

Design of a Mobile UK-Clinic Application Using Svelte Front-End

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Abstract - This paper focuses on the design of a mobile UK-Clinic application, developed to address the healthcare needs of the clinic at Universitas Klabat. The application's architecture is proposed using Svelte for the front-end, outlining comprehensive functionalities for both staff/admin (doctors) and students (patients). Key design features for staff/admin include planned schedule management, prescription management, additional document handling, chat functionality, and profile management. For students, the design provides for appointment booking, medical record access, additional document viewing, chat, notifications, and a clinic location map. The UI/UX design emphasizes ease of use, with clear proposed flows from the login process to feature interactions, laying the groundwork for its future implementation.

Keywords: Mobile Application, UK-Clinic, Svelte, UI/UX, Medical Records.

I. INTRODUCTION

Student health is a crucial aspect supporting academic activities and overall well-being. University clinics play a vital role in providing accessible healthcare services to the academic community. Currently, the Universitas Klabat Clinic still relies on a manual record-keeping system for medical records, appointment schedules, and drug management. This manual approach often faces various challenges, such as low efficiency in data retrieval and storage, the risk of losing or damaging physical medical records, the potential for errors in recording, and slow service processes due to long queues and complicated bureaucracy (Smith & Jones, 2018). These conditions not only hinder clinic staff performance but also cause inconvenience for students who require fast and accurate healthcare services.

In response to these challenges, the proposed solution is the development of a mobile-based health information system. In this digital era, the development of mobile applications has emerged as an effective solution to enhance the efficiency and accessibility of clinic services. This paper primarily discusses the design of a mobile UK-Clinic application that aims to comprehensively facilitate clinic management for both staff/admin (doctors) and patients (students). This application design proposes a unified system for appointment booking, digital medical record management, drug prescription recording, and more efficient communication between doctors and patients. The primary objective is to enable improved clinic operational efficiency, ease of access to healthcare services for students, reduced recording errors, and

enhanced overall service quality through modern digitalization, serving as a blueprint for its future realization.

II. LITERATURE REVIEW

The Literature Review provides a comprehensive foundation for the research by critically analyzing previous studies related to the topic. It supports the background section by offering detailed evidence for the research problem and situating the current study within the broader academic discourse. This section should demonstrate a thorough understanding of existing scholarships while identifying gaps, inconsistencies, or unanswered questions that the current study seeks to address.

This section provides a comprehensive overview of the theoretical foundations, established methods, and key concepts relevant to the design of a mobile UK-Clinic application utilizing Svelte for the front-end.

Concepts of Mobile Application Design

User Interface (UI) and User Experience (UX) Theories: The design of this application heavily relies on principles of UI and UX to ensure an intuitive and efficient interaction for both clinic staff and students.

Norman's Design Principles (2013): Emphasize visibility, feedback, constraints, mapping, consistency, and affordance. These principles guide the creation of interfaces that are easy to understand and use, reducing cognitive load for users.

Garrett's Elements of User Experience (2010): This framework outlines five planes (strategy, scope, structure, skeleton, and surface) that contribute to a holistic user experience. For this application, defining the user needs (strategy) and functionalities (scope) precedes structuring the information architecture (structure), designing the interface layout (skeleton), and creating the visual design (surface).

Mobile Usability (Nielsen & Budiu, 2012): Specific considerations for mobile environments, such as limited screen size, touch interaction, varying network conditions, and context-awareness, are crucial. The design aims for clear, concise information presentation and minimal user input.

Human-Computer Interaction (HCI): This field explores the design and use of computer technology, focusing on the interfaces between users and computers. For a clinic application, HCI principles ensure that the interaction between medical professionals, students, and the system is seamless, efficient, and supports their tasks effectively. Concepts like learnability, efficiency, memorability, error prevention, and satisfaction are key design goals (Shneiderman et al., 2016).

Information Architecture (IA): This defines the structural design of shared information environments, enabling users to find and manage information effectively. For medical records and appointments, a clear IA is vital for intuitive navigation and quick access to critical data.

User-Centered Design (UCD): This iterative design process focuses on understanding the users, their tasks, and environments from the outset. By involving users throughout the design process, the application can be tailored to their specific needs, leading to higher usability and satisfaction (Rosson & Carroll, 2002).

Application Development Methods

The system development approach adopted here, adapting stages from the Software Development Life Cycle (SDLC), aligns with widely accepted methodologies for software creation.

