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Module name: Production Project

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Coursework title: Mental Well-being and Self-care using Mobile Application Technology

Due Date: 12 July, 2021

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Abstract

Technology has been influencing our lives for a while now but there are few innovations that help us to take care of our mental health and well-being. How often do you find yourself using technology to take care of your mental health? Our mental health determines our lifestyle however the existing mental healthcare system has a huge treatment gap and is inefficient to solve mental health problems of the world. The research focuses on developing a mobile technology that would help people to take care of their mental health, ultimately helping the mental healthcare system to reduce the treatment gap.

One in ten people are estimated to suffer from some form of mental illness and 60% of them don't receive proper mental health treatments or services. Many researchers have identified various problems faced by the mental healthcare system and have suggested solutions. The major problems which have been affecting the system have been analyzed and technology has been identified to be the best tool that could be used to uplift the problem faced by the people and the system. The research has proposed and developed a prototype product that uses psychological treatment and well-being techniques. The methodologies and implementation techniques used in the prototype have been discussed within the research report.

The fusion of technology and psychological techniques implemented within the developed product confirmed that it would indeed help in reducing the treatment gap problem. The prototype was successful in accumulating the features which would help to increase awareness, reduce stigmatization, provide resources and services. Although technological developments have not yet been identified as the best treatment alternative for mental health problems, the research has identified it as the most effective tool which would help people in their mental well-being and self-care journey ultimately uplifting the mental healthcare system around the globe. Nevertheless, the research also shows the possibility for future developments and recommendations that would improve the mobile application which has been included within the report.

Keywords: Mental Health and Technology, mental health treatment gap, mental well-being, and self-care application.

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Mental Well-being and Self-care using Mobile Application Technology

1. Introduction

1.1 Background

Modern society is conscious about health and well-being and is perhaps diligent enough to utilize technology to achieve a healthy lifestyle. Do you include yourself amongst those individuals of the smart community? Many of us, indeed, consider using technology to maintain a physically healthy life however, a healthy lifestyle is comprised of both physical and mental well-being. Although many technological innovations have been developed to promote and maintain physical health, they have been gradually enhancing their way into the mental healthcare industry by helping people to nurture and take care of their mental health.

1.2 Problem and Specification

Mental health is a state of emotional, psychological, and social well-being in which an individual perceives their capabilities, confronts stress, and works in a productive manner. It is the foundation for our emotions, thinking, communication, learning, resilience, and self-esteem which helps in maintaining our relationships, personal and emotional well-being (Parekh, 2018). It is significant to the people of every age group from childhood to adolescence through adulthood till old age. A disorder in the mental state of an individual which affects their mood, thinking, and behaviors determine mental illness. Mental disorders like depression, bipolar disorder, schizophrenia, dementia, and developmental disorders have been affecting many individuals from all around the world. Although mental health is considered one of the most prominent parts of our health, there are many problems faced by individuals and professionals in the mental healthcare system.

Many people occasionally have mental health concerns. These concerns are developed as mental illnesses when they cause excessive stress and affect the ability of an individual to function well mentally. Mental disorders occur in every region and culture of the world. Despite the increasing prevalence of mental illness, the mental healthcare system has a huge treatment gap which proves that it is inefficient in delivering its services successfully. Most of the people who experience mental illness are not aware of mental health

disorders. The lack of awareness about mental health disorders acts as a huge barrier in the prevailing mental healthcare system. Similarly, mental health stigma is considered as another reason for the treatment gap issues faced by the system. There is high societal disapproval of people who suffer from mental health illnesses. People who are aware of their mental illness do not seek help because of societal stigma or self-stigma. In addition, limitations in the use and inadequate access to mental health resources are other factors that constitute the treatment gap within the mental healthcare system. Finally, low allocation of financial and human resources to mental health sectors leading to low quality of service is regarded as another challenge that has to be handled by the system. Although many initiatives have been taken to solve these challenges, many research papers claim that the treatment gap in mental healthcare systems can be reduced, and mental health services can be delivered effectively with the help of technology.

Technological innovations have been developed to solve our problems with enhanced convenience. They have been successful in influencing our lives efficiently and the healthcare sector is no exception. The health technology industry has been helping to take care of our physical health however, few innovations offer mental healthcare facilities.

1.3 Aims and Objectives

Therefore, the primary objective of the research is to gain insightful information on the mental healthcare system to develop an android based mobile application which allows people to reflect on their mental well-being, nurture themselves, and reduce the treatment gap within the system. The research intends to develop a prototype mobile application that includes an information portal to help people to gain information related to mental health issues and their treatments. It proposes to design a prototype that acts as a platform for people to cope with mental health problems using Cognitive Behavior Therapy (CBT), positive psychology, mindfulness, and self-care activities. In addition, it aims to create a platform for certified mental health professionals who can connect to their patients to monitor their mental state regularly. Finally, it intends to develop an online community where people can share their personal opinions and peer success stories. Thus, the paper focuses on comprehensive research which then proposes a technological

platform helping people to take care of their mental health ultimately aiming to reduce the mental health treatment gap of the prevailing mental healthcare system.

1.4 Structure of the Report

In order to accomplish the objectives of the research, this literature discusses several problems faced by the mental healthcare system and establishes methods to mitigate those problems using technology. It also compares previous research papers for problems and discusses their proposed solutions. Furthermore, it argues how the existing technology is helping the system by giving several examples of existing technologies. After a detailed discussion on problems, the paper proposes a technological solution that supports the project objectives. It then mentions methodologies and techniques used by the proposed prototype along with a discussion about how they satisfy the aim of the research. Moreover, it also performs an overview evaluation of the developed prototype product and the research by highlighting problems faced and how they were mitigated. Finally, it mentions some suggestions and recommendations for future works to be performed on technology so that it can uplift mental health, self-care, and general well-being of the people.

2. Review of Literature

The World Health Organization (WHO) defines mental health as “a state of well-being in which the individual realizes his or her abilities, can cope with the normal stresses of life, can work productively and fruitfully, and can make a contribution to their community” (WHO, 2018). Even though mental health is considered as one of the significant factors for improving quality of life and generating social and economic benefits, it accounts for almost 13% of the disease globally which is expected to rise to 15% by 2030 (Murray et al., 2012). It is estimated that 450 million people in the world have a mental illness and 25% of them might suffer from mental illness of some form during their lifetime (WHO, 2017). Thus, many research papers and authors have concluded that the mental healthcare system is inefficient in solving prevailing mental illnesses and problems. The wide range of literature focusing on different problems which would help to get insights into the mental healthcare system has been accessed and discussed below in this section.

2.1 Problem Identification

Multiple research paper has estimated that one in ten people suffer from some form of mental illness out of which approximately 60% of people with mental illness don't receive any mental health services (MentalHelp, 2021) which evidence for a high mental health treatment gap resulting in the declining mental health system. Various studies have analyzed that the existence of the treatment gap is because of limitations in the access of mental health resources and facilities as it reported that 28% of countries don't have specific finance for mental health, whereas 36% of the countries with the budget for mental health assign less than 1% of their total health capital (Rathod et al., 2017). Due to limited access to mental health resources and treatment, mental healthcare services have become expensive and inefficient, resulting in low mental health awareness and high mental illness stigma among people. According to the research conducted by Mental Health Foundation, 90% of people with mental health problems have been facing negative effects on their lives because of stigma which discourages people to seek professional help (Mental Health Foundation, 2015). Therefore, it can be concluded that lack of awareness, high mental health stigma, inefficient and limited access to mental health resources, and low budget funding in the mental health sectors are the major factors that have been depreciating the existing condition of mental healthcare systems.

2.2 Literature Suggested Solutions

Many research papers and articles have been published reflecting on the problems faced by the mental healthcare systems and suggesting various solutions including instruments, innovations, and programs. Despite the success of WHO's mental health Gap Action Program (mhGAP), the system still has a high treatment gap thus other papers discussed that the decentralization of mental health resources and services are necessary to integrate them into the primary healthcare system (Abayneh et al., 2017). Moreover, some research also suggests that focus on mental well-being with the help of recovery, positive psychology, Cognitive Behavior Therapy (CBT), and Mindfulness are necessary to reduce mental health illness (Slade, 2010). Furthermore, many studies argue that technology and mobile mental health support would be most effective in connecting mental healthcare systems with their patients ultimately improving the mental health treatment gap.

In accordance with the challenges faced within the mental healthcare systems and proposed solutions, the responsibility for nurturing the mental health of an individual often falls upon themselves or their close ones. Technological inventions would be the most prominent tool as it includes suggestions of multiple research papers which might be helpful to uplift the treatment gap within the system. As there are over 200 classified mental illnesses, it is perhaps not convenient for people to know about mental illness and its treatment (Clark, 2020). However, technological advancements have been a convenient tool that can help people to literate and aware themselves of mental health as it can centralize the mental health resources and treatment mechanisms. Accordingly, limited access to mental health treatment can be overcome with the help of technology as people can search for mental health professionals from within their smartphones when they are ready or when it is necessary. In addition, technology may help connect people with mental illness to their therapists which adds up to quality treatment (NIMH, 2021). Technology is a simple, effective, and convenient tool which can be used to reduce the treatment gap and helps to uplift the prevailing mental healthcare systems. However, they must be working simultaneously with mental health treatment mechanisms which have been proven to be effective in overcoming the mental illness of an individual.

The focus of mental healthcare systems must be promoting both mental well-being as well as treating illness as the mental well-being of an individual ultimately improves the mental health condition resulting in decreased mental health illnesses reported every year. The most effective mental well-being and treatment mechanisms that can be incorporated within the technological advancements have been discussed below.

Mindfulness

“Mindfulness is a mind-body integrative approach that assists people in managing their thoughts, feelings, and mental health “(Mental Health Foundation, 2021). It includes exercises that help people to focus on living in the moment with the help of meditation and breathing. Research conducted by the University of Cambridge (Galante et al., 2021) has concluded that mindfulness increases mental well-being and can reduce anxiety, depression, and stress problems.

Positive Psychology

“Positive psychology is a branch of psychology that focuses on character strengths and behaviors that enable people to live meaningful lives to shift from surviving to flourishing” (Psychology Today, 2021). It is specifically determined towards personal recovery by uplifting individual characters including hope, spirituality, empowerment, purpose, connection, self-identity, and stigma (Luitel et al., 2012). Positive psychology can be practiced by doing gratitude exercises, journaling, and savoring the special moments of life. The results of a study indicated that positive psychology may be more effective in boosting happiness amongst people with depression.

