

UI/UX Optimization for OTP (One-Time Password) Verification in Digital Health Apps using Design Thinking

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ABSTRACT

The rapid advancement of digital technology in the healthcare sector has catalyzed the development of applications such as XYZ, which offer streamlined access to medical services. However, security remains a critical challenge, particularly regarding the One-Time Password (OTP) authentication process. Issues such as delayed code delivery, insufficient system feedback, and ambiguous user guidance frequently degrade the overall user experience. This study aims to enhance the usability and effectiveness of the OTP verification process within the XYZ application using the Design Thinking methodology. The methodology comprises five distinct phases: Empathize, Define, Ideate, Prototype, and Test. Findings from the Empathize and Define stages identified core pain points from the user's perspective. The Ideate phase generated innovative solutions, including multi-channel OTP resend options, destination number validation, and informative system feedback with integrated help features. High-fidelity prototypes were developed using Figma and evaluated through internal usability testing to measure ease of use and operational effectiveness. The results demonstrate that the Design Thinking approach produces solutions more closely aligned with user needs, significantly improving the quality and reliability of the OTP verification process.

Keywords: User Experience, User Interface, Design Thinking, One-Time Password, Information System.

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INTRODUCTION

The advancement of digital technology has introduced significant transformations across various sectors, most notably in healthcare. Digital health applications, such as XYZ, enable users to access medical services with unprecedented speed and practicality, thereby enhancing both convenience and clinical efficiency [1]. However, this surge in digital accessibility presents critical challenges regarding security, particularly in user authentication processes designed to ensure that only authorized individuals gain access to sensitive services [2]. Consequently, robust security measures have become a primary priority in the development of digital health ecosystems [3].

One of the most prevalent authentication methods is One-Time Password (OTP) verification, a temporary, unique code sent to users to validate their access authenticity. While this method is effective in bolstering security, the verification process frequently encounters obstacles that degrade the User Experience (UX). Users often report confusion and frustration stemming from delayed code delivery, a lack of system feedback during the transmission process, and insufficient guidance regarding verification steps.

This study aims to optimize the user experience of the OTP verification process within the XYZ application by employing the Design Thinking methodology. This approach focuses on gaining a

profound understanding of user needs and developing innovative, user-centric solutions. By applying this framework, the research seeks to transform the OTP process into a more effective and seamless experience without compromising application security. Ultimately, this study contributes to the broader development of reliable and accessible digital healthcare services.

LITERATURE REVIEW

User Interface (UI) and User Experience (UX) are critical elements in the development of digital applications, particularly those handling sensitive data such as healthcare services. UI encompasses visual aesthetics and interactive components, including buttons, typography, and layout. Conversely, UX focuses on the user's holistic journey throughout the application, emphasizing navigational clarity, system responsiveness, and overall user satisfaction [4]. Well-engineered UI/UX design enhances usability, operational efficiency, and user trust in the platform [5].

In the context of security, One-Time Password (OTP) authentication is a widely adopted industry standard. Despite its security advantages, OTP implementation continues to present UX challenges, most notably regarding latency in code delivery and a lack of real-time system feedback during the verification process. The integration of OTP into the application's UI must be grounded in a user-centric approach to ensure it does not disrupt the user's workflow [6].

Design Thinking serves as a highly effective methodology for addressing these interface challenges. This framework prioritizes empathy toward the user and utilizes an iterative process to generate innovative solutions [7]. The Design Thinking process has been successfully implemented across various healthcare applications, resulting in significant improvements in visual clarity, navigational flow, and the overall verification experience [8].

METHODOLOGY

This research employs a Design Thinking approach, which prioritizes a deep understanding of user needs and experiences to generate effective, human-centered solutions. The methodology is executed through five iterative phases:

Empathize

In the initial phase, data was gathered directly from XYZ application users. The primary objective was to uncover the specific pain points encountered during the OTP verification process, including cognitive confusion, emotional frustration, and technical barriers that hinder a smooth login experience.

