# Mobile-Based Medical Health Application - Medi-Chat App

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**ABSTRACT**: The aftermath of the development and implementation of the Android operating system and its associated Application Programming Interfaces(API) by Google culminated in the development more mobile device-enabled applications designed for our day-to-day businesses and personal use, however in recent times we are experiencing a massive revolution in the use of mobile technology in the health sectors of our economy and this revolution is termed as Mobile Health Technology (MHT).This new technological breakthrough has enabled the development of powerful android applications that enabled people tract and monitor the treat of heart and kidney related diseases as well as the monitoring and evaluation certain drug prescriptions. It has also changed the way we communicate with our specialist doctors from phone, text to mobile-based communication. All these interventions provided by MHT have drastically increased the efficient and effective provision of health care delivery on one side and providing a common platform for prospective patients to easily interact with health professionals for medical advice and subsequent treatment of their diseases. Moreover, In Ghana It would provide a much efficient and cost effective way of improving health-care methodologies in this 21st century which is characterized by information and communication technology. In this paper, the main goal is to develop a mobile health application that provides common platform prospective patients and specialist doctors give free consultation and health tips on health related conditions thereby reducing the difficulty and challenges uncounted in accessing free medical health care at the already overburdened hospitals, polyclinics and health centers in Ghana.

**Keywords:** Mobile, Android, Google, Programming, Health

## 1.0 INTRODUCTION

Mobile Health Technology (MHT) is the use of mobile applications for provision and delivery affordable healthcare. It is a young and dynamic field that could be explored and harnessed to improve the health conditions of people around the world [1]. The development of Mobile health applications can lower the costs of health care delivery and improve the quality of healthcare as well as shift behavior to strengthen prevention and treatment of reported cases at the, all of which can improve health outcomes over the long term. One of the main goals of using mobile technology in the health sector is to improve the quality of and access to health care. [1]0Because so many different factors can contribute to these aspects of healthcare, a wide variety of mobile health interventions have been implemented to address these issues.


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With the aforementioned issues relating to the power of Mobile Health Technology in Ghana and the increasing use of smartphones and internet penetration among the Ghana populace as well as data from the Ghana Statistical Services and Ghana Aids Commission, it is estimated that the prevalence rate of sexually transmitted diseases in Ghana for the ages of 15-49 is 1.6% for 2015, showing that the category of the population most affected with sexually transmitted infection is the youth as well as the social stigma that is associated to it, hence this paper. In this paper the **Medi-chat app** is developed to address the issues raised above. 00The Medi-chat app is going to be an indispensable tool for any user of an android operated smartphone in a manner that individuals will be given the platform and convenience to have a direct interaction concerning general health and STI (Sexually Transmitted Infections or diseases) issues with a qualified and certified doctor through the mobile devices of individuals anywhere. This app will help reduce outpatient department cases and also reduce the overcrowding of prospective patients at our various hospitals in Ghana hospitals and also eliminate the inconvenience associated with one-on-one interaction with a doctor about illnesses and specifically STI infections. It will not only be a real-time chat app but also it will publish various health articles and other relative information to its users hooked on the mobile health platform. This feature will help sensitize users on numerous health related topics both prevention and treatment measures and even on diet. 000The Med-chat app is developed to address all common health problems but with sexually transmitted infections been our main focus and to enable immediate reporting of symptoms to health practitioners as well as alleviate the social stigma infected persons would face seeking for treatment 00.

## 2.0 CONCEPTUAL FRAMEWORK

Early in its development, in 2003, Mobile-Health Technology was defined as wireless telemedicine involving the use of mobile telecommunications and multimedia technologies and their integration with mobile healthcare delivery systems (Istepanian and Lacal, 2003). 000Since then it has come to encompass any use of mobile technology to address healthcare challenges such as access, quality, affordability,

matching of resources, and behavioral norms. Thus it can involve a wide variety of people and products, as well as the actions that connect them. The crux of these connections is the exchange of information. Mobile technologies cannot physically carry drugs, doctors, and equipment between locations, but they can carry and process information in many forms: coded data, text, images, audio, and video00.

### 2.1 SURVEY OF SIMILAR SYSTEMS

#### 2.1.1 Bisa Health App

Bisa means "ask in the Ghanaian Twi language. [1]0 Bisa is a mobile application that allows users with an android or windows phone to interact directly with medical practitioners without having physical contact; an advantage to people who have health concerns but are shy to talk to a doctor face to face.