Cognitive Behavior Therapy (CBT)

Healthline (Legg, 2019) defines Cognitive Behavior Therapy (CBT) as a “treatment approach which helps people to recognize negative thoughts and behavior patterns.” It is a popular and effective therapeutic approach which have been successful in treating substance use disorder, schizophrenia, psychotic disorders, depression and dysthymia, bipolar disorder, and many other mental health illnesses (Hofmann et al., 2012). SMART goal setting, journaling, positive self-talk, thought recording, reading out positive affirmations, etc. are some popular techniques used in Cognitive Behavior Therapy.

Self-care Practices

As simple as it sounds, self-care is a practice of doing things, that helps people to take care of themselves, consciously with the presence of mind which helps to improve the overall well-being of an individual. Self-care activities are meant to improve the way people feel within their bodies and mind. It has been identified to improve physical health, reduce stress and anxiety, boost self-esteem, protection of one’s well-being, and also lead to better relationships (BMI HealthCare, 2021). Some commonly used self-care practices include getting enough sleep, drinking a proper amount of water, making a nurturing dish, and savoring it. Self-care practices can be different for everyone as many of us have various things that make us happy.

2.3 Proposed Solution

After a comprehensive review of literature based on mental health, well-being, mindfulness, positive psychology, Cognitive Behavior Therapy (CBT), and self-care activities with the help of technology has been evidenced to a convenient tool in helping people to nurture their mental health. Although other techniques like good governance in mental healthcare and increased financial upliftment seemed to be effective alternatives, they have not been incorporated within this research. Thus, this research paper proposes to develop a technological platform that includes the above-mentioned techniques and would perhaps help to reduce the problem faced by the prevailing mental healthcare systems. In addition, it is also supposed to help people to nurture themselves, increase awareness, reduce stigma, ensure the flow of information and resources and promote mental illness treatment.

3. Review of Technologies

Modern technological innovations have influenced various sectors of our lives starting from the beginning of the day to our everyday activities until we end our day. Many mental health organizations like the National Institute of Mental Health (NIMH) and National Health Service (NHS) have identified mental health technologies to be cost-effective as well as are possible solutions for the mental health treatment gap (Chandrashekar, 2018). Technological advancements have multiple platforms including mobile-based applications, internet-based groups, telehealth, virtual reality, and artificial intelligence-based applications.

3.1 Mobile Applications

The mental healthcare systems have been taking over our smartphones recently although digital technologies were introduced for physical health practices for years. There are approximately one thousand mobile applications devoted to mental health and well-being with much focused-on depression, substance abuse, anxiety, and stress (Lewis, 2021). A research study suggested that mobile applications have been accepted by many mentally ill people to get over multiple mental health disorders and to take care of

themselves for overall well-being (Cole-Lewis & Kershaw, 2010). Many research-based on mobile technology has concluded that technology has been used for mental health is based on text messaging, and Cognitive Behavior Therapy (CBT) (Rizvi et al., 2011). Some of the mobile applications including InnerHour, Wysa, and What's up were assessed during the research.

InnerHour is a mobile-based application designed to help people dealing with anxiety and depression. It has multiple features including self-care courses, goals tracking, mood tracking, chat application, and resources sections. Secondly, WYSA is another mobile-based application blending AI-guided chatting for mental health which leverages CBT. It also includes professional human supports, self-care exercising, journaling, and emergency SOS. Finally, What's Up? is an application designed to access tools for managing mental health issues. It uses some techniques of CBT and Acceptance Commitment Therapy (ACT) to help users to cope with depression, anxiety, stress, anger, and self-esteem.

3.2 Internet-Based Groups

Internet-based technologies are one of the most effective technologies for mental health support, well-being, and self-care (Aguilera, 2015). Mental health support groups have been advanced to address a wide range of mental problems anonymously. Internet-based therapy is cost-effective with increased convenience which also adds up to overcome mental health stigma, because of anonymity (Griffiths et al, 2006). Internet-based support group TogetherAll was accessed practically during the research. It is a web-based application developed to support mental health and well-being which includes an online community where peers can support each other along with self-assessments and recommended resources and self-guided

3.3 Telehealth

"Telehealth, in general, refers to the use of digital information and communication technologies to gain remote access to healthcare facilities via mobile devices or computers" (Mayo Clinic, 2020). Telehealth facilities can be used as a communication mediator between mental health professionals and their patients. Telehealth facilities via video conferencing are more beneficial as it helps patients to connect to their mental

health professionals. In addition, these facilities are cost-effective, easy to access, and convenient. Thus, telehealth technology has been taking momentum in the mental healthcare industry.

3.4 Proposed technology for the Prototype Product

In accordance with the research performed, mobile application technology has been identified as the best technological platform to develop a product, that would nurture the mental health of individuals, because of its diverse facilities including convenience, accessibility, and anonymity. As mobile phone is a personally used technology, it ensures people have anonymity reducing mental health stigma amongst people facing mental health issues. Furthermore, many studies have suggested that mobile applications for mental healthcare are cost-effective as compared to conventional therapy. Although internet-based support groups have been identified as widely used technology, there are some major limitations as they suffer from high attrition rates. Therefore, this research suggests mobile application as a technology for mental well-being and self-care and will develop a prototype mobile application that will include some important features from the mobile applications that have been practically utilized during the research.

There is a wide range of technical techniques which can be used to develop a mobile application including different programming languages, platforms, database management, and design techniques. In-depth research on various platforms, languages, database management tools, and design techniques was performed which have been discussed below.

3.5 Mobile Application Platform: Android

Android is a mobile operating system that is one of the most widely used mobile OS with the statistics of 72.7% of mobile phones using Android OS (Statcounter, 2021). Although some researchers argue that iOS has better performance and flawless user experience designs, android’s flexibility and wide range of possibilities to developed products on several platforms make it the better choice for the mental well-being application prototype. Thus, the proposed application will be developed in the Android OS platform.

3.6 Programming Language: Java

In accordance with android application development, there are several programming languages to pick from including Java, Kotlin, C#, or JavaScript. Java being the official language of Android development has more support from Google. Although C# and JavaScript were considered, they are not the official language supported by Android and thus would require more effort and time. Therefore, Java has been chosen as the programming language to develop the prototype product of the research.

3.7 Integrated Development Environment (IDE): Android Studio

Integrated Development Environment (IDE) is a software development environment used to write programs using tools like editor and compiler. It is a useful tool that provides code insights, dubbing features, compiling and building the program, and finally testing facilities in one platform. Even though other IDEs like Eclipse, Visual Studio, and NetBeans were considered, Android Studio has been chosen as the ideal IDE for the prototype development because of its Intelligent code editor, android emulator, flexible Gradle-build system, layout editor, and APK analyzer features (Harvey, 2017).

3.8 Database Management System: Firebase Realtime Database

Database Management is one of the most crucial features to consider while developing any software as it allows the software to organize, store and retrieve data. Firebase Realtime Database is real-time, is accessible from multiple platforms with proper security policies, and is a Google-based cloud platform. It has been considered as the best DBMS option for prototype development although MySQL, SQLite, and Oracle databases are widely used DBMS with cheaper and multiple programming language supporting features.

3.9 Design Tools

The software designing tools are necessary for every software development as they help in designing the project and also helps in increasing the user experience by uplifting User Interface designs. The design tool considered for the project management is ClickUp which is a cloud-based collaboration tool that helps to manage, design, and track tasks uplifting productivity. Secondly, QSEE is another tool that will be used to design Entity Relationship Diagrams (ERD) and Use Case Diagrams. Finally, Canva, Adobe Illustrator,

and Photoshop will be used for User Interface design which will perhaps help to enhance the overall interface of the product and supports the user experience of the prototype.

Therefore, a wide range of reviews of technologies on mobile applications, internet-based groups, and telehealth was performed to identify the best software platform for the proposed prototype and mobile application has been identified to be the most suitable platform. Furthermore, the research on technologies that can be used for the development of the proposed prototype was conducted which helped in deciding the operation systems platform: Android, programming language: Java, IDE: Android Studio, DBMS: Firebase Realtime Development as necessary technologies for the development of the proposed product, which will perhaps help people in their mental well-being and self-care journey.

4. Methodology

Although this research paper proposed a technological prototype for the upliftment of mental well-being and self-care practices amongst people, the development methodologies for the prototype have not yet been discussed. Thus, this section focuses on methodologies that can be used in the development of the prototype product. The efficacy of every project is determined by the techniques and methodologies applied for the management of the project. Software Development Life Cycle (SDLC) has to be applied for mobile applications. “SDLC is the process of creating an information system that includes proper analysis, design, implementation, and maintenance” (The FAS Solutions, 2010). It helps developers to identify the methodologies along with the development phases and structure flow between different phases of the project. Different SDLC methodologies are beneficial for different types of projects however, Agile methodology and Waterfall methodology have been considered for the project management in this research.

4.1 Proposed: Agile Methodology

Agile methodology is a software development approach that encourages rapid and continuous iteration of development and testing. It is an incremental model based on the

principles which focus on the result and collaboration and flexible responses to changes. This model takes development and testing phases simultaneously which allows developers for feedback collection and development at the same time thus, increases the development quality of the product.

On the other hand, the Waterfall methodology is a Linear Sequential Life Cycle Model which supports one development phase at a time as its preceding is based on the preceding deliverables. It is a traditional model focusing on distinct aims and is easy to manage. Despite the advantages, it has not been considered as the appropriate model for the development of the prototype product as it does not support simultaneous feedback and development. The development phases of the waterfall model have been depicted pictorially and have been added in Appendix. After the brief research on both of these methodologies, agile methodology has been identified as the best software development approach for the prototype product to be developed for the research.