Iterative Design: This method involves cycles of prototyping, testing, and refinement, allowing for continuous improvement based on feedback. Given the complexity of healthcare applications, an iterative approach helps to address evolving requirements and improve usability incrementally.

Prototyping: The use of Figma for wireframing and mockups falls under prototyping, which allows for early visualization and validation of design concepts with stakeholders before significant development resources are committed. This helps in gathering feedback on UI/UX early in the design phase (Cooper et al., 2014).

Technological Concepts

Svelte for Front-End: Svelte is a modern JavaScript framework known for its unique approach to building user interfaces. Unlike traditional frameworks that run much of their work in the browser, Svelte shifts that work into a compile step when the application is built.

Compile-Time Approach: Svelte compiles the application code into small, highly optimized vanilla JavaScript, leading to smaller bundle sizes and faster runtime performance by avoiding the need for a virtual DOM (Johnson et al., 2021). This efficiency is beneficial for mobile applications where resource optimization is critical.

Reactivity: Svelte offers a highly intuitive and native approach to reactivity, simplifying state management and data flow within the application, which is crucial for dynamic clinic data.

Firebase for Back-End: Firebase is Google's mobile and web application development platform that provides a suite of tools and services. It functions as a Backend-as-a-Service (BaaS).

Authentication (Firebase Auth): Provides robust and easy-to-implement authentication services, supporting various methods (email/password, social logins) crucial for securing sensitive clinic data (Firebase Auth, 2024).

Cloud Firestore: A flexible, scalable NoSQL cloud database for mobile, web, and server development. It offers real-time data synchronization, enabling instant updates for appointments, medical records, and chat messages, which is vital in a dynamic clinic environment (Cloud Firestore Documentation, 2024).

Cloud Storage (Firebase Storage): Allows for secure uploading and downloading of user-generated content, such as additional medical documents or sick leave certificates (Firebase Storage, 2024).

Cloud Messaging (Firebase Cloud Messaging - FCM): A cross-platform messaging solution that lets developers reliably send notifications. This is essential for features like appointment reminders, medical checkup approvals, and chat notifications (Firebase Cloud Messaging, 2024).

Serverless Architecture: Firebase abstracts away server management, allowing developers to focus solely on application logic, which can accelerate the development process (Lee & Kim, 2019).

Mobile Health (mHealth) Systems: The overarching concept governing this application's domain. mHealth leverages mobile communication technologies for health services and information. Key considerations include data privacy and security (HIPAA compliance if applicable), reliability, scalability, and integration with existing healthcare systems. Studies emphasize the potential of mHealth to improve accessibility, efficiency, and patient engagement in healthcare (Smith & Jones, 2018; Zhang et al., 2018).

This comprehensive literature review informs the design decisions and methodological choices made in developing the UK-Clinic application, aiming for a robust, user-friendly, and efficient digital healthcare solution.

III. MATERIALS AND METHODS

This research employs a **qualitative descriptive research method** with a **system development approach**, adapting stages from the **Software Development Life Cycle (SDLC)** model to design the application. These stages consist of:

Problem Identification The initial phase involved identifying the functional and nonfunctional requirements necessary for the mobile clinic application. This was primarily achieved through **direct observation of existing clinic operations** and **structured communication with clinic staff, including doctors and administrative personnel, as well as students** who utilize the clinic services. This approach allowed for a comprehensive understanding of the current workflow, existing challenges, and specific needs related to patient registration, appointment scheduling, medical record management, and communication.

This stage is crucial for ensuring the designed system addresses actual user needs and operational challenges (Peterson & White, 2019).

Literature Study A literature study was conducted to gather relevant information and theoretical foundations. The areas of study include:

- **UI and UX design principles**, to ensure usability, accessibility, and optimal user experience in mobile applications (Norman, 2013; Garrett, 2010; Nielsen & Budiu, 2012)
- **Mobile application development technologies**, particularly Android Studio and Java for application development (Google Developers, 2023)
- **Backend-as-a-service platforms**, especially Firebase for authentication, real-time databases, storage, and notifications (Firebase Documentation, 2024)
- **Front-end frameworks and design tools**, including Svelte for efficient interface development (Harris, 2021) and Figma for collaborative UI/UX prototyping (Figma Community, 2023)
- **Related studies on mHealth applications**, to identify best practices and challenges in digital healthcare systems (Zhang et al., 2018).

