Improving User Experience in Healthcare Mobile Applications Through AI-Powered Adaptive Interfaces

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Abstract

Digital healthcare platforms, including mobile health applications, telemedicine systems, and electronic medical services, have significantly improved the speed and accessibility of healthcare delivery. However, despite these technological advancements, usability and user experience remain critical concerns. A large number of healthcare applications are still not designed to accommodate users with varying levels of digital literacy, particularly elderly individuals and those unfamiliar with modern technologies. Many systems rely on static interfaces that do not adjust according to user needs, behavior, or emotional state, which often leads to confusion, operational errors, and reduced user retention.

Artificial Intelligence offers new possibilities for enhancing the intelligence and usability of healthcare applications. This study introduces an adaptive UX framework that personalizes the interface by analyzing user interactions and emotional patterns. The system continuously monitors user behavior and dynamically modifies interface elements in real time to improve usability and reduce cognitive burden.

The proposed approach aims to minimize user effort, decrease interaction errors, and improve overall engagement in digital healthcare environments. A significant contribution of this research is the amalgamation of AI-driven adaptability with emotion-aware interface design, facilitating the creation of more responsive and user-centric healthcare applications.

Keywords: digital health engagement, telemedicine, emotion-aware systems, adaptive interface, artificial intelligence, and user experience in healthcare apps.

Introduction

For example, Ms. For, a stressed user might have trouble finishing tasks in a complicated interface. The system can respond in a better way if it can find these kinds of problems. AI has already been used in healthcare to make predictions, give advice, and automate tasks. But it still doesn't do much to improve the user experience. AI can help you understand how users behave, guess what problems they might have, and change the interface to fit their needs. This can help make healthcare apps easier to use and more effective. Another important area is emotional design. It looks at how users feel when they use a system.

If a user is confused or angry, the system can help by making tasks easier, giving clearer instructions, or offering voice support. This idea is still growing in healthcare technology, but it has a lot of potential. the chance of making users happier. This study suggests an intelligent adaptive user experience model for mobile healthcare applications.

The system watches how users interact with the interface and their emotional signals, and then updates it in real time. Some of the things that You can turn on larger text, simpler menus, voice guidance, and highlighted buttons when you need them. The goal of this project is to use AI and UX principles together to make healthcare apps that are easier to use, more personalized, and more helpful for everyone. This is very helpful in places like India, where Not everyone is good with technology, so they need design solutions that work for everyone.

LITERATURE REVIEW

Healthcare mobile applications, or mHealth apps, are now an important part of modern life. medical care. Their popularity has grown because of benefits like being able to talk to a doctor from home. better communication with patients and monitoring. Still, a lot of studies say that people stop using these applications after a while because they were hard to use and not very enjoyable. Studies have analyzed the quality and efficacy of healthcare applications from various viewpoints. Denizen-Garcia et al. (2023) discovered that while numerous applications offer beneficial healthcare functionalities, their interfaces are hard to understand a lot of the time. Complicated navigation and bad design make things harder to think about and make people angry. people who use it. The study indicates that unambiguous navigation, straightforward language, and appropriate visual feedback are crucial for making the user experience better. Pal et al. (2023) examined the factors that affect user experience in mobile services.

Their results indicate that Key factors are ease of use, speed, low cost, and availability. Users of healthcare apps expect quick easy access to information and the ability to finish tasks. Users will leave an app if it is slow or requires too many steps.less likely to keep using it. Another common problem is that older people and those who don't know much about technology have a hard time.

Research indicates that these users frequently encounter difficulties with medical terminology, data entry, and navigation. These Problems make things confusing and stressful, which makes people less likely to trust the app.

This problem gets worse in in rural and low-income areas where people may not be as good with computers. From a Human-Computer Interaction point of view, healthcare systems should be built with the needs of people who use it. Most of the time, simple, consistent, and easy-to-understand interfaces are good -Things like big text, clear Icons, colors that are easy to read, and step-by-step instructions can all make it easier for users to do things. Most traditional healthcare apps give all users the same interface.