4.2 Key Stages of Agile Development Methodology

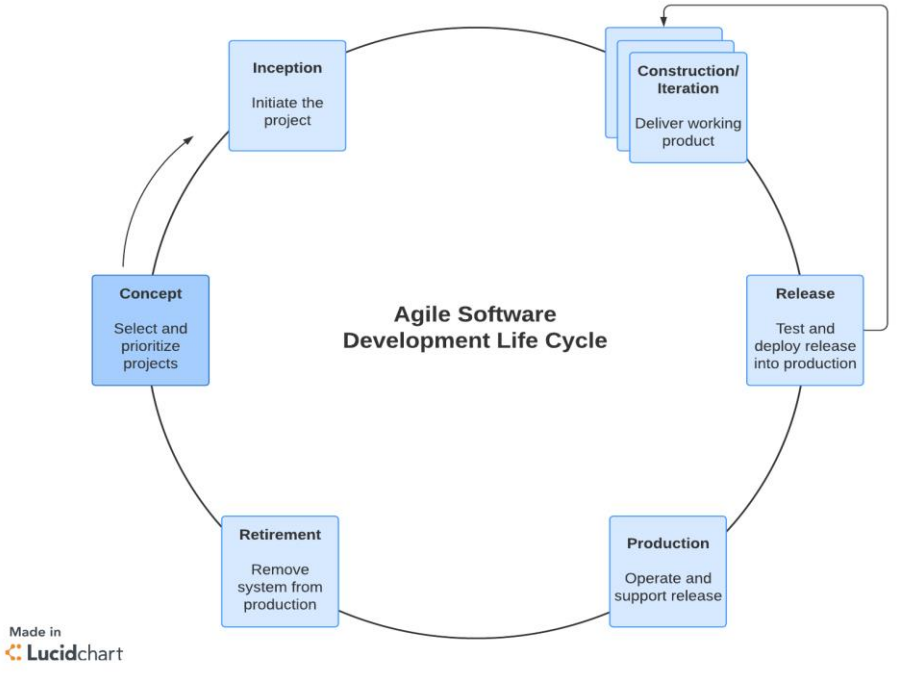


Fig1: Agile Software Development Lifecycle stages.

The figure above presents the development phases of the Agile Software Development methodology. These key stages have been discussed below to give insights into the proposed prototype development.

The first stage of agile methodology is a concept, where a problem is identified and research on solutions is concluded. The second stage is the inception where the project is initiated with product design. The third and fourth stages, construction and release, go simultaneously as development and testing are done iteratively. Finally, in the production stage, products are completed then demonstrated and in the last phase, products are released to user access.

The initial phase of the agile methodology was initiated with qualitative and quantitative research methodologies researching on prevailing mental health conditions of people and the mental healthcare system. In addition, the survey reports conducted by Happy Minds Health within the students of The British College were referred to identify the problems faced by the students. The survey complete reports have been added in the appendix section. According to the survey, 36% of the students reported that they suffered from some form of mental illness while 30% of them were not aware of mental illnesses. Likewise, students experienced changes in mental health during the Corona Virus pandemic lockdown because of loneliness, fear, worry, sleep issues, anxiety, and depression. These reports were helpful to identify the awareness level amongst students and problems faced by them. Thus, these data were acknowledged while listing the functionalities for the proposed prototype.

5. Product Design

The planning phase of the product prototype was initiated with requirement analysis being based on the identified problems. The functional and non-functional requirements of the proposed prototype were recognized and listed. Moreover, a discussion session with the mental health professional Shreeya Giri from Happy Minds Health was conducted to enhance requirements and to visualize the effectiveness of the proposed product. The

participation information sheet and ethical consent signed by the participant along with the requirements analyzed have been added in Appendix.

Product design helps the developer to design and visualize the technical requirements of the desired product. Therefore, the product database has been designed using Entity-Relationship Diagram (ERD) and the process flow has been designed using Use Case Diagrams which have been discussed below along with activity diagrams.

5.1 Entity Relationship Diagram (ERD)

ERD is a graphically designed data modeling technique that represents the database along with the relationships of all the entities that are required within the product. It helps to determine the information system requirement of the desired product (Biscobing, 2019).

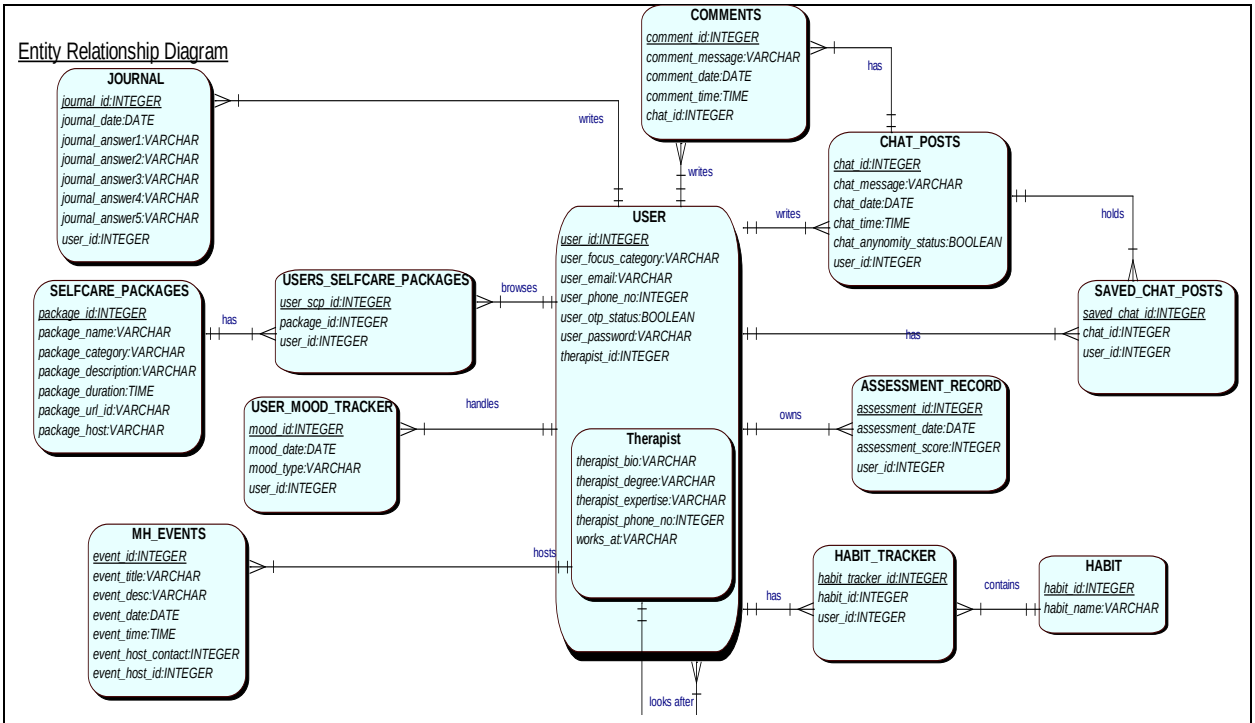


Fig 2: Composite Entity Relationship Diagram for the proposed prototype product.

The development of the design for the prototype was started with the EERD which was later modified to be ERD. The EERD and ERD designed have been added in Appendix. The picture above is the final composite ERD of the desired product.

5.2 Use Case Diagram

Use Case Diagram is the graphical representation of the user's possible interaction with the system. It is significant to identify the behavior of the user towards the systems as it represents the requirement of the product technically and determines the execution flow of the proposed product.

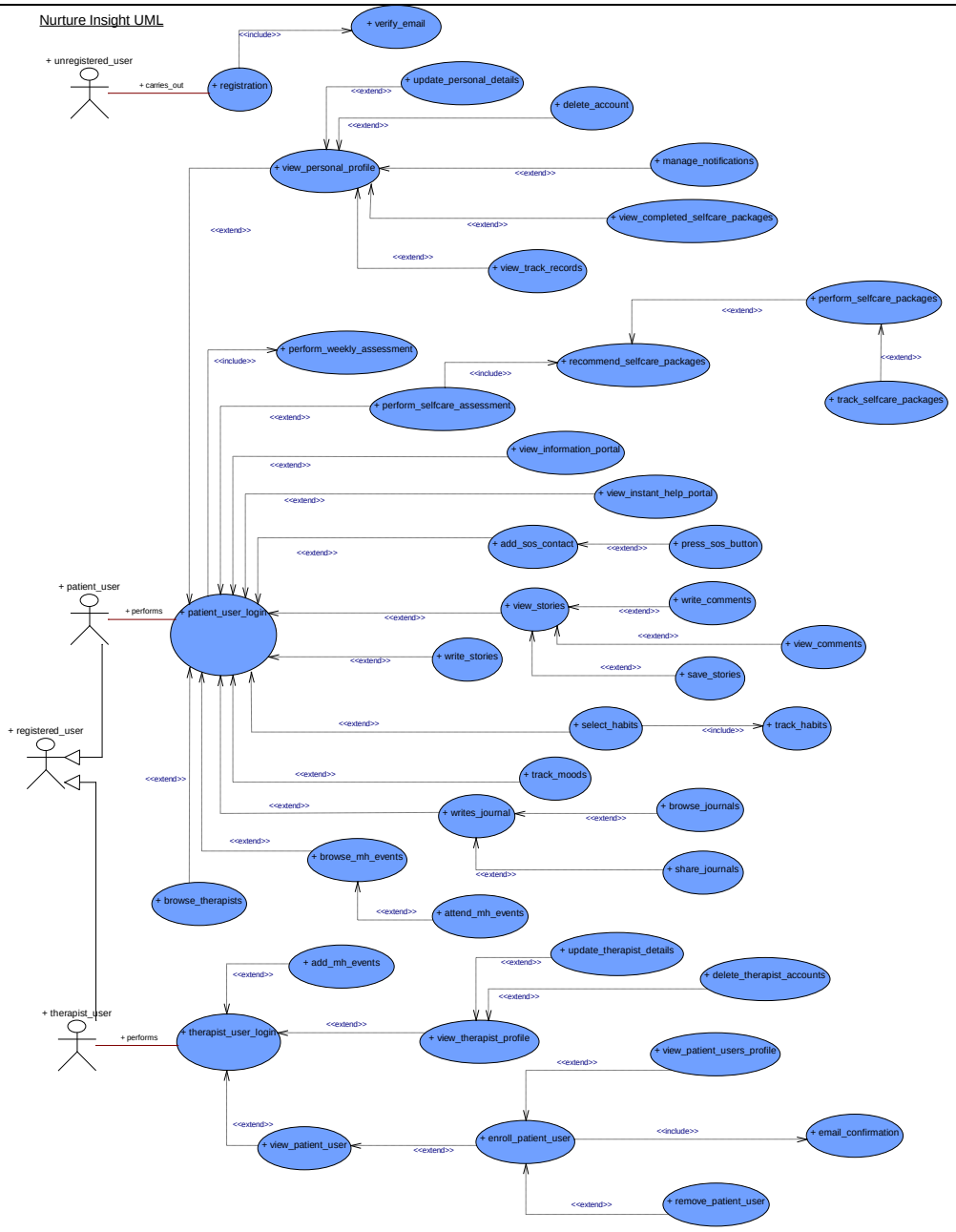


Fig 3: UML Use Case Diagram for the proposed prototype product.