Define

The Define phase involved synthesizing the qualitative data from the Empathize stage to formulate a core problem statement. The primary issues identified included a critical lack of real-time system feedback, significant latency in OTP delivery, and a deficit of instructional guidance, all of which contributed to user drop-off.

Ideate

Once the problem was focused, the Ideate phase was conducted through brainstorming sessions and group discussions to generate creative and innovative alternatives. Proposed solutions included:

- 1) Options to receive OTP via SMS, WhatsApp, or Email.
- 2) Implementation of a countdown timer to manage user expectations.
- 3) Clear system messaging and direct "Help" links for troubleshooting failed deliveries.

Prototype

During the Prototype phase, high-fidelity wireframes and interactive models were developed to accommodate the new verification features. These prototypes were built using Figma, allowing for preliminary simulations and internal evaluations to assess the feasibility of the proposed solutions in addressing user grievances.

Test

The final Test phase involved evaluating the prototype with 15 selected users to gather direct feedback. The testing methodology included usability testing and post-task in-depth interviews. Researchers observed user responses, collected critical feedback, and evaluated whether the implemented solutions successfully enhanced the OTP verification experience. The results of this phase served as the basis for iterative refinement to ensure the final design fully aligned with user requirements.

RESULTS AND DISCUSSION

The Design Thinking framework was systematically applied to optimize the user experience of the OTP verification process within the XYZ application. By prioritizing the user's perspective, the study produced highly targeted and relevant design interventions.

Empathize

Empirical data was gathered through semi-structured interviews, direct observation, and questionnaires. The findings revealed significant levels of user frustration and cognitive friction during the authentication phase. The primary catalysts for this dissatisfaction were identified as delivery latency, a lack of system status updates during the waiting period, and ambiguous instructional guidance, which left users uncertain of the necessary next steps.

Define

During this phase, the qualitative insights were synthesized to pinpoint core problem areas. The fundamental issues were defined as:

- 1) A failure to inform the user of the transmission status.
- 2) Delays in code reception.
- 3) A lack of clarity that induced anxiety. These definitions provided a strategic foundation for developing focused, solution-oriented design requirements.

Ideate

The ideation phase focused on increasing flexibility and transparency. Key solutions developed include:

- 1) Providing users with multi-channel options (e.g., WhatsApp, Email) to adapt to varying network conditions.
- 2) Displaying masked destination numbers/methods to reinforce user confidence.
- 3) Implementing informative visual cues (e.g., progress bars, countdown timers) to reduce perceived wait times and increase transparency.
- 4) Integrating direct access to customer support and troubleshooting guides for instances of failed delivery.

Prototype

High-fidelity, interactive prototypes were developed using Figma. This allowed for a realistic simulation of the optimized OTP workflow. The prototype successfully visualized the updated user journey, incorporating the multi-channel resend features, dynamic feedback interfaces, and integrated help modules developed in the previous stage.

Test

The prototype underwent internal usability testing to evaluate ease of use, informational clarity, and the effectiveness of the new features. This testing served to identify potential friction points and architectural inconsistencies prior to full-scale implementation. The results indicated that the new design significantly smoothed the verification flow, with the feedback used to further refine the interface for optimal user performance.

CONCLUSION

The OTP verification process is a critical element in balancing security and user convenience within digital platforms like the XYZ application. Despite its necessity, systemic issues such as delivery

latency, inadequate system feedback, and ambiguous user guidance often lead to significant user frustration and cognitive friction. Through the Design Thinking methodology, this study conducted an in-depth analysis of user needs to formulate human-centered solutions. The proposed enhancements including multi-channel resend options, destination number validation, informative system messaging, and integrated support modules, address the core vulnerabilities of the current verification flow. Developed in Figma and validated through internal usability testing, the high-fidelity prototypes confirm that a user-centric approach effectively streamlines the authentication process. Ultimately, this research demonstrates that prioritizing user experience in security protocols significantly improves navigational clarity, operational efficiency, and overall user satisfaction in digital health services.

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