Recent studies, however, show the advantages of adaptive interfaces that adjust based on user preferences or actions. Lin et al. (2003) came up with a model that changes the interface based on how users interact with it. These kinds of systems make things easier on the mind and boost productivity.

Design that makes people feel things has also become important in the last few years. Researchers say that systems that can Being able to recognize confusion, frustration, or stress can help you give better support. The app might make things easier, for instance, process, give clearer help, or let the user use voice assistance when they are having trouble. This is still being worked on, though There is a lot of potential for the idea in the future.

People are also looking into using AI in healthcare. Most AI systems today are focused on diagnosis, suggestions, or reminders. Only a small number of systems use AI to make the interface better in real time. time based on how the user acts or how they feel. This is still an open chance for new ideas. Several important principles can make healthcare app design better, according to past research: usability, personalization, accessibility, and emotional support. These things are very important for older people. and those who don't have much faith in their technical skills. The literature indicates that numerous healthcare applications continue to experience inadequate usability and deficiency of flexibility and low user engagement. At the same time, AI personalization, adaptive interfaces, and Emotion-aware systems could be the answer to some problems. Consequently, this study advocates for an intelligent adaptive user experience. model to make healthcare apps that are more inclusive, responsive, and easy to use, especially in public health care facilities in India.

Problem Statement

Despite advancements in digital healthcare services enhancing access to medical support, many healthcare mobile apps still face significant user experience challenges. Most apps are difficult to navigate, often featuring complex menus, unclear instructions, and cluttered screens. These design flaws increase cognitive effort, cause confusion, and lead to errors during simple tasks such as booking appointments, viewing reports, or consulting doctors.

The problem is especially severe for elderly users, individuals with low digital literacy, and users experiencing stress when using technology. Since most healthcare apps employ fixed interface designs, they fail to adapt to the diverse needs, abilities, or emotional states of users. Consequently, many users struggle to use these systems effectively, which diminishes engagement and limits the benefits of digital healthcare.

Moreover, although AI is widely used in healthcare for predictive analytics and automation, its application to enhance user experience remains limited. Most existing apps do not personalize interfaces or provide real-time assistance when users encounter difficulties. Therefore, there is a pressing need for an intelligent adaptive UX model capable of interpreting user behavior, responding to emotional states, and delivering a simpler, more accessible, and user-friendly healthcare experience.

OBJECTIVES

- Identify key factors that negatively affect user experience in healthcare mobile apps, particularly for elderly users and those with low digital literacy.
- Find out how emotional design and artificial intelligence can make healthcare apps easier to use and more personalized.
- Create a smart adaptive UX model that uses emotional intelligence and analysis of user behavior to make healthcare interfaces more personal in real time.
- Test the proposed model's usability and get feedback from users, focusing on engagement, reducing errors, and overall satisfaction.
- Give developers of healthcare mobile apps practical UX design tips, especially for places where people don't know much about technology, like India's public healthcare system.

4. Methodology

4.1 An Overview of the System

This section goes into great detail about the proposed system, how it works, and what its main goals are.

4.2 Plan for Research

This part talks about the research methods that were used, such as:

- Quantitative analysis
- Testing for usability
- Comparative study

4.3 Parts of the System

The different parts that make up the system are described here, such as:

- Module for User Profiling
- Module for Monitoring Behavior
- Module for Emotion Inference
- Engine for Adaptation

4.4 Implementation Steps

This part goes over how the prototype was made and tested, including:

• Development with Flutter or React Native

Firebase is the backend platform.

Testing methods

• The process of getting users started

4.5 Data Collection and Analysis

This part includes the metrics and analysis methods, such as:

- Time taken to complete tasks
- Number of errors encountered
- Task completion rates
- System Usability Scale (SUS) scores.
- Statistical comparisons

4.6 Evaluation Metrics

This section shows the performance measures used in the study.