5.3 Activity Diagram

A behavioral diagram depicts the behavior of a system when the user performs some actions within the application or software. It is similar to a flowchart or data flow diagram. It helps to decide the steps through which the user has to go to perform certain actions from start to finish. Some activity diagrams designed for the product have been attached below.

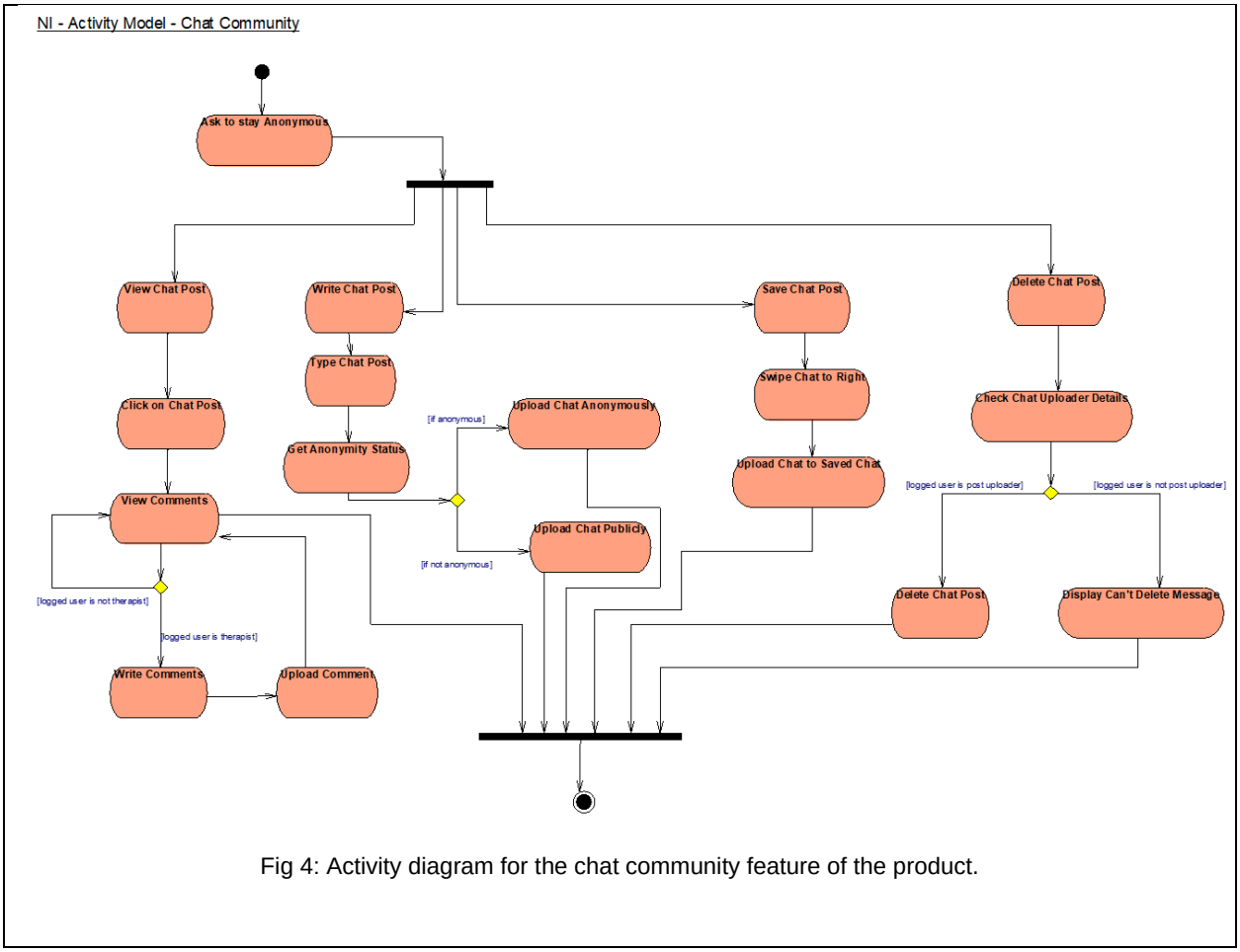


Fig 4: Activity diagram for the chat community feature of the product.

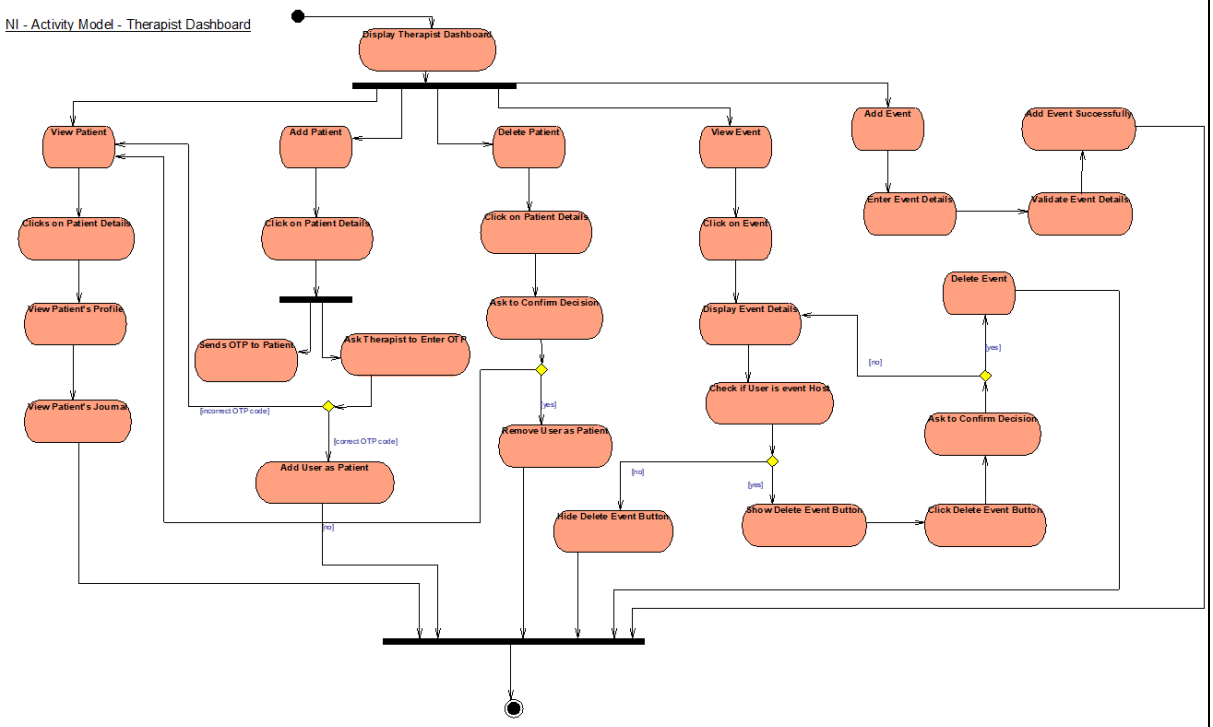


Fig 5: Activity diagram for the Therapist Dashboard feature of the product.

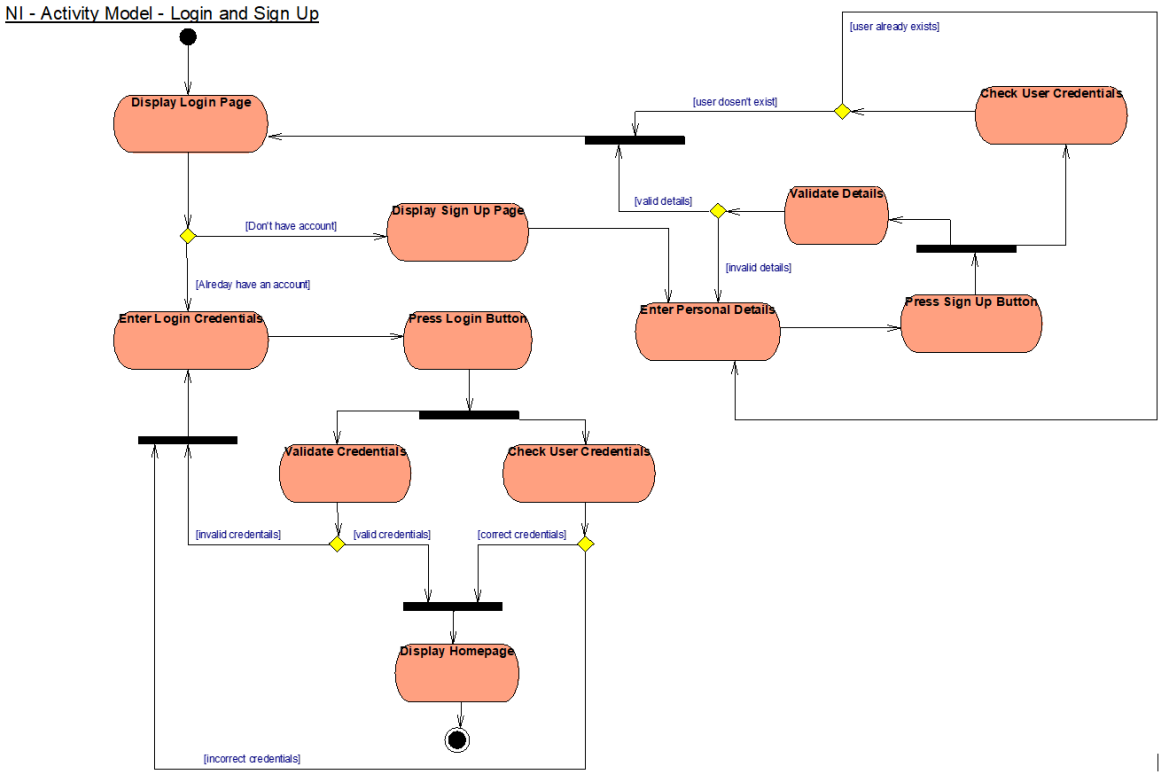


Fig 6: Activity diagram for login and sign-up features of the product.