#### 2.1.2Vodafone Health Line App

This app keeps you up-to-date on Health Line viewing times, health tips, profiles of the doctors and so much more00.

#### 2.1.3Lybrate - Consult a Doctor App

Lybrate has revolutionized the way people in India take care of their health. We have more than 90,000 doctors registered with us from all over the country to help you lead a healthy and happy life 00.Be it about managing diabetes of your parents living in a different city, or finding solutions to various pediatric problems of your kids, or dealing with your own stress, or any lifestyle or infectious disease, now you have a doctor for everything just a tap away. Chat with top doctors of India, find valuable health tips from them, get opinions from multiple trusted doctors, reach out to the top doctors from different cities, and find and book appointments with the best doctors in your own city.

#### 2.1.4 Free Doctor, Doctor Gratis App

Free online Doctor, Free Doctor, Free medical consultation for any medical issues (Doctor Gratis / Dokter Gratis). No appointment needed instant live chat with our General Physicians. No waiting time 0.

#### 2.1.5 TopDoctorsOnline (TDO) App

This is a health service that enables you to find a complete solution to your health concerns using the app. The TDO way is to understand users' health concern completely before we recommend your health services to resolve your health concern.

#### 2.1.6 Superdoc - Ask A Doctor Online App

Superdoc is the best free app to ask a doctor online. 00Superdoc allows you to chat with a doctor online for free.It's very simple! Use Superdoc to ask a doctor about your health or medical queries and get answers instantly! You can also live chat with a doctor, attach a picture of your affected area or your latest lab reports and get answers in few taps. Your answer arrives in less than 15 minutes. You get the benefit of doctor consultation from the convenience of your home and for free. You can also get a second opinion using Superdoc.

## 3.0 METHODOLOGY

The methodology employed in this paper is organized into several stages and sections as indicated below:

### 3.1 General Objectives

Since it's a real time application, the main objective is to design and implement an application that will create an online platform to help connect people and enable them chat with doctors about their health status (sexually transmitted diseases) before visiting the hospital 00.

#### 3.1.1Specific Objectives

1. To develop an application that will create an avenue to be able to chat with doctors about health matters and issues.
2. The system will also display various health articles and tips about healthy diets.

#### 3.1.2The scope of this chat application development are:

I. Text-based communication system with multiple user connection development on android operating system (minimum version: 4.0) based on the java programming language (Android Studio IDE-Integrated Development Environment version 2.1.2), Android SDK-Software Development Kit, and Android API Level 23 0.
II. The user interface is developed in XML-Extensible Mark-Up language.
III. The user interfaces include, login interface, chat interface, blog interface, chat list interface.
IV. The backend development is based on google firebase real-time communication and database Application Programming Interface 00.

### 3.2 System Requirement Specification

The application requirements can be divided into **Functional** and **Non-Functional** requirements. Functional requirements define the capabilities and functions that a system must be able to perform successfully. Non-Functional requirements define the qualities and criteria that can be used to judge the operation of a system.

#### 3.2.1Functional Requirements

I. Users must be able to sign up.
II. Manager must create account for certified doctors (member of Ghana Medical Association) on the system.
III. Users must be able to log into the system.
IV. Users must be able to logout of the system at any time.
V. System must provide an error message in case of login failure for certain number of times
VI. System must provide a chat list of doctors online.
VII. System must allow all users to send and receive messages.
VIII. System must allow sign-in users to access doctor's profile.
IX. System must publish health related articles and tips.
X. Any user (both normal users and doctors) will be able to enter the system using his own unique ID and password00.

### 3.2.2Non-Functional Requirements

I. The graphical user interface and sub interfaces of the application must be user friendly
II. The system should show clear and detailed notification messages to the user.
III. The system must have lack of bugs and inform the user of every wrong operation.
IV. The system will be able to run on all Android devices.
V. The system will request a password for each user account.
VI. The system supports simultaneous users.
VII. User manual must be developed to help a new user understand the usage of the system.