The insights from these sources provided the theoretical and technical basis for designing the proposed UK-Clinic application, ensuring both scientific grounding and practical feasibility.

Research Objective Determination Based on the identified problems and literature study, the specific objective of the application design was defined: to design a UK-Clinic application capable of digitally facilitating healthcare services for doctors and students.

UI/UX Design This stage focuses on designing the user interface and user experience using Figma. The design process includes: **Wireframing and Mockup**: Creating visual frameworks and *mockups* for each application page, providing a blueprint for development (Cooper et al., 2014). **User Flow**: Defining the user's interaction flow from start to finish, such as the login process, appointment booking, and feature access, ensuring a logical and intuitive journey (Lidwell et al., 2010). **Component Design**: Designing UI elements such as buttons, input fields, icons, and layouts consistently to maintain brand identity and improve usability (Shneiderman et al., 2016). **User-Specific Design**: Designing separate interfaces for staff/admin (doctors) and students (patients) with features relevant to each role, acknowledging their distinct needs and workflows (Rosson & Carroll, 2002).

Proposed Backend Structure with Firebase The backend structure is designed using Firebase, which encompasses: **User Authentication**: Managing the proposed login and registration processes for both doctors and students, providing secure access control (Firebase Auth, 2024). **Database**: Utilizing Cloud Firestore for storing medical record data, doctor schedules, patient information, and prescriptions, leveraging its NoSQL flexible data model (Cloud Firestore Documentation, 2024). **File Storage**: Managing the storage of additional documents such as sick leave certificates via Firebase Storage (Firebase Storage, 2024). **Notifications**: Designing notification features to inform patients about appointment approvals or doctors about medical checkup requests using Firebase Cloud Messaging (Firebase Cloud Messaging, 2024).

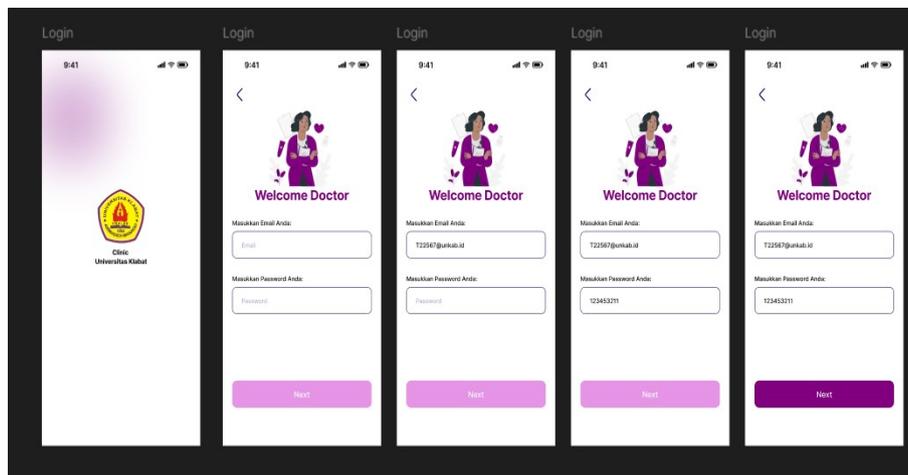
Proposed Front-End and Back-End Integration In this phase, the front-end designed with Svelte is conceptualized for integration with the Firebase back-end. This involves outlining how the user interface will connect with the Firebase APIs to retrieve, store, and update data, ensuring seamless data flow and functionality.

Analysis and Evaluation of Design After the design phase, the application design is reviewed to ensure all conceptual functionalities align with the requirements. Evaluation is conducted to identify potential improvements in UI/UX design or proposed system functionality through methods such as design walkthroughs and expert reviews (Rubin & Chisnell, 2008).

The application functionality design for the mobile UK-Clinic application, outlining the user interface and user experience considerations for both staff/admin (doctors) and students (patients). Each sub-section describes the intended purpose and visual layout of the features, demonstrating how the design aims to meet specific user needs and streamline clinic operations, below are the description of the application functionality design.