Finally, the User Interface for the prototype product was designed to wrap up the design phase of the development. The UI Design of the product helps to visualize the overview of the product's appearance which makes the development process easier and faster as developers will be clear about the product's interface. The UI design was designed as a wireframe, please refer to the appendix section where wireframe designs have been added**.** Therefore, the product planning phase of agile methodology was concluded after the design of ERD, Use Case Diagrams, Activity Diagrams, and UI designs.

6. Implementation and Testing

The research report has discussed various research papers, technologies, and methodologies that have been used to propose a complete mental well-being and self-care prototype product. This section of the report emphasizes the prototype product development based on all the research performed previously. The implementation of all the suggestions and research outcomes have been discussed in this section of the report. In addition, this section discusses the construction and release part of the agile development methodology which includes the development of the product and testing of the product as an iterative process. As mentioned earlier, the prototype product was proposed to be a mobile-based application that includes psychological therapy techniques like Cognitive Behavior Therapy (CBT), Positive Psychology, Mindfulness, and Self-care practices to help people nurture their mental health. Thus, these techniques have been integrated into the product using the following coding and implementation techniques.

6.1 Implementation of Mindfulness and Self-care Techniques

Mindfulness as mentioned earlier is one of the best practices thus it has been implemented as self-care packages in the product using the following lines of code.

```
self_care_packages = new ArrayList<>();

for (int index=0; index < packageImages.length; index++){
    Self_Care_Packages model = new Self_Care_Packages(packageImages[index], packageName[index], packageDesc[index]);
    self_care_packages.add(model);
}

LinearLayoutManager layoutManager = new LinearLayoutManager(getContext());
scp_home_recyclerView.setLayoutManager(layoutManager);
self_care_packages_adapter = new Self_Care_Packages_Adapter(getContext(), self_care_packages);
scp_home_recyclerView.setAdapter(self_care_packages_adapter);

return view;
```

Fig 7: Code sample to retrieve self-care packages from the database.

```
public void onBindViewHolder(@NonNull ViewHolder holder, int position) {

    holder.package_image.setScaleType(ImageView.ScaleType.CENTER_CROP);
    holder.package_image.setImageResource(self_care_packages.get(position).getSelfCarePackages());
    holder.package_title.setText(self_care_packages.get(position).getSelfCarePackagesTitle());
    holder.package_desc.setText(self_care_packages.get(position).getSelfCarePackagesDesc());
    holder.eachPackageCard.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {

            switch(position){
                case 0:
                    packageType = "Guided Meditation";
                    break;
                case 1:
                    packageType = "Relaxation Music";
                    break;
                case 2:
                    packageType = "Body and Mind Yoga";
                    break;
                case 3:
                    packageType = "Uplifting Stories";
                    break;
                case 4:
                    packageType = "Breathwork Exercises";
                    break;
            }

            Fragment fragment = new self_care_exercise_list();
            Bundle bundle = new Bundle();
            bundle.putString("type", packageType);
            fragment.setArguments(bundle);
            AppCompatActivity activity = (AppCompatActivity) v.getContext();
            activity.getSupportFragmentManager().beginTransaction().replace(R.id.main_fragmentLayout, fragment).addToBackStack(null).commit();

        }
    });
```

Fig 8: Code sample to display self-care packages and to redirect users to other pages of the application when clicked.

```
DatabaseReference requiredRef = self_care.get(position).getEachRef();

requiredRef.addValueEventListener(new ValueEventListener() {
    @Override
    public void onDataChange(@NonNull DataSnapshot snapshot) {
        if(snapshot.exists()){
            Self_care self_care_obj = snapshot.getValue(Self_care.class);

            final int random = new Random().nextInt( bound: (9 - 1) + 1) + 1;
            holder.eachImage.setImageResource(images[random]);

            holder.eachImage.setScaleType(ImageView.ScaleType.CENTER_CROP);
            holder.eachTitle.setText(self_care_obj.getName());
            holder.eachDuration.setText("Duration: " + self_care_obj.getDuration());

            holder.eachCardView.setOnClickListener(new View.OnClickListener() {
                @Override
                public void onClick(View v) {
                    Fragment fragment = new self_care_exercise();
                    Bundle bundle = new Bundle();
                    bundle.putString("id", snapshot.getKey());
                    fragment.setArguments(bundle);
                    AppCompatActivity activity = (AppCompatActivity) v.getContext();
                    activity.getSupportFragmentManager().beginTransaction().replace(R.id.main_fragmentLayout, fragment).addToBackStack(null).commit();

                }
            });
        }
    }

    @Override
    public void onCancelled(@NonNull DatabaseError error) {

    }
```

Fig 9: Code sample to display each exercise that has been clicked by the user.

```
private void uploadAssessmentAnswer() {
    DatabaseReference assessmentRef = FirebaseDatabase.getInstance().getReference().child("Users")
            .child(Prevalent.currentOnlineUser.getPhoneNo());

    HashMap<String, Object> assessmentHashMap = new HashMap<>();
    assessmentHashMap.put("category", choseOption);

    assessmentRef.updateChildren(assessmentHashMap)
            .addOnCompleteListener(new OnCompleteListener<Void>() {
                @Override
                public void onComplete(@NonNull Task<Void> task) {
                    if(task.isSuccessful()){
                        new AlertDialog.Builder(getContext())
                                .setTitle("Nurture Insight's Mental Health Assessment")
                                .setMessage("Congratulations! You have completed your assessment. " +
                                        "Best of Luck for Your Journey! Have a nice time!")
                                .setNegativeButton(android.R.string.yes, listener: null)
                                .setIcon(android.R.drawable.ic_dialog_alert)
                                .show();

                        Fragment fragment =  new weekly_assessment();
                        FragmentTransaction transaction = getFragmentManager().beginTransaction();
                        transaction.replace(R.id.main_fragmentLayout, fragment );
                        transaction.commit();

                    }
                    else{
                        new AlertDialog.Builder(getContext())
                                .setTitle("Nurture Insight - Self-Care Assessment")
                                .setMessage("Sorry! You assessment score couldn't be recorded because of some issues. " +
                                        "Please, re-take the assessment.")
                                .setNegativeButton(android.R.string.yes, listener: null)
                                .setIcon(android.R.drawable.ic_dialog_alert)
                                .show();
                    }
                }
```

Fig 10: Code sample to record user's self-care assessment results

6.2 Cognitive Behavior Therapy (CBT) and Positive Psychology Implementation

The research proposed to have used CBT and positive psychology in the prototype product which has been implemented using mood tracker, habit tracker, journaling, and positive affirmations.

```
private void recordUserMood(String userMood) {
    String saveCurrentDate;
    Calendar calForDate = Calendar.getInstance();
    SimpleDateFormat currentDate = new SimpleDateFormat( pattern: "MMM dd, yyyy");
    saveCurrentDate = currentDate.format(calForDate.getTime());

    final DatabaseReference moodTrackerRef = FirebaseDatabase.getInstance().getReference().child("Mood_Tracker");

    final HashMap<String, Object> moodMap = new HashMap<>();
    moodMap.put("moodDate", saveCurrentDate);

    if(!(TextUtils.isEmpty(userMood))){
        moodMap.put("moodType", userMood);
    }

    moodTrackerRef.child(Prevalent.currentOnlineUser.getPhoneNo()).child(saveCurrentDate)
            .updateChildren(moodMap)
            .addOnCompleteListener(new OnCompleteListener<Void>() {
                @Override
                public void onComplete(@NonNull Task<Void> task) {
                    if(task.isSuccessful()){
                        moodTrackerDisplay();
                        Toast.makeText(getContext(),"Your Mood has been recorded", Toast.LENGTH_SHORT).show();
                    }
                }
            });
}
```

Fig 11: Code sample to record user's daily mood

```
private void getMoodEntriesForGraph() throws ParseException {
    barEntries = new ArrayList<>();
    String saveCurrentDate;

    Calendar calForDate = Calendar.getInstance();
    SimpleDateFormat currentDate = new SimpleDateFormat( pattern: "MMM dd, yyyy");
    saveCurrentDate = currentDate.format(calForDate.getTime());
    Date myCurrentDate = currentDate.parse(saveCurrentDate);

    final DatabaseReference moodTrackerRef = FirebaseDatabase.getInstance()
            .getReference().child("Mood_Tracker")
            .child(Prevalent.currentOnlineUser.getPhoneNo());


    moodTrackerRef.addListenerForSingleValueEvent(new ValueEventListener() {
        @Override
        public void onDataChange(@NonNull DataSnapshot snapshot) {
            int index = 1;

            if(snapshot.hasChildren()){
                for(DataSnapshot myDataSnapshot: snapshot.getChildren()){
                    Mood_Tracker dataPoint = myDataSnapshot.getValue(Mood_Tracker.class);
                    String eachDateInString = myDataSnapshot.child("moodDate").getValue().toString();
                    String currentMood = myDataSnapshot.child("moodType").getValue().toString();

                    try {
                        Date eachDate = currentDate.parse(eachDateInString);
                        if((myCurrentDate.getTime() - eachDate.getTime()) < 604800000){
                            int moodNumber = getMoodNumber(currentMood);
                            barEntries.add(new BarEntry(index, moodNumber));
                            index++;
                        }
                    } catch (ParseException e) {
                        e.printStackTrace();
                    } catch (NullPointerException e) {
                        e.printStackTrace();
```