### 3.3 Pictorial Representation

### 3.4 Use Case Diagram For Proposed System

**Actors:** Doctors, Normal users, manager and administrator

**Use cases:**

I. Logging into the system
II. Signing Up users
III. Logging Out of the system
IV. Send a message
V. Receive a message
VI. Access blogs
VII. Access doctor's profile

### 3.4 A further illustration is the use case diagram in figure A below

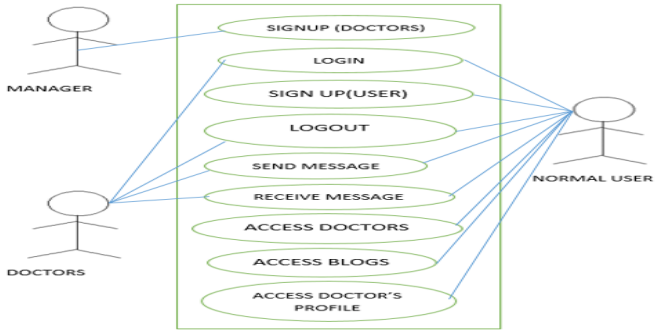


***Fig. A*** *(Anibrika et al, 2016)*

**Figure A** above depicts the use case diagram proposed for the Medi-Chat App.The Actors include Manager who has administrative rights or privileges to create accounts or sign up doctors on the system so as to ensure that a certified or qualified doctors from the Ghana Medical Bar Association (GMBA). As observed in figure A above the, Doctors have access rights to Log-in, Send and Receive messages and also Log-out of the system. The Normal user however has the access right to Sign-up, Log-in, Log-out, Send and Receive messages, Access Doctors lists, Access blogs as well as Access Doctor's Profile.The mapping of communication between the Doctor to the user is is many-to-many because several Doctors could interact with the users simultaneously while several users could interact with several Doctors at the same time.

### 3.5 Class Diagram (Logical View) - Medi-Chat

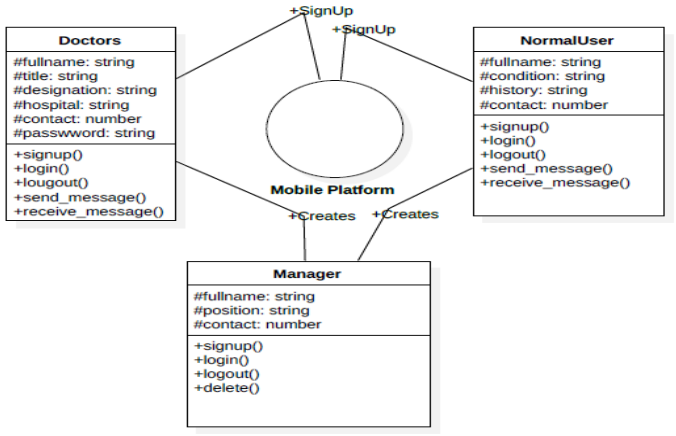


***Fig. B*** *Fire-base integration (Anibrika et al, 2016)*

### 3.6 Block Diagram of Functional and Non-functional Requirements

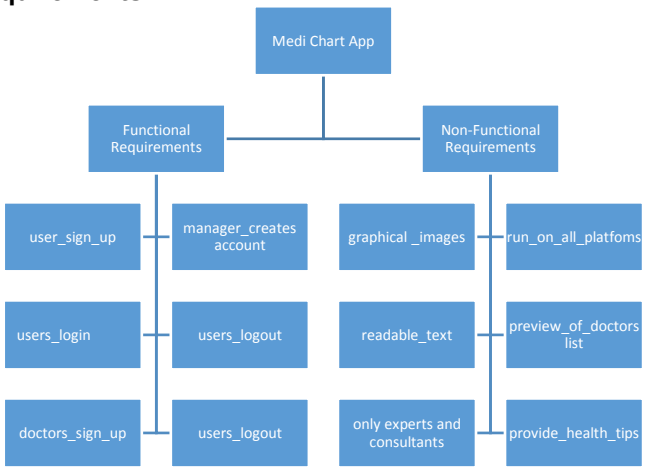


***Fig. C*** *Functional and Non-functional Requirements*

## 4.0 SYSTEM DESIGN

The design of this project is an integration of a real-time mobile-based communication among multiple users on a single platform. It includes three main areas: Architecture Design, Model design, backend design and user interface design 0.

