide clear feedback: Offer explicit and direct cues, especially when users interact with forms or buttons. Additionally, the report notes that older adults’ learning processes are often slower compared to other age groups. Therefore, digital experiences should be designed with a user-friendly approach, minimizing cognitive load, and allowing for more time to explore (Nielsen Norman Group, 2013).

2.8. The Theory of Icon Usage in UI/UX Design

According to the article “Icon Usability” by the Nielsen Norman Group, icons are important visual elements in user interface (UI) design that can accelerate understanding, save space, and enhance design aesthetics. However, the effectiveness of icons depends heavily on their design, context, and usage. Icons that are not intuitive or lack supporting text labels can cause user confusion. The report highlights several key principles for icon usage: Clarity and Intuitiveness: Icons should be easily understood without requiring much interpretation. Add Text Labels: Icons are often more effective when accompanied by text labels, especially for complex functions or concepts. Consistency: Icon design must be consistent across the entire interface to avoid confusion. Test with Users: Icon usage should be tested with target users to ensure they understand their meaning. Additionally, the Nielsen Norman Group emphasizes that universal icons (such as the search icon with a magnifying glass symbol) are more effective because users are already familiar with their meaning. Conversely, abstract or novel icons require more effort to understand and can diminish the user experience (Nielsen Norman Group, 2014).

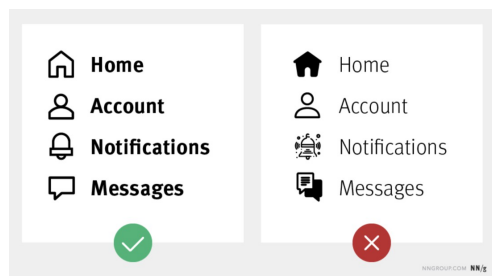


Figure 1. Correct use of Iconography
Resource: nngroup.com

3. Objectives

The purpose of this research was to redesign Glucosee apps' navigation to make it easier for users to use the app; redesign Glucosee's UI to give it a more appealing visual identity and provide a more aesthetically pleasing user experience; and incorporate illustrations and informative visual assets to clarify information and improve readability for older users.

4. Research Methodology

4.1. Research Approach

This study employs a human-centered design (HCD) approach as the primary framework for redesigning the Glucosee app to make it more user-friendly for older adults. HCD was chosen because it emphasizes active user involvement at every stage of development, ensuring that the resulting solution truly aligns with their needs and limitations. This approach involves an iterative process consisting of needs analysis, prototype design, testing, and design refinement based on user feedback.

4.2. Needs Analysis

The initial phase of the study began with a needs analysis to understand the challenges faced by older adults in using digital health apps.

- Primary data was obtained through in-depth interviews and surveys of older adults with diabetes in Indonesia. Questions focused on their experiences monitoring blood sugar levels, the challenges they faced, and their preferences regarding app features.
- Secondary data was collected from national health reports, academic publications, and previous studies on digital literacy among older adults.
- Next, we analyzed and identified visual issues experienced by users within the app, analyzed information regarding diabetes and the role of healthcare professionals in diabetes management, and analyzed interview results alongside comparisons with competitor apps.
- Finally, we summarized the overall findings of the analysis

This needs analysis aims to identify the key factors affecting usability, such as visual and motor impairments, as well as the level of comfort in using a smartphone.

4.3. Prototype Development

Based on the results of the requirements analysis, the Glucosee app prototype was developed with a focus on:

- Simplifying the user interface (UI): use of large fonts, high color contrast, and simple navigation.
- Data visualization: simple graphs with color indicators to facilitate the interpretation of blood glucose levels.
- Additional features: tracking of physical activity, medication intake, and dietary patterns to provide a more holistic view of health.
- Data-sharing functionality: integration with healthcare systems so that doctors can access patients' health histories in real time.

The prototype was developed using interactive design software (e.g., Figma or Adobe XD) to facilitate usage simulation prior to full implementation.

5. Result and discussion

The process of redesigning the Glucosee app interface began with in-depth research to understand user needs and challenges, particularly those of older adults with diabetes. The research was conducted through a literature review that included data searches on the internet, scientific journals, and books, as well as direct interviews with doctors, diabetes patients, and their families. The results of this research served as the foundation for developing the Information Architecture, which was used to determine the structure and main pages to be designed in the latest version of the Glucosee app.

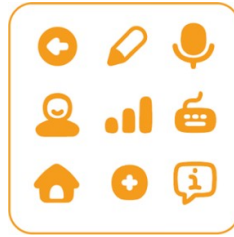


Figure 5. Glucosee Illustration
Resource: Documented by researchers (2025)

5.4. Prototyping

Prototypes are designed based on page-to-page transitions to determine the motion and micro-interactions to be implemented. The prototypes are created using Figma.