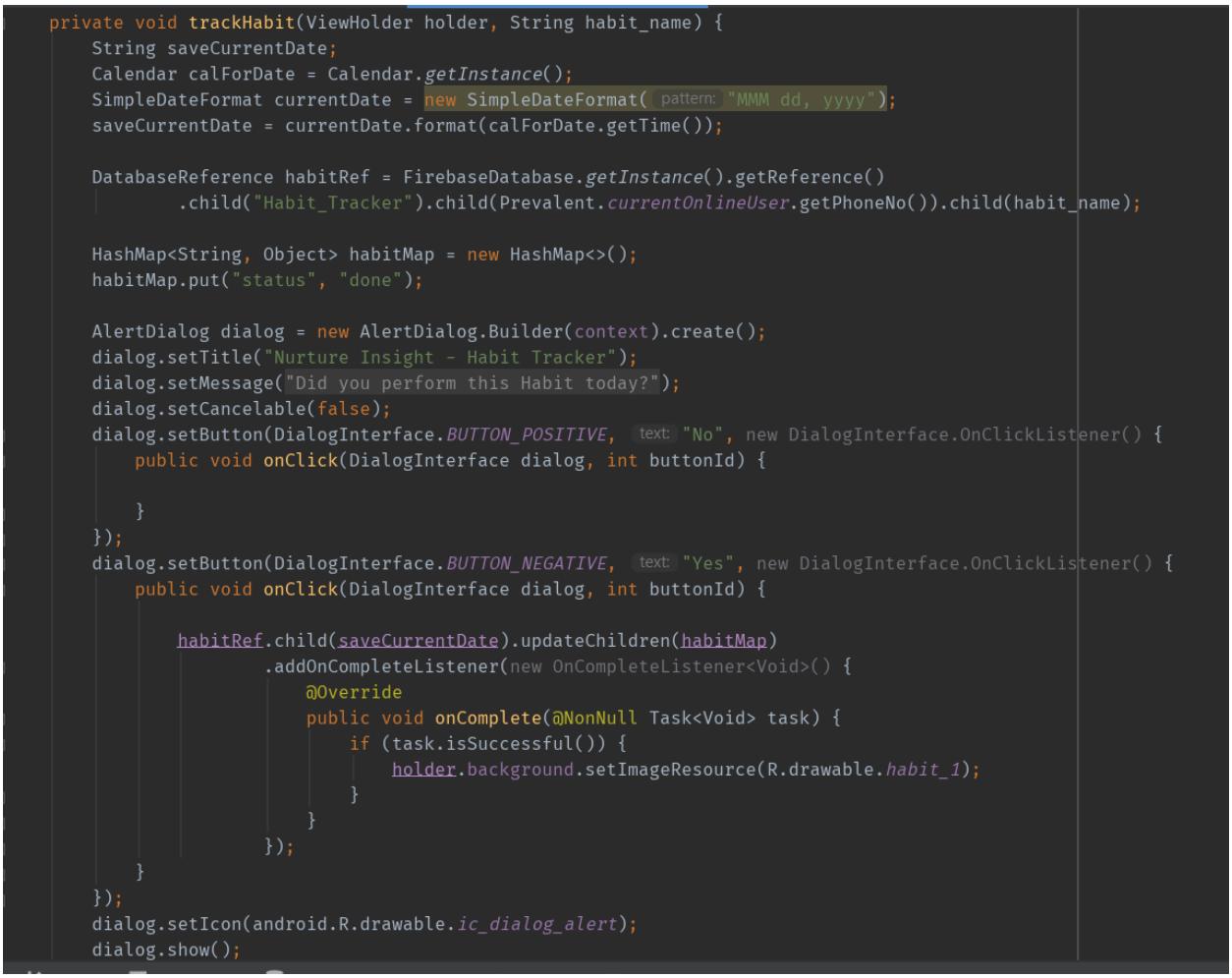
```
                }
                showBarGraph(barEntries);
            }
            else{
                barChart.clear();
                barChart.invalidate();
            }
        }

        @Override
        public void onCancelled(@NonNull DatabaseError error) {

        }
    });

}

private void showBarGraph(ArrayList barEntries) {

    barDataSet = new BarDataSet(barEntries, "Your latest recorded Mood Levels of the past week on th...");
    barData = new BarData(barDataSet);
    barChart.setData(barData);
    barData.setBarWidth(0.3f);
    barDataSet.setColor(getResources().getColor(R.color.ni_blue));
    barDataSet.setValueTextColor(getResources().getColor(R.color.ni_blue));
    barDataSet.setValueTextSize(15f);
    barChart.setDescription(null);
    for (IDataSet set : barChart.getData().getDataSets())
        set.setDrawValues(!set.isDrawValuesEnabled());

    barChart.animateXY( durationMillisX: 1000,  durationMillisY: 1000);
    barChart.invalidate();

}
```

Fig 12: Code sample to display mood tracker history chart of the user.

Likewise, the habit tracker has been implemented within the product using the following lines of code.

```
AlertDialog dialog = new AlertDialog.Builder(context).create();
dialog.setTitle("Add a New Habit");
dialog.setMessage("Do want to add this habit to your daily tracking schedule?");
dialog.setCancelable(false);
dialog.setButton(DialogInterface.BUTTON_POSITIVE, text: "No", new DialogInterface.OnClickListener() {
    public void onClick(DialogInterface dialog, int buttonId) {

    }
});
dialog.setButton(DialogInterface.BUTTON_NEGATIVE, text: "Yes", new DialogInterface.OnClickListener() {
    public void onClick(DialogInterface dialog, int buttonId) {

        habitRef.child(habit_title).updateChildren(habitMap).addOnCompleteListener(new OnCompleteListener<Void>() {
            @Override
            public void onComplete(@NonNull Task<Void> task) {
                if(task.isSuccessful()){
                    Fragment fragment = null;
                    fragment = new habit_tracker_home();

                    FragmentTransaction transaction = ((AppCompatActivity)context).getSupportFragmentManager().beginTransaction();
                    transaction.replace(R.id.main_fragmentLayout, fragment );
                    transaction.commit();

                }
                else{
                    new AlertDialog.Builder(context)
                            .setTitle("Add a New Habit")
                            .setMessage("Habit could not be added to your schedule")
                            .setNegativeButton(android.R.string.yes, listener: null)
                            .setIcon(android.R.drawable.ic_dialog_alert)
                            .show();
                }
            }
        });
```

Fig 13: Code sample to allow users to add new habits into daily habit tracking schedule.



```
private void trackHabit(ViewHolder holder, String habit_name) {
    String saveCurrentDate;
    Calendar calForDate = Calendar.getInstance();
    SimpleDateFormat currentDate = new SimpleDateFormat( pattern: "MMM dd, yyyy");
    saveCurrentDate = currentDate.format(calForDate.getTime());

    DatabaseReference habitRef = FirebaseDatabase.getInstance().getReference()
            .child("Habit_Tracker").child(Prevalent.currentOnlineUser.getPhoneNo()).child(habit_name);

    HashMap<String, Object> habitMap = new HashMap<>();
    habitMap.put("status", "done");

    AlertDialog dialog = new AlertDialog.Builder(context).create();
    dialog.setTitle("Nurture Insight - Habit Tracker");
    dialog.setMessage("Did you perform this Habit today?");
    dialog.setCancelable(false);
    dialog.setButton(DialogInterface.BUTTON_POSITIVE,  text: "No", new DialogInterface.OnClickListener() {
        public void onClick(DialogInterface dialog, int buttonId) {

        }
    });
    dialog.setButton(DialogInterface.BUTTON_NEGATIVE,  text: "Yes", new DialogInterface.OnClickListener() {
        public void onClick(DialogInterface dialog, int buttonId) {

            habitRef.child(saveCurrentDate).updateChildren(habitMap)
                    .addOnCompleteListener(new OnCompleteListener<Void>() {
                        @Override
                        public void onComplete(@NonNull Task<Void> task) {
                            if (task.isSuccessful()) {
                                holder.background.setImageResource(R.drawable.habit_1);
                            }
                        }
                    });
        }
    });
    dialog.setIcon(android.R.drawable.ic_dialog_alert);
    dialog.show();
```

Fig 14: Code sample that helps user to track their habits every day.

```java
private void displayTrackedHabits(String clickedDate) {

    final DatabaseReference habitRef = FirebaseDatabase.getInstance().getReference()
            .child("Habit_Tracker").child(Prevalent.currentOnlineUser.getPhoneNo());

    habitRef.addValueEventListener(new ValueEventListener() {
        @Override
        public void onDataChange(@NonNull DataSnapshot snapshot) {
            trackedHabitList.clear();
            for(DataSnapshot habitSnap: snapshot.getChildren()){
                String name = habitSnap.getKey();

                habitRef.child(name).addValueEventListener(new ValueEventListener() {
                    @Override
                    public void onDataChange(@NonNull DataSnapshot snapshot) {
                        if(snapshot.hasChild(clickedDate)){
                            Habits model = new Habits(name);
                            trackedHabitList.add(model);
                        }

                        layoutManager = new LinearLayoutManager(getContext());
                        trackedHabitsRV.setLayoutManager(layoutManager);
                        trackedHabitsAdapter = new TrackedHabitsAdapter(getContext(), trackedHabitList);
                        trackedHabitsRV.setAdapter(trackedHabitsAdapter);
                    }

                    @Override
                    public void onCancelled(@NonNull DatabaseError error) {

                    }
                });
            }
        }
```

Fig 15: Code sample that displays the tracked habits of a particular day when different dates of calendar is clicked.

The journaling feature has been implemented in the application using the following code.

```
HashMap<String, Object> journalMap = new HashMap<>();
journalMap.put("answer_1", inputAnswer1);
journalMap.put("answer_2", inputAnswer2);
journalMap.put("answer_3", inputAnswer3);
journalMap.put("answer_4", inputAnswer4);
journalMap.put("answer_5", inputAnswer5);

journalRef.child(saveCurrentDate).updateChildren(journalMap).addOnCompleteListener(new OnCompleteListener<Void>() {
    @Override
    public void onComplete(@NonNull Task<Void> task) {
        if(task.isSuccessful()){
            Fragment fragment = null;
            fragment = new JournalFragment();

            FragmentTransaction transaction = getFragmentManager().beginTransaction();
            transaction.replace(R.id.main_fragmentLayout, fragment );
            transaction.commit();

            new AlertDialog.Builder(getContext())
                    .setTitle("Nurture Insight - Journal")
                    .setMessage("Thank You for Writing your Journal Today. You are amazing!")
                    .setCancelable(false)
                    .setPositiveButton( text: "ok", new DialogInterface.OnClickListener() {
                        @Override
                        public void onClick(DialogInterface dialog, int which) {

                        }
                    }).show();
        }
```

Fig 16: Code sample to record journaling answers of users and to store them in the database.

```
String clickedDate = currentDate.format(clickedCalendar.getTime());

if(saveCurrentDate.equals(clickedDate)){
    Fragment fragment =  new journaling_form();

    FragmentTransaction transaction = getFragmentManager().beginTransaction();
    transaction.replace(R.id.main_fragmentLayout, fragment );
    transaction.commit();
}
else{
    Fragment fragment = new journal_display();
    Bundle bundle = new Bundle();
    bundle.putString("clickedDate", clickedDate);
    fragment.setArguments(bundle);

    FragmentTransaction transaction = getFragmentManager().beginTransaction();
    transaction.replace(R.id.main_fragmentLayout, fragment );
    transaction.commit();
}
```

```
String title = "Journal Memory: " + loadDate;
saved_journal_title.setText(title);

final DatabaseReference savedJournalRef = FirebaseDatabase.getInstance().getReference()
        .child("Journals").child(Prevalent.currentOnlineUser.getPhoneNo());

savedJournalRef.addValueEventListener(new ValueEventListener() {
    @Override
    public void onDataChange(@NonNull DataSnapshot snapshot) {

        if(snapshot.hasChild(loadDate)){
            savedJournalRef.child(loadDate).addValueEventListener(new ValueEventListener() {
                @Override
                public void onDataChange(@NonNull DataSnapshot snapshot) {
                    saved_journal_answer1.setText(snapshot.child("answer_1").getValue().toString());
                    saved_journal_answer2.setText(snapshot.child("answer_2").getValue().toString());
                    saved_journal_answer3.setText(snapshot.child("answer_3").getValue().toString());
                    saved_journal_answer4.setText(snapshot.child("answer_4").getValue().toString());
                    saved_journal_answer5.setText(snapshot.child("answer_5").getValue().toString());
                }

                @Override
                public void onCancelled(@NonNull DatabaseError error) {

                }
            });
        }
        else{
            saved_journal_answer1.setText("Journal not Found!! No Journal writings have been recor...");
```

Fig 17: Code sample to display user's journal based on the date clicked.