### 4.1 Architectural Design - Firebase

Firebase is a fully managed platform for building iOS, Android, and web apps that provides automatic data synchronization, authentication services, messaging, file storage, analytics, and more. Starting with Firebase is an efficient way to build or prototype mobile backend services.

### 4.2 Firebase mobile app backend service, design pattern diagram.

This project employs the complete firebase-powered apps design pattern. In this architecture, your app only consists of static content and assets, and all your dynamic content and user data is stored and retrieved from Firebase. With this technology, Firebase-powered apps, user authentication can be handled by our Simple Login service which supports

Facebook, Twitter, GitHub and Google; in addition to a regular email/password login scheme. Simple Login eliminates the need for you to write your own server-side authentication code.

### 4.3How firebase is integrated into your app diagram illustration

Find below Fig**. C** a picturesque description of the architectural composition of the Firebase and the communication between mobile platform. This architectural design is based on the Client-Side architecture of computing where there is decoupling of several services and interprocess communication between hardware processes, software processes as well as user requests and therefore from the users perspective of computing , eventhough there are services and processes occurring at the core of the system it is seen as unifying and single entity. The mobile platform allows synchronous and bidirectional communication between the user (prospective patient) and a professional Medical Doctor. The Firebase architectural design helps the separate the core services provided by the mobile platform generated by users and Medical Doctors are designated as the function of the database agent (Firebase). Firebase gives an integrated mobile platform that gives you a suite of Application Programming Interface that enables you to quickly develop mobile applications. It is a powerful platform for creating applications and products referred to as Backend as a Service Solution which is actually referred to as Mobile Backend as a Service (MBaaS).Furthermore, Firebase has support for handling push notifications, mobile app analytics, mobile-oriented software development kit (SDKs), support for various user authentication methods, cloud storage for static elements, as well as database design.Therefore the use of Firebase to develop our Mobile Health Chat app (Medi-Chat app) enables the easy integration and deployment of mobile services integrated with database engine on one single platform. The diagram below therefore demonstrates how Firebase is employed in the development of our mobile application to deliver mobile-based services to users with different mobility patterns (e.g hawkers, artisans, and business professionals).

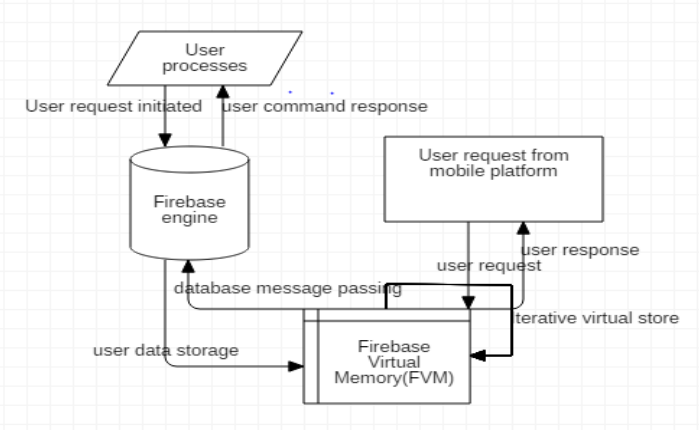


***Fig. C*** *(Anibrika et al 2016)*

### 4.2 Design Model

**The design model of this project includes the following packages:**

- Java code package: this consist of all java based source code of the application.
- Resource package: this includes xml layouts, media and other values of the project 0.

### 4.3 Backend Design

**Firebase backend design has multiple components.**

- Cloud messaging: Send unlimited upstream/downstream messages, Send messages to individual devices or a user segment. Handle all aspects of queueing and delivery with the application.
- Authentication: Easily integrates the application with our custom authentication service to give your users secure access to many of Firebase's other
- Real-time database: A cloud-hosted NoSQL database. Data is stored as JSON, synced across connected devices in milliseconds, and available when your app goes offline.
- Storage: Store and retrieve user-generated content like images, audio and video directly from the Firebase client SDK.
- Hosting: Production-grade hosting for developers. Deploy Web and mobile Web apps to a global content-delivery network (CDN) with a single command.