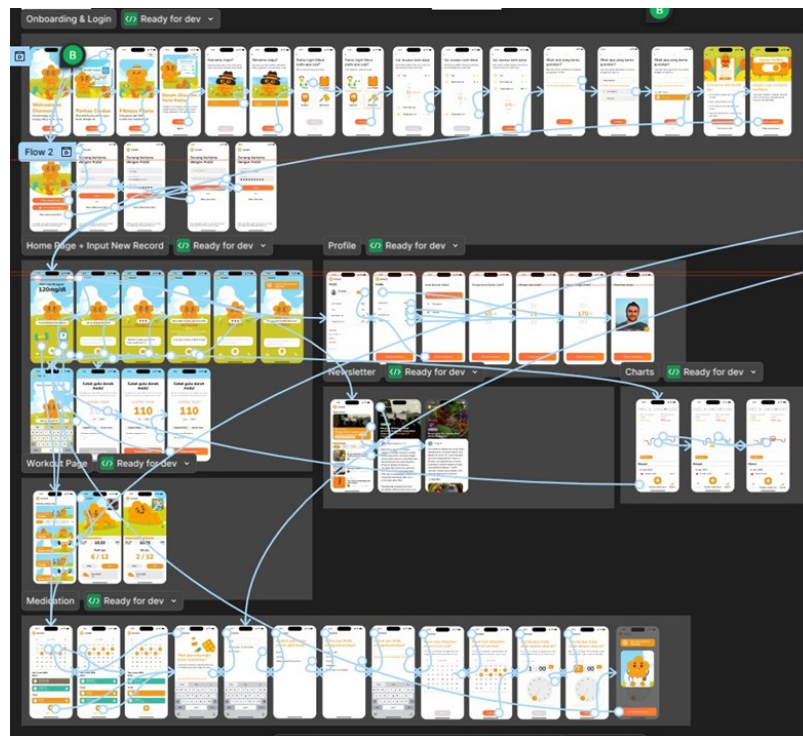


Figure 6. Prototyping
Resource: Documented by researchers (2025)

5.5. Onboarding

When users first open the Glucosee app, they are greeted with an onboarding screen that introduces the app's main features. In addition, there is a short survey to collect user information in order to tailor the Glucosee experience to individual needs.

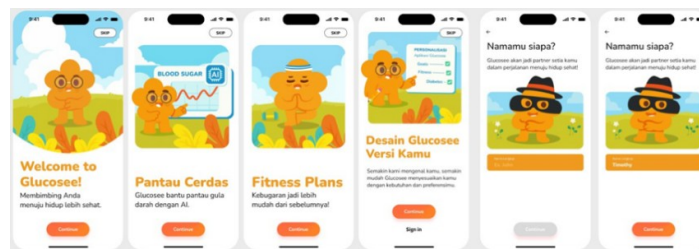


Figure 7. Onboarding 1
Resource: Documented by researchers (2025)



Figure 8. Onboarding 2
Resource: Documented by researchers (2025)

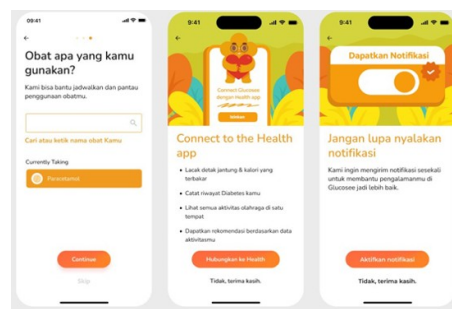


Figure 9. Onboarding 3
Resource: Documented by researchers (2025)

6. Conclusion

This study aims to redesign the Glucosee app using a human-centered design (HCD) approach to make it more user-friendly for elderly people with diabetes in Indonesia. Glucosee is a blood glucose tracking app developed to help diabetes patients, particularly the elderly, monitor their daily health. Elderly individuals often face difficulties using technology, leading them to prefer manually recording their blood sugar levels. This complicates the monitoring process for both doctors and the patient's family. The initial version of Glucosee did not fully address the needs of elderly users in terms of interface design or ease of use.

The Glucosee app was redesigned to simplify the user experience and improve accessibility and ease of use for the elderly and their caregivers. This update includes simplifying the blood sugar tracking process by integrating artificial intelligence technology, using soothing yet high-contrast colors, and offering large, easy-to-read fonts. Additional features such as medication reminders, blood sugar history, simple graphical displays, medication reminders, a diabetes newsletter, and fitness assistance are designed to improve patients' awareness and consistency in managing their health. The visual style and iconography are intuitive and familiar to ensure users feel comfortable and not overwhelmed when using the app. This design underscores that the implementation.

In addition to its technical benefits, this app also has a positive social impact. Older adults feel more supported by their families through digital collaboration, fostering closer intergenerational bonds in managing health. Thus, the Glucosee app serves not only as a medical tool but also as a means of empowering older adults to improve their quality of life. Overall, this study makes an important contribution to the literature on digital health apps for older adults, particularly in Indonesia. The redesign of the Glucosee app using a human-centered design

approach has proven effective in improving usability, accessibility, and the quality of life for older adults with diabetes. This innovation is expected to serve as a model for the development of other inclusive health apps that are user-centered, ensuring that technology truly benefits all segments of society.

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