6.3 Chat community Feature Implementation

A chat community feature has been added to the application which will motivate users to learn about mental health and share success stories. Similarly, users can consult therapists directly via chat community. Thus, the chat community feature has been implemented by using the following lines of code.

```
private void uploadChatMessage() {
    String inputMessage = messageArea.getText().toString();

    String saveCurrentDate, saveCurrentTime;
    Calendar calForDate = Calendar.getInstance();
    SimpleDateFormat currentDate = new SimpleDateFormat( pattern: "MMM dd, yyyy");
    saveCurrentDate = currentDate.format(calForDate.getTime());
    SimpleDateFormat currentTime = new SimpleDateFormat( pattern: "HH:mm:ss a");
    saveCurrentTime = currentTime.format(calForDate.getTime());

    if(!(TextUtils.isEmpty(inputMessage))){

        final DatabaseReference chatReference = FirebaseDatabase.getInstance().getReference().child("Chat_Messages");

        final HashMap<String, Object> chatMap = new HashMap<>();
        chatMap.put("messageDate", saveCurrentDate);
        chatMap.put("messageTime", saveCurrentTime);
        chatMap.put("message", inputMessage);
        chatMap.put("username", Prevalent.currentOnlineUser.getUsername());
        chatMap.put("anonymousStatus", anonymousStatus);

        chatReference.child(Prevalent.currentOnlineUser.getPhoneNo()).child(saveCurrentDate+saveCurrentTime)
                .updateChildren(chatMap)
                .addOnCompleteListener(new OnCompleteListener<Void>() {
                    @Override
                    public void onComplete(@NonNull Task<Void> task) {
                        if(task.isSuccessful()){
                            messageArea.setText(null);
                            //DO SOMETHING AFTER SUCCESSFUL UPLOAD.-------- CALL RECYCLER VIEW TO DISPLAY OK
                        }
                    }
                });
        chatMessages.clear();
```

Fig 18: Code sample to record user's chat messages and store them in the database

```
    Chat_Message chatMessage = chatMessageList.get(position);
    String chatID = chatMessage.getChatID();
    holder.chatMessageDate.setText(chatMessage.getMessageDate() + " at " + chatMessage.getMessageTime());
    holder.chatMessage.setText(chatMessage.getMessage());
    holder.chatMessageUsername.setText(chatMessage.getUsername());

    if(chatMessage.getAnonymousStatus().equals("true")){
        holder.chatMessageUsername.setText("Posted Anonymously");
    }
    else{
        holder.chatMessageUsername.setText(chatMessage.getUsername());
    }

    holder.each_chat_card.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            Fragment fragment = new ViewChatPosts();
            Bundle bundle = new Bundle();
            bundle.putString("chatID", chatID);
            fragment.setArguments(bundle);
            AppCompatActivity activity = (AppCompatActivity) v.getContext();
            activity.getSupportFragmentManager().beginTransaction().replace(R.id.main_fragmentLayout, fragment).addToBackStack(

        }
    });

}
```

Fig 19: Code sample to retrieve and display users' messages in the chat community.

```
    @Override
    public void onSwiped(@NonNull RecyclerView.ViewHolder viewHolder, int direction) {

            AlertDialog dialog = new AlertDialog.Builder(getContext()).create();
            dialog.setTitle("Nurture Insight - Chat Community");
            dialog.setMessage("Are you sure you want to delete this post?");
            dialog.setCancelable(false);
            dialog.setButton(DialogInterface.BUTTON_POSITIVE, text: "No", new DialogInterface.OnClickListener() {
                public void onClick(DialogInterface dialog, int buttonId) {
                    adapter.notifyDataSetChanged();
                }
            });
            dialog.setButton(DialogInterface.BUTTON_NEGATIVE, text: "Yes", new DialogInterface.OnClickListener() {
                public void onClick(DialogInterface dialog, int buttonId) {
                    int position = viewHolder.getBindingAdapterPosition();
                    adapter.getDatabaseItem(position, getContext());
                    adapter.notifyDataSetChanged();
                }
            });
            dialog.setIcon(android.R.drawable.ic_dialog_alert);
            dialog.show();
    }
}).attachToRecyclerView(recyclerView);
```

Fig 20: Code sample to delete users' messages from the chat community.

```
        AlertDialog dialog = new AlertDialog.Builder(getContext()).create();
        dialog.setTitle("Nurture Insight - Chat Community");
        dialog.setMessage("Are you sure you want to save this post?");
        dialog.setCancelable(false);
        dialog.setButton(DialogInterface.BUTTON_POSITIVE, text: "No", new DialogInterface.OnClickListener() {
            public void onClick(DialogInterface dialog, int buttonId) {
                adapter.notifyDataSetChanged();
            }
        });
        dialog.setButton(DialogInterface.BUTTON_NEGATIVE, text: "Yes", new DialogInterface.OnClickListener() {
            public void onClick(DialogInterface dialog, int buttonId) {
                int position = viewHolder.getBindingAdapterPosition();

                adapter.saveDatabaseItem(position, getContext());
                adapter.notifyDataSetChanged();
            }
        });
        dialog.setIcon(android.R.drawable.ic_dialog_alert);
        dialog.show();
    }
```

Fig 21: Code sample to save users' messages from the chat community.

```
private void getComments() {

    final DatabaseReference commentRef = FirebaseDatabase.getInstance().getReference().child("Comments").child(chatID);

    commentRef.addValueEventListener(new ValueEventListener() {
        @Override
        public void onDataChange(@NonNull DataSnapshot snapshot) {
            commentsArrayList.clear();
            for(DataSnapshot eachSnapshot: snapshot.getChildren()){
                DatabaseReference commentID = eachSnapshot.getRef();
                Comments model = new Comments(commentID);
                commentsArrayList.add(model);

            }

            layoutManager = new LinearLayoutManager(getContext());
            commentRecyclerView.setLayoutManager(layoutManager);
            commentAdapter = new CommentAdapter(getContext(), commentsArrayList);
            commentRecyclerView.setAdapter(commentAdapter);

            if (commentsArrayList.isEmpty()){
                viewChat_commentsLL.setVisibility(View.GONE);
            }
            else{
                viewChat_commentsLL.setVisibility(View.VISIBLE);
            }

        }

        @Override
        public void onCancelled(@NonNull DatabaseError error) {

        }
```

Fig 22: Code sample which displays comments of each post of the chat community.

```
private void uploadComment() {
    String saveCurrentDate, saveCurrentTime;
    Calendar calForDate = Calendar.getInstance();
    SimpleDateFormat currentDate = new SimpleDateFormat( pattern: "MMM dd, yyyy");
    saveCurrentDate = currentDate.format(calForDate.getTime());
    SimpleDateFormat currentTime = new SimpleDateFormat( pattern: "HH:mm:ss a");
    saveCurrentTime = currentTime.format(calForDate.getTime());

    String inputComment = commentTypeArea.getText().toString();

    if (!TextUtils.isEmpty(inputComment)){

        final DatabaseReference commentRef = FirebaseDatabase.getInstance().getReference().child("Comments").child(chatID);
        HashMap<String, Object> commentMap = new HashMap<>();
        commentMap.put("comment", inputComment);
        commentMap.put("postedBy", Prevalent.currentOnlineUser.getUsername());
        commentMap.put("postedDate", saveCurrentDate);
        commentMap.put("postedTime", saveCurrentTime);

        commentRef.child(saveCurrentDate+saveCurrentTime).updateChildren(commentMap)
                .addOnCompleteListener(new OnCompleteListener<Void>() {
            @Override
            public void onComplete(@NonNull Task<Void> task) {
                if(task.isSuccessful()){
                    commentTypeArea.setText(null);
                }
            }
        });
    }
```

Fig 23: Code sample which allows the therapist to add comments to the posts of chat community.