### 4.4 User Interface Design

### 4.5 Login Interface screenshot Of Medi-Chat App

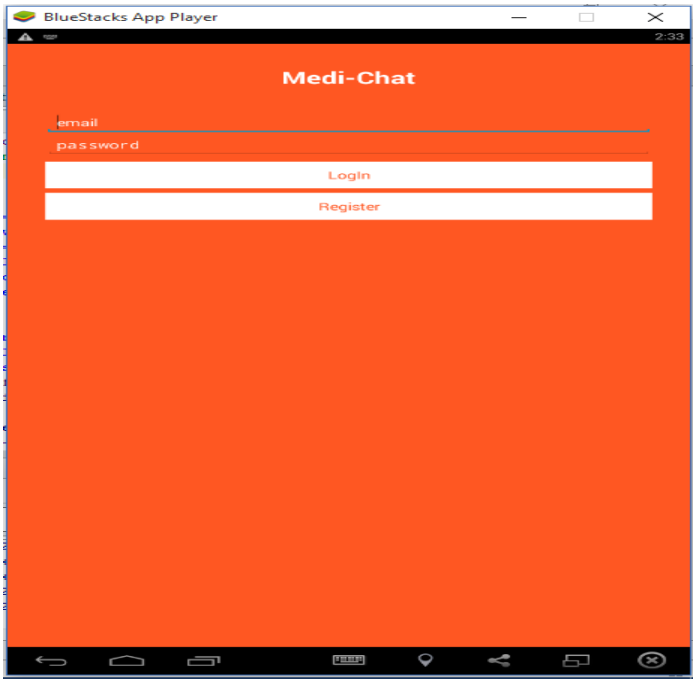


***Fig. D*** *Sign Up Interface Screenshot Of Medi-Chat App*

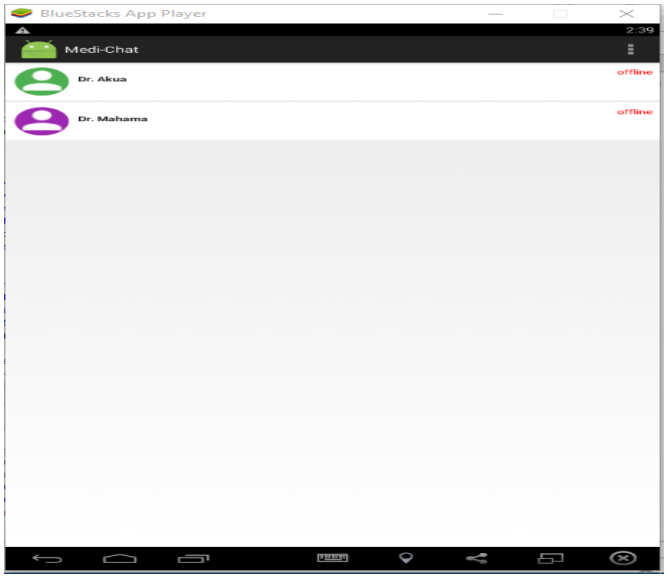


***Fig. E*** *5.0 SYSTEM IMPLEMENTATION AND TESTING*

**Implementation**

This chapter discusses the implementation of the Medi-Chat health application and the backend services. The first section presents the application development followed by the section of the firebase real-time communication services. In each section the tools that have been used are also presented 00.

### 5.1 Application Development

This section presents the Implementation of the mobile chat android application. Based on the design described in the previous section, the code written and the implementation techniques used are presented.

### 5.2 Tools (Software)

- Android Studio IDE
- Android SDK (System Development Kit)
- Firebase-client library: this library contains codes used to implement the firebase real-time communication service
- Bluestacks: the tool is used for emulating a real device.

### 5.3 Firebase And Chat Service Implementation

The implementation of the firebase package is needed to connect the application to the firebase server. Extract Of The ReferenceUrl Class For Firebase Initialization.

