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**SCHOOL OF COMPUTER SCIENCE AND ENGINEERING**

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A Telehealth Application on Android Platform

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REPORT COMMITTEE   
(Whichever applies)

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# ABSTRACT

The advancement of remote healthcare applications is crucial in addressing the challenges posed by time-consuming and inconvenient commutes to healthcare facilities. This type of application is substantially benefited when the commute between the patient’s house and the hospital or any emergency service is frustrating and taking a lot of time. By the request of the Mobile Application Development course, we designed a simple application that support the communication and chatting with the doctor, and booking system. The application leverages the Google Firebase as the remote database system, along with the Agora SDK to support these base business functionalities.

# INTRODUCTION

## Background

In the second decade of the 21st century, we have witnessed a shift in healthcare, driven by rapid technological advancements. Remote healthcare, more commonly known as telehealth, has emerged as a critical component of modern medical practice, especially the accessibility to healthcare is a global concern. A common example of the difficulty is that most people do not store the hospital’s contact as a daily routine, and communication in the emergency is less efficient, leading to a misunderstanding of the patient's scenario and resulting in them being in a danger zone. The advancement of digital technology, especially the online communication platform, robust data management systems, and real-time communication platforms has facilitated the development of telehealth applications that promise to bridge the gap between healthcare providers and patients, especially in remote or underserved areas. While the integration of technology in healthcare is not a new solution, we expect this to have a more inclusive healthcare system.

## Problem Statement

While the telehealth system has shown great promise, its full potential is yet to be realized, especially when the downside of the application should not be underrated such as complex user interfaces, inefficient appointment scheduling processes, inadequate communication channels between patients and healthcare providers, and along with the integration between the client-oriented (mobile) system and server-oriented system. One of the significant challenges is the inefficiency of appointment scheduling processes. Many telehealth platforms lack a streamlined approach to booking and managing appointments, resulting in confusion, time wastage, and often, missed appointments. Additionally, the communication channels sometimes raise concerns about the confidentiality and privacy of sensitive medical information. Furthermore, there is a gap in the integration of these systems with broader healthcare infrastructures. Many telehealth solutions operate in isolation, without proper synchronization with other medical records or systems used by healthcare providers. For example, the development of the hospital software, which is usually operated on a computer or laptop, is different from the mobile system which focuses more on the user experience, convenience, and data security, resulting in fragmented care, under-utilized resources, and money for the hospital. Another point from the hospital perspective is that the hospital cannot charge or profit the patient based on their usage of the application but their health only, while they still need a local or third-party team to maintain their system.

In general, the lack of a streamlined, easy-to-use telehealth system poses a significant barrier to the adoption of remote healthcare services, thus impeding the goal of achieving universal healthcare accessibility. By this, a simple, efficient, and user-centric telehealth application is not just a great opportunity and challenge to address these shortcomings, but a necessary step to pave the way for a telehealth solution that is accessible, reliable, and seamlessly integrated into the broader healthcare ecosystem.

## Scope and Objectives to Solution

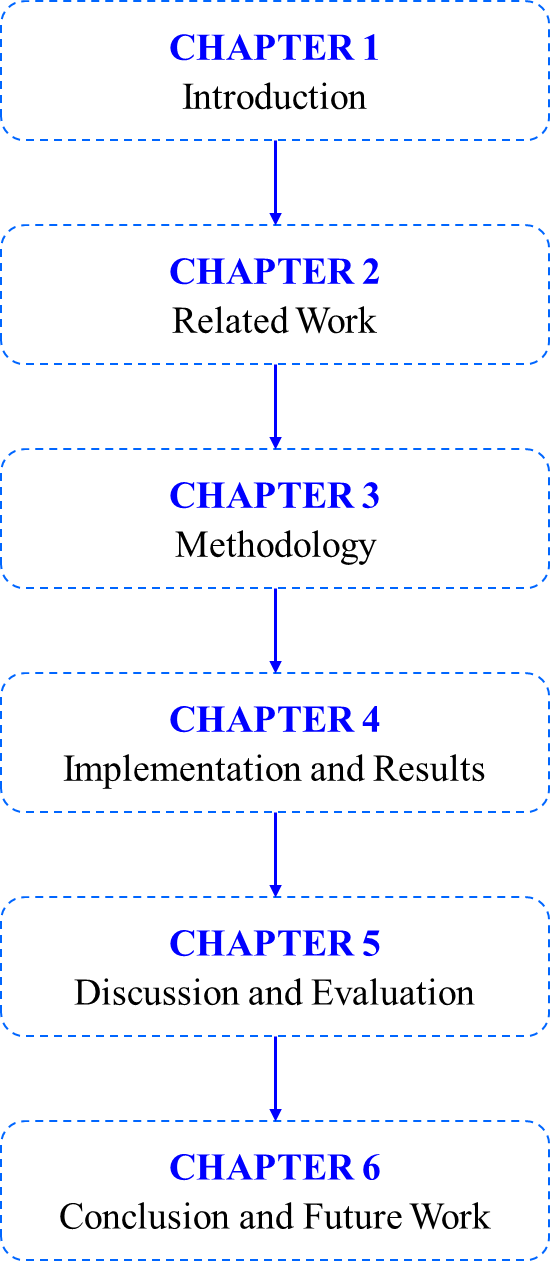
Recall from the previous section, that our scope is to demonstrate a simple way to bring the idea of a telehealth system online without incurring too much cost. This study is focused on the technological aspects of developing a telehealth application, showing that there are only several functionalities that the user wants. Specifically, the objectives are