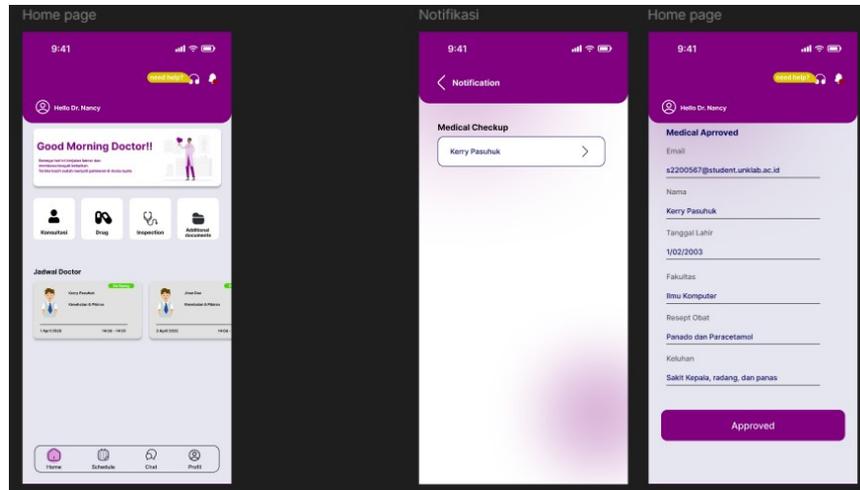
IV. RESULTS AND DISCUSSION

The application functionality design results for the mobile UK-Clinic application, outlining the user interface and user experience considerations for both staff/admin (doctors) and students (patients). Each sub-section describes the intended purpose and visual layout of the features, demonstrating how the design aims to meet specific user needs and streamline clinic operations, below are the description of the application functionality design: **Functionality Design for Staff & Admin (Doctors)**



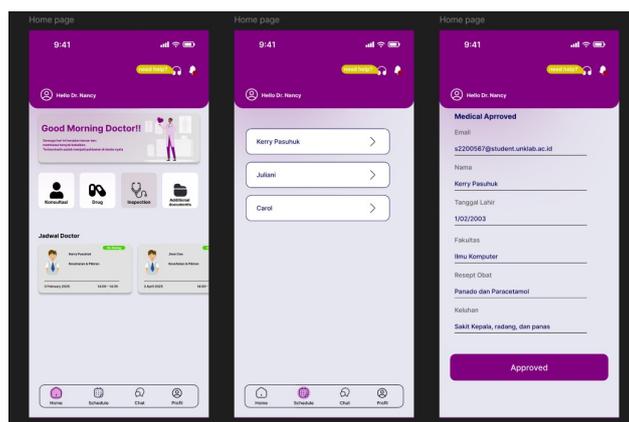
Login: This page is designed as the initial authentication point for users (doctors) before accessing clinic features. The phased design indicates a good UX flow, visually guiding the user through form completion.

The first screen displays the logo and application name of Clinic Universitas Klabat. The login page is designed with the title "Welcome Doctor," including input fields for email and password, and a "Next" button.



Homepage - Notifications: This series of UI designs supports the doctor's workflow for checking schedules, accessing service features (consultation, medication, inspection, etc.), viewing patient medical checkup notifications, and approving diagnoses and prescriptions.

The main page (left) is designed with the header "Hello Dr. Nancy," help and notification icons, a feature menu (Consultation, Medication, Inspection, Additional documents), and a doctor's schedule. Bottom navigation includes Home, Schedule, Chat, Profile. The Notification view (center) is designed to display a list of Medical Checkup notifications for patients, such as "Kerry Pasuhuk," which can be clicked to view details. The Medical Checkup Detail view (right) is designed to display patient details (Email, Name, Date of birth, Faculty, Prescriptions, Complaints) and an "Approved" button.



Homepage - Schedule: Similar to the notification page, but focuses on the doctor's schedule display.

- The Schedule page (center) is designed to list patient names in the schedule or for medical checkups (Kerry Pasuhuk, Juliani, Carol).
- The Examination Detail page (right) is designed to display patient data such as email, name, date of birth, faculty, prescriptions, and complaints, with an "Approved" button.
- **Medical Medication:** Doctors are designed to access the "Medication" feature from the main menu for managing medication prescriptions.
 - The Medical Prescription - Input page (center) is designed to allow doctors to write patient symptoms and select appropriate medications, such as Panadol and Paracetamol, and a "Send" button.
 - The Prescription Confirmation page (right) is designed to appear after the "Send" button is pressed, displaying a list of prescribed products and quantities, with a "✓ Medical Prescription" label and a "Send" button.
- **Additional Document:** Doctors are designed to access a page for creating sick leave certificates.
 - The "Additional Documents" page (right) is designed to contain a Sick Leave Certificate template automatically filled with patient data (doctor's name, patient ID, patient name, gender, age, address, examination results, sick period, purpose of letter, doctor's signature, and automatic date). A "Send File" button is provided.
- **Chat:** The "Chat" icon at the bottom is designed to lead to the instant messaging feature with patients.
 - The Chat Consultation view (right) is designed to display a conversation between Dr. Nancy and a patient (Kerry Pasuhuk) with timestamps and chat bubbles. Doctors can respond directly from the clinic.
- **Doctor Profile:** The Profile menu is designed to be at the bottom right, with the user's name (Dr. Nancy) appearing in the application header.
 - The Edit Profile page (center) is designed with fields for First Name, Last Name, Date of Birth, and Email, along with a "Next" button.
 - The Profile Detail page (right) is designed to display the filled profile information (Email, Date of Birth, Phone Number) and a "Done" button.