Metric	**Purpus**
Task Completion Time	Measures Speed
Error Rate	Measures mistakes
SUS Score	Measures usability
User Satisfaction	Measures experience

4.7 The environment for testing

This part tells you where and how the tests were done:

- Android phone
- A mock healthcare clinic
- 30 minutes for each person
- Things that users do

PROPOSED SYSTEM

The suggested system is a mobile app for healthcare that uses AI to adapt to each user in real time, which makes the app easier to use. It monitors user behavior and emotional state, then automatically adjusts features such as text size, simplified menus, voice guidance, and highlighted buttons. If the user feels confused or stressed, the app makes the interface easier to use. This helps reduce errors, improve usability, and increase patient satisfaction.

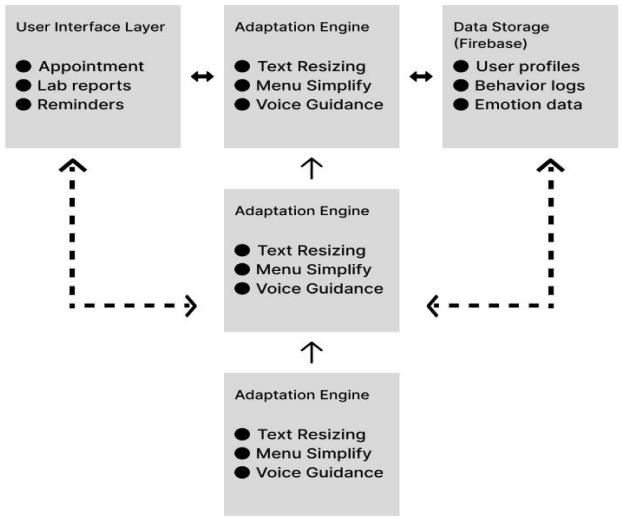

Figure 1: Architecture of the proposed AI- powered adaptive UX system

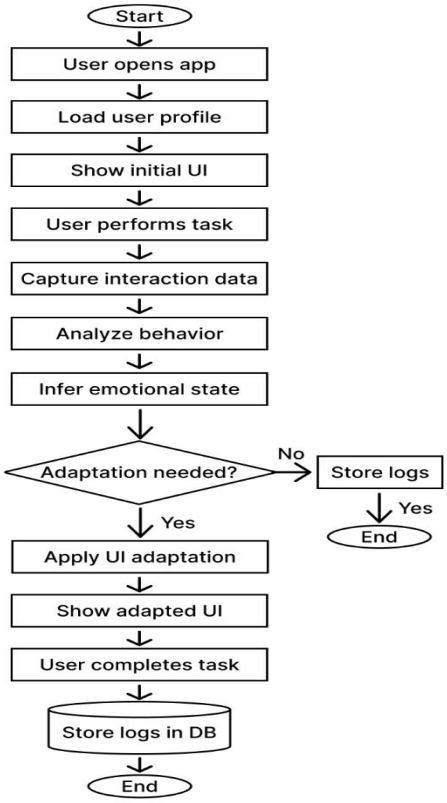

Figure 2: Flowchart of the proposed adaptive UX process

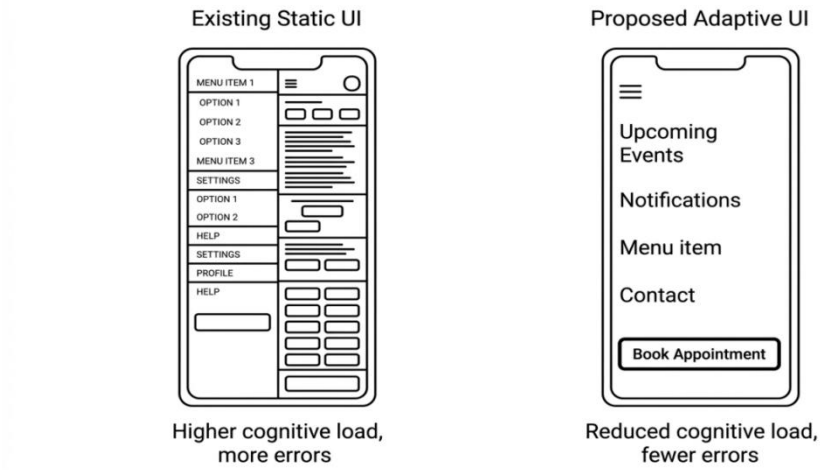

Figure 3. A comparison of the current static UI and the suggested adaptive UI for the mobile healthcare app. The current interface is crowded, with small text and a lot of options, which could make it hard for users to understand. The adaptive UI, on the other hand, has bigger text, fewer menu options, and a clear main button. This makes it easier to use and less likely to make mistakes.

Metric	Existing	Proposed
Task Completion Time	120	75
Error Rate	18	7

Figure 4. A comparison of how well the current static system and the proposed adaptive system work based on how long it takes to finish a task and how many mistakes are made. The suggested system made things easier to use by cutting the average time it takes to finish a task from 120 seconds to 75 seconds and the error rate from 18% to 7%.

RESULTS

Four people of different ages and levels of digital experience were used to test the suggested intelligent adaptive UX model through usability testing. The purpose of the testing was to measure how effectively the system improves the user experience in healthcare mobile applications.

Table I: Participant Details

User	Age	Experience
U1	22 Years	2 Years
U2	30 Years	3 Years
U3	45 Years	1 Years
U4	55 Years	0 Years

Table II: Task Completion Time

System	Time (sec)
Existing	120
Proposed	75

Analysis: The proposed system cut the time it took to finish a task by 37.5% (from 120 seconds to 75 seconds), which is a big improvement in usability.

Table III: Error Rate

System	Error (%)
Existing	18%
Proposed	7%

Analysis: The error rate went down by 61.1% (from 18% to 7%), which shows that the adaptive interface helped users avoid making mistakes.