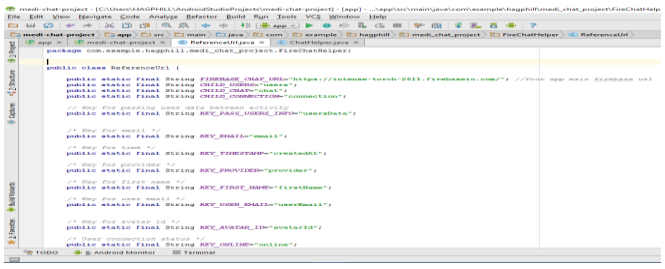

***Fig. F*** *(Anibrika et al,2016)*
*Extract Of The MainActivity Class*

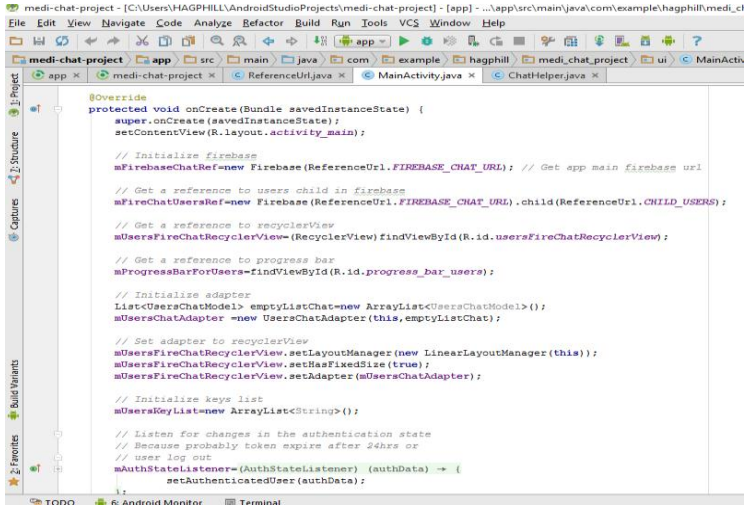

***Fig. G*** *(Anibrika et all, 2016)*
*Extract of the Chat Activity class.*

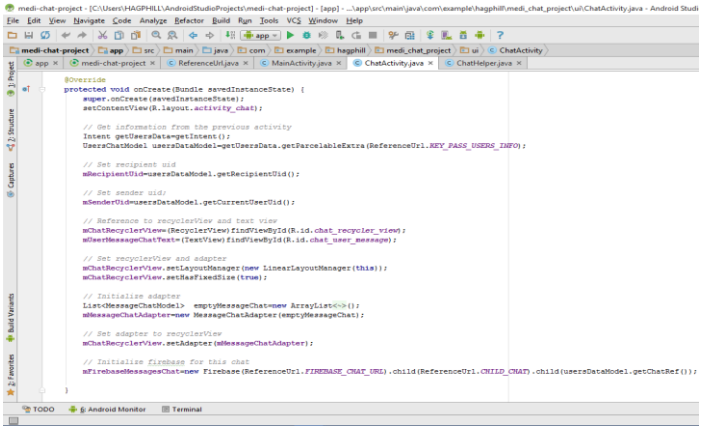

***Fig. H*** *(Anibrika et al, 2016)*

### 5.4 Graphical User Interface Implementation

Implementation of the user interface design. Extract of login.xml file for the login page.

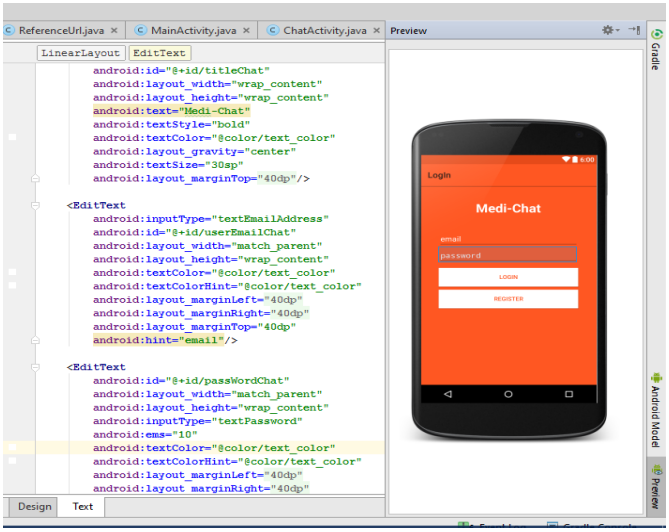


***Fig. I*** *(Anibrika et al, 2016)*

Extract of the register.xml file for the register page.