* **Developing a User-Friendly Interface**: This is one of the uttermost important factors in having a diverse user base, including those with limited technological skills. The aim is to simplify the navigation and operation of the application, making telehealth services more accessible and less intimidating to the average user. But to achieve this, unless the team is comprised of high-tech engineers with proper skill set and service mindset, it would require
* **Minimal Business Functionalities**: This helps to simplify the unnecessary information or functionalities that are not or rarely used by the user such as the communication between patients. This example would bring great annoyance to patients when not only being exploited to scam the patients but also the mental privacy and insecure data protection; whilst the social media platforms are well-handed on these types of scenarios. By this, we reduced the number of functionalities into two which are
  + **Efficient Appointment Management**: The system should efficiently manage appointments, reducing the likelihood of errors and miscommunications that can lead to missed appointments. But to prevent spammers, the system would require medical-operation experts to accept the appointment, which would also utilize and balance the medical system resources and make the platform manageable.
  + **Secure and High-Quality Communication**: The application will prioritize establishing a secure and seamless communication channel, involving high-quality video and audio capabilities with stable connectivity. However, to ensure the best treatment the patient could receive while adapting to the production-grade medical standard, the doctors must have passed an online advisor course, which helps the patients how to use the medicine properly and diagnose any adversarial symptoms without concluding the sick.

In this study, we focused on the technological aspects of the solution where we developed a telehealth system that highlights the use of Google Firebase and Agora SDK in crafting a solution. The solution would detailed exploration of the design process and technical development of the application, but acknowledge its limitations towards existing healthcare systems in real-world healthcare settings.

## Report’s Structure

This report consists of six chapters in which the first chapter is an overview of the real-world consequence, the motivation, and the proposed solution of this report. The second chapter is a literature review of some existing related works found on Google Play. The third chapter presents how methods and approaches used in the development of the telehealth application are described, including the technical specifications, design principles, and development tools. The fourth chapter will present the demo and instructions for our initial deployment and testing. The fifth and sixth chapters finalize the report by discussing the topic, the validity of the application, and the development direction of the report.



***Figure 1***: The structure of the report with six chapters.

# RELATED WORK

## a (2013)

a

## b (2020)

a

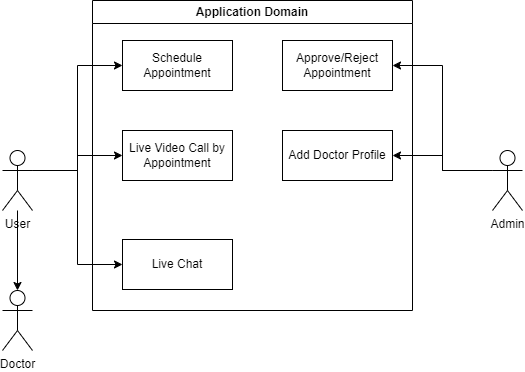
## Summary

which is detailed in the **Methodology** chapter (*Chapter 3*).

# METHODOLOGY

## User Requirement Analysis

As mentioned in Section 1.3, the two main functionalities related to the appointment scheduling and live communication is splitted into this use-case diagram. From the perspective of the application domain, the user and doctor share similar functional usecase, as opposed to the administrator. The user and doctor can schedule the appointment and live video call on the accepted appointment from the administrator. They can also perform live messaging, a new functionality that enable direct communication between users and doctor. On the other hand, the administrator would support the user to either approve or reject the appointment, and create the doctor’s profile, which adds another management layer. The doctor’s profile can be seen when the user wants to perform live communication with any doctors provided by the application. The detailed diagram in Figure 4



**Figure 4**: The use-case diagram represents the user’s requirement analysis

## System Design

### Design Architecture

In this section, we will discuss how our application delivered. By our nature, our application involves separate parts following the MVVM design patten (model-view-viewmodel).

### Database Design

In this section, we will discuss how our packages are designed on the surface, but not described in detail.

### Application Design

In this section, we will discuss how our packages are designed on the surface, but not described in detail.

# IMPLEMENTATION AND RESULTS

## Appointment Scheduling

To have a thorough evaluation

## User Communication

The

## Benchmarking

In an overall manner,

# DISCUSSION AND EVALUATION

## Discussion

In this thesis,

**Method Interpretation:** By

**Result Interpretation**: The observed performance

**Limitations**: However,

## Evaluation

**Scalability**:

**Methodology Assessment**: In this study,

# CONCLUSION

## Conclusion

In total,

## Future Work

In total,

# REFERENCES