4.2. Functionality Design for Students

- **Login:**

The Splash Screen is designed to display the Clinic Universitas Klabat logo. The Welcome Screen is designed to feature an illustration and a welcome text, with a "Get Started" button. The Full Login Form is designed to show both fields (Email and Password) filled, and the button changes to "Get Started."

There are three user screens for the doctor's interface of the UK-Clinic mobile application:

Homepage (Left): This screen is designed to greet the doctor (e.g., "Dr. Nancy") and provides quick access to core features. It includes a header with help, headset, and notification icons. A main menu offers four key features: Consultation, Medication, Inspection, and Additional Documents. Below this, a section displays the doctor's upcoming schedule with patient names, dates, times, and "On Duty" status for active doctors. A bottom navigation bar allows easy access to Home, Schedule, Chat, and Profile sections.

Schedule Page (Center): This screen is designed to present a consolidated list of patients scheduled for appointments or medical checkups, such as Kerry Pasuhuk, Juliani, and Carol. Doctors can select any patient name from this list to navigate to a detailed examination view.

Examination Detail Page (Right): Titled "Medical Approved," this screen displays comprehensive details for a selected patient's examination. It includes the patient's email, name, date of birth, faculty, prescribed medications (e.g., Panadol and Paracetamol), and reported complaints (e.g., headache, sore throat, fever). An "Approved" button at the bottom allows the doctor to confirm and finalize the examination results.

V. CONCLUSION

This study presents the design of a mobile UK-Clinic application tailored to address the healthcare service challenges at Universitas Klabat. By leveraging **Svelte** for the front-end, the proposed system introduces a modern and efficient architecture that aims to digitalize core clinic operations for both doctors and students.

The design outcomes reflect a user-centered approach grounded in established **UI/UX principles**, ensuring intuitive navigation and role-specific features. For **staff/admin (doctors)**, functionalities include schedule and prescription management, patient communication, document generation, and profile settings. For **students (patients)**, the system supports appointment booking, medical record access, notifications, document viewing, chat features, and map-based clinic navigation.

This application design contributes to addressing key limitations of the clinic's current manual system by improving **data accessibility**, **reducing errors**, and **streamlining workflows**. Furthermore, it offers a scalable model for other educational institutions seeking to enhance healthcare service delivery through digital means.

However, as this study is limited to the design phase, actual implementation, testing, and performance evaluation in real-world use remain future steps. Additional research is recommended to:

- Validate the system's usability through field trials,
- Explore integration with national health records or insurance systems,
- Ensure compliance with medical data privacy standards (e.g., HIPAA or local equivalents).

In conclusion, the mobile UK-Clinic application design lays a solid foundation for digital health transformation within campus-based medical services, bridging gaps between healthcare providers and student patients through modern mobile technology.

Finally, the conclusion should offer **recommendations for future research**, practice, or policy, where appropriate. These may include potential directions for extending the study, refining methodologies, or exploring unanswered questions that emerged from the findings.

AUTHORS' CONTRIBUTIONS

- Marchel Thimoty Tombeng*: Conceptualization, methodology, UI/UX design framework, literature review, and supervision of the research process.
- Regi Fernando Najooan: System architecture design, Firebase integration planning, writing (original draft preparation), and editing.
- dr. Nancy Lidya Sampouw: Identifying the problems and gathering data for the Clinic.
- Ns. Yesenia Ketty Dalos: Identifying the Business Process including healthcare service, patient service, clinical service, and service delivery process.

All the authors contributed to reviewing and approving the final version of the manuscript. The author marked with * is the corresponding author.

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