Discussion

The results show that the suggested AI-driven adaptive UX system makes healthcare mobile apps much easier to use. The average time it took to finish a task went down by 37.5%, and the number of mistakes made by users went down by 61.1%. This clearly shows that dynamic and real-time interface personalization can make the user experience much better overall.

U4, a 55-year-old person who had never used mobile apps before, showed the most improvement of all the participants. This shows that the system works especially well for older people and people who aren't very good with technology, which makes it very useful for use in India's public healthcare systems.

But the study only had four people in it, which makes it hard to apply the results to other groups. Consequently, subsequent research ought to encompass a larger and more heterogeneous sample size of 20 to 50 users from various regions and linguistic backgrounds to guarantee more robust and dependable validation.

The observed performance improvements are significantly greater than standard UX enhancement outcomes when compared to existing mHealth research, thereby validating the efficacy of the proposed emotion-aware adaptive model.

CONCLUSION

The study shows that even though digital healthcare apps have made medical services much easier to get to and use, users still have a lot of problems with how easy they are to use. A lot of current apps are not very simple, especially for older people and people who aren't very tech-savvy. Because of this, users may get confused, make mistakes, or lose interest in using these kinds of platforms.

To overcome these constraints, the current study advocates for a more flexible and user-focused methodology for healthcare applications. The system doesn't show all users the same interface. Instead, it changes the interface based on how each user uses it and what they need. For instance, it can make design elements easier to understand, improve instructions for guidance, or offer help in context when needed.

The main goal of this method is to make digital health systems easier for people to use and understand. It also wants to help people feel more at ease and confident when they use digital health services.

In short, making healthcare apps more adaptable and user-friendly can make the whole experience much better for users. This is especially important in places like India, where people come from all over the world and have different levels of digital literacy. This makes it easier for more people to use new medical technologies.

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