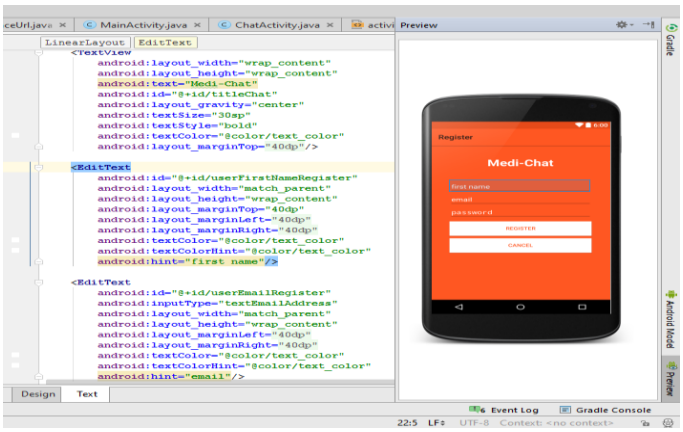


***Fig. J*** *(Anibrika et al, 2016)*

## 6.0 IMPLEMENTATION METHOD

There are several methods for handling the implementation of the complete application package. The method used is the pilot method. Since the application is an initial trial, small-scale version project. This will help catch potential problems and prevent them from escalating as well as accomplish a full implementation of all the various features of the project 00.

### 6.1 Implementation Scheme

- It will help confirm if the application is ready for full-scale implementation.
- Pilot method gives an opportunity to gauge the target population's reaction to the program.
- It helps in making decisions about how to allocate time and resources
- It also helps ensure that the project is well prepared to measure the success of the application

### 6.2 Evaluation and Testing

This section presents the evaluation and testing of the project. The main testing methodology use in the project is the functional requirement testing. Where the integrated testing framework of the android framework and the SDK tools were employed. Thus, we tested all aspects of the application during and after implementation 0.

### 6.3 Testing User Interfaces

**Application Evaluation**

- Heuristic evaluation – is a method for quick, cheap, and easy evaluation of the user interface design. The goal of the heuristic evaluation is to find the usability problems in the design so that they can be attended to as part of an interactive design process. The heuristic evaluation involves having a small set of evaluators examine the interface and judge its compliance with recognized usability principles (the "heuristics")000.
- Cognitive walkthrough evaluation – is a usability inspection method used to identify usability issues in interactive systems. It is task-specific, whereas the heuristic evaluation takes a holistic view in order to spot problems not spotted by this and other usability inspection methods. The method is rooted in the notion that users typically prefer to learn a system by using it to accomplish tasks, rather than, for example, studying a manual. The method is prized for its ability to generate results quickly with low cost, especially when compared to usability testing, as well as for the ability to apply the method early in the design phases, before coding has even begun.

The application's development was completed within the vacation period, so it was impossible to run it in a class with a teacher and students as evaluators. Thus, the cognitive walkthrough evaluation was chosen to be done by an expert evaluator, because the heuristic evaluation requires three to five evaluators and cannot replace an actual user evaluation 00.

### 6.4 CONCLUSIONS/DISCUSSION

The goals of the project were to development a chat application to facilitate communication between doctors and patients built on the android platform. Another goal was to add a blog column to the app, where users can read health related articles. The main goal was accomplished as well as their related functional and non-functional requirements were met. The agile development model was used in the android mobile development specifically prototyping. It is discussed that android software development does not follow a structural design or pattern, hence it is mostly difficult for developers to work on android application but with the agile model allows, it enable us to easily modify or change the requirements when needed, the frequent small incremental releases of the software helps us quickly improve the application's design, add more features and fix the bugs. Having researched about mobile health and how it can be used to address common health issues in Ghana, we can provide an overall account of our project. To begin with, in our project we created a real-time chat communication application that can enable person who medical attention need be able to have access to a doctor via the internet. The main health issue that drove our desire to undertake such a project was Sexually transmitted disease. Which is very prevalent among the youth today? The concept for this application is an essential and effective way to seek medical advice with little effort. To conclude, we believe that, with further improvement from future developers, this useful application we created could become fully operational with the health sector system, as it has much to offer by enormously adding to and evolving the educational process.

### 6.5 FUTURE WORK

This section discusses the possible improvements that can be made in the future to improve application, complete the remaining features and add new functions.

- **Improvements in doctors profile.**

The doctor's profile is not well detailed. Hence the enhancement should show a well detailed doctor profile including his/her specialty and health institution serving in.

- **Add multimedia communication feature**

With the current implementation users can only communicate with doctors via text. Therefore, for future enhancement, users should be able to send pictures and videos to doctors and other related features.

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**Source code and associated libraries are available upon request**

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