6.4 Therapist Dashboard Implementation

The therapist dashboard which allows registered therapists to add users as patients, view their details, and add/delete events have been implemented using the following code:

```
HashMap<String, Object> eventMap = new HashMap<>();
eventMap.put("title", inputTitle);
eventMap.put("location", inputLocation);
eventMap.put("description", inputDesc);
eventMap.put("date", pickedDateStr);
eventMap.put("time", pickedTimeStr);
eventMap.put("conductor", Prevalent.currentOnlineUser.getUsername());
eventMap.put("contact", Prevalent.currentOnlineUser.getPhoneNo());
eventMap.put("eventStatus", "notCompleted");

String saveCurrentDate, saveCurrentTime;
Calendar calForDate = Calendar.getInstance();
SimpleDateFormat currentDate = new SimpleDateFormat( pattern: "MMM dd, yyyy");
saveCurrentDate = currentDate.format(calForDate.getTime());
SimpleDateFormat currentTime = new SimpleDateFormat( pattern: "HH:mm:ss");
saveCurrentTime = currentTime.format(calForDate.getTime());

final DatabaseReference eventRef = FirebaseDatabase.getInstance().getReference().child("events")
        .child(Prevalent.currentOnlineUser.getPhoneNo());

eventRef.child(saveCurrentDate+saveCurrentTime).updateChildren(eventMap).addOnCompleteListener(new OnCompleteListener<Void>() {
    @Override
    public void onComplete(@NonNull Task<Void> task) {
        if(task.isSuccessful()){
            new AlertDialog.Builder(getContext())
                    .setTitle("Nurture Insight - Create a Event")
                    .setMessage("Congratulations! Your Event has been added successfully.")
                    .setNegativeButton(android.R.string.yes,  listener: null)
                    .setIcon(android.R.drawable.ic_dialog_alert)
                    .show();

            Fragment fragment =  new therapistDashboard();

            FragmentTransaction transaction = getFragmentManager().beginTransaction();
            transaction.replace(R.id.main_fragmentLayout, fragment );
```

Fig 24: Code sample to create and add events from the therapist dashboard.

```
@Override
public void onDataChange(@NonNull DataSnapshot snapshot) {
    String eventTitle, eventLocation, eventDateAndTime, eventDesc, eventHost, eventHostContact;
    events eventObj = snapshot.getValue(events.class);
    eventTitle = snapshot.child("title").getValue().toString();
    eventLocation = snapshot.child("location").getValue().toString();
    eventDateAndTime = snapshot.child("date").getValue().toString() + " at " + snapshot.child("time").getValue().toString();
    eventDesc = snapshot.child("description").getValue().toString();
    eventHost = eventObj.getConductor();
    eventHostContact = eventObj.getContact();

    eachEventTitle.setText(eventTitle);
    eachEventLocation.setText(eventLocation);
    eachEventDate.setText("Event Date: " + eventDateAndTime);
    eachEventHost.setText("Host: " + eventHost);
    eachEventHostContact.setText("Contact: " + eventHostContact);
    eachEventDesc.setText("Event Details: " + eventDesc);

    if(Prevalent.currentOnlineUser.getPhoneNo().equals(eventHostContact)){
        deleteEventButton.setVisibility(View.VISIBLE);
    }
    else{
        deleteEventButton.setVisibility(View.GONE);
    }

    deleteEventButton.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            eventRef.removeValue();
            EventDisplayAdapter.events.remove(eventRef);
            HomeFragment.eventsList.remove(eventRef);

            Fragment fragment =  new HomeFragment();
            FragmentTransaction transaction = getFragmentManager().beginTransaction();
            transaction.replace(R.id.main_fragmentLayout, fragment );
            transaction.commit();
```

Fig 25: Code sample to create and add events

```
private void sendOtpCode(String phoneNo) {
    PhoneAuthProvider.getInstance().verifyPhoneNumber( phoneNumber: "+977" + phoneNo,  timeout: 60, TimeUnit.SECONDS,
            (AppCompatActivity)context  , new PhoneAuthProvider.OnVerificationStateChangedCallbacks() {
                @Override
                public void onVerificationCompleted(@NonNull PhoneAuthCredential phoneAuthCredential) {

                }

                @Override
                public void onVerificationFailed(@NonNull FirebaseException e) {
                }

                @Override
                public void onCodeSent(@NonNull String s, @NonNull PhoneAuthProvider.ForceResendingToken forceResendingToken) {

                    Intent intent = new Intent(context, otpActivity.class);
                    intent.putExtra( name: "phone_number", phoneNo);
                    intent.putExtra( name: "otp_code", s);
                    intent.putExtra( name: "from",  value: "AddUser");
                    context.startActivity(intent);
                }
            });
}
```

```
HashMap<String, Object> newHash = new HashMap<>();
newHash.put("status", "true");

RootReference.updateChildren(newHash).addOnCompleteListener(new OnCompleteListener<Void>() {
    @Override
    public void onComplete(@NonNull Task<Void> task) {
        if(task.isSuccessful()){
            String from = getIntent().getStringExtra( name: "from");
            Log.d( tag: "UNIQUENAME",  msg: "onComplete: " + from);
            if (from!=null){
                HashMap<String, Object> userMap = new HashMap<>();
                userMap.put("therapistID", Prevalent.currentOnlineUser.getPhoneNo());

                final DatabaseReference userRef = FirebaseDatabase.getInstance().getReference()
                        .child("Users").child(phoneNo);

                userRef.updateChildren(userMap).addOnCompleteListener(new OnCompleteListener<Void>() {
                    @Override
                    public void onComplete(@NonNull Task<Void> task) {
                        if(task.isSuccessful()){
                            Intent intent = new Intent( packageContext: otpActivity.this, MainActivity.class);
                            intent.putExtra( name: "status",  value: "otpDone");
                            startActivity(intent);
                            finish();

                            loading.dismiss();
                        }
                        else{

                            loading.dismiss();
                            Intent intent = new Intent( packageContext: otpActivity.this, MainActivity.class);
                            intent.putExtra( name: "status",  value: "otpDone");
                            startActivity(intent);
                            finish();
```

Fig 26: Code sample to send OTP code to the user before adding them as a user.

```
private void loadPatientDetails() {

    final DatabaseReference patientRef = FirebaseDatabase.getInstance().getReference()
            .child("Users").child(patientID);

    patientRef.addValueEventListener(new ValueEventListener() {
        @Override
        public void onDataChange(@NonNull DataSnapshot snapshot) {
            patientName = snapshot.child("username").getValue().toString();
            patientCategory = snapshot.child("category").getValue().toString();

            username.setText(patientName);
            String categoryName = getCategoryName(patientCategory);
            focusedOn.setText(patientID + "\nFocused on: " + categoryName);
        }

        @Override
        public void onCancelled(@NonNull DatabaseError error) {

        }
    });
}
```

Fig 27: Code sample which displays all the users who are enrolled to the therapist in the dashboard.

```
private void moodProgressBar(){
    DatabaseReference moodRef = FirebaseDatabase.getInstance().getReference()
            .child("Mood_Tracker").child(patientID);

    moodRef.addValueEventListener(new ValueEventListener() {
        @Override
        public void onDataChange(@NonNull DataSnapshot snapshot) {
            int counter=0;

            for(DataSnapshot newSnap: snapshot.getChildren()){
                String eachMoodId = newSnap.getKey();

                DateFormat dayFormat=new SimpleDateFormat( pattern: "MMM");

                Date eachDate = null;
                try {
                    eachDate = dayFormat.parse(eachMoodId);
                } catch (ParseException e) {
                    e.printStackTrace();
                }

                String finalDay = dayFormat.format(eachDate);
                Calendar calObj = Calendar.getInstance();
                String saveCurrentDate = dayFormat.format(calObj.getTime());

                if (finalDay.equals(saveCurrentDate)){
                    counter++;
                }
            }

            double res = (counter / 31.0f) * 100;
            int progress = (int) res;
            moodProgressChart.setProgress(progress);
            moodProgressChart.animate();
            moodProgressPercent.setText(progress+"%");
            moodProgressMessage.setText("Mood Tracked for " + counter + " days in this month");
```

Fig 28: Code sample which displays mood tracker progress bar in the profile of each user.

```
private void loadAssessmentResults() {

    assessmentsList = new ArrayList<>();
    final DatabaseReference assessmentRef = FirebaseDatabase.getInstance().getReference()
            .child("Assessment").child(patientID);

    assessmentRef.addValueEventListener(new ValueEventListener() {
        @Override
        public void onDataChange(@NonNull DataSnapshot snapshot) {
            assessmentsList.clear();
            for (DataSnapshot newSnap: snapshot.getChildren()){
                String assessmentID = newSnap.getKey();
                DatabaseReference eachAssessmentRef = assessmentRef.child(assessmentID);

                Assessment model = new Assessment(eachAssessmentRef);
                assessmentsList.add(model);
            }
            layoutManager = new LinearLayoutManager(getContext());
            assessmentRecyclerView.setLayoutManager(layoutManager);
            assessmentAdapter = new AssessmentAdapter(getContext(),assessmentsList);
            assessmentRecyclerView.setAdapter(assessmentAdapter);
        }

        @Override
        public void onCancelled(@NonNull DatabaseError error) {

        }
    });
}
```

Fig 29: Code sample which displays all the assessment scores of the user in their profile

6.5 SOS Emergency Implementation

Another important feature of the application is to send an emergency SMS message to the user's trusted closed ones' contact which has been implemented with the help of the below code.

```
private void uploadNumber() {

    String inputPhoneNo = phoneNo.getText().toString();

    if(TextUtils.isEmpty(inputPhoneNo)){
        phoneNo.setError("You must enter your phone number!");
    }
    else if(inputPhoneNo.length()!=10){
        phoneNo.setError("Please enter a valid phone number.");
    }
    else{
        SharedPreferences sharedPreferences = getContext().getSharedPreferences( name: "phoneNo", getContext().MODE_PRIVATE);
        SharedPreferences.Editor editor = sharedPreferences.edit();
        editor.putString("phoneNo", inputPhoneNo);
        editor.apply();

        Fragment fragment =  new HomeFragment();
        FragmentTransaction transaction = getFragmentManager().beginTransaction();
        transaction.replace(R.id.main_fragmentLayout, fragment);
        transaction.commit();
    }
}
```

Fig 30: Code sample which asks the user to add phone contact of their close one for SOS emergency

```
private void sosEmergency(SharedPreferences sharedPreferences) {
    String phoneNo = sharedPreferences.getString( key: "phoneNo",  defValue: " ");
    String userName = Prevalent.currentOnlineUser.getUsername();


    AlertDialog dialog = new AlertDialog.Builder(getContext()).create();
    dialog.setTitle("SOS Emergency");
    dialog.setMessage("Are you in danger! Do you want to notify your contact?");
    dialog.setCancelable(false);
    dialog.setButton(DialogInterface.BUTTON_POSITIVE,  text: "No", new DialogInterface.OnClickListener() {
        public void onClick(DialogInterface dialog, int buttonId) {

            SharedPreferences.Editor editor = messageSharedPref.edit();
            editor.putBoolean("messageSent", true);
            editor.apply();
        }
    });
    dialog.setButton(DialogInterface.BUTTON_NEGATIVE,  text: "Yes", new DialogInterface.OnClickListener() {
        public void onClick(DialogInterface dialog, int buttonId) {
                SmsManager smsManager = SmsManager.getDefault();
                smsManager.sendTextMessage(Prevalent.currentOnlineUser.getPhoneNo(),  scAddress: "",  text: "Hey! I am " + userName +
                        " (" + phoneNo + ") " + " I am having some mental health issue and I am in dange...",  sentIntent: null,  deliveryIntent: null);

            SharedPreferences.Editor editor = messageSharedPref.edit();
            editor.putBoolean("messageSent", true);
            editor.apply();

        }
    });
    dialog.setIcon(android.R.drawable.ic_dialog_alert);
    dialog.show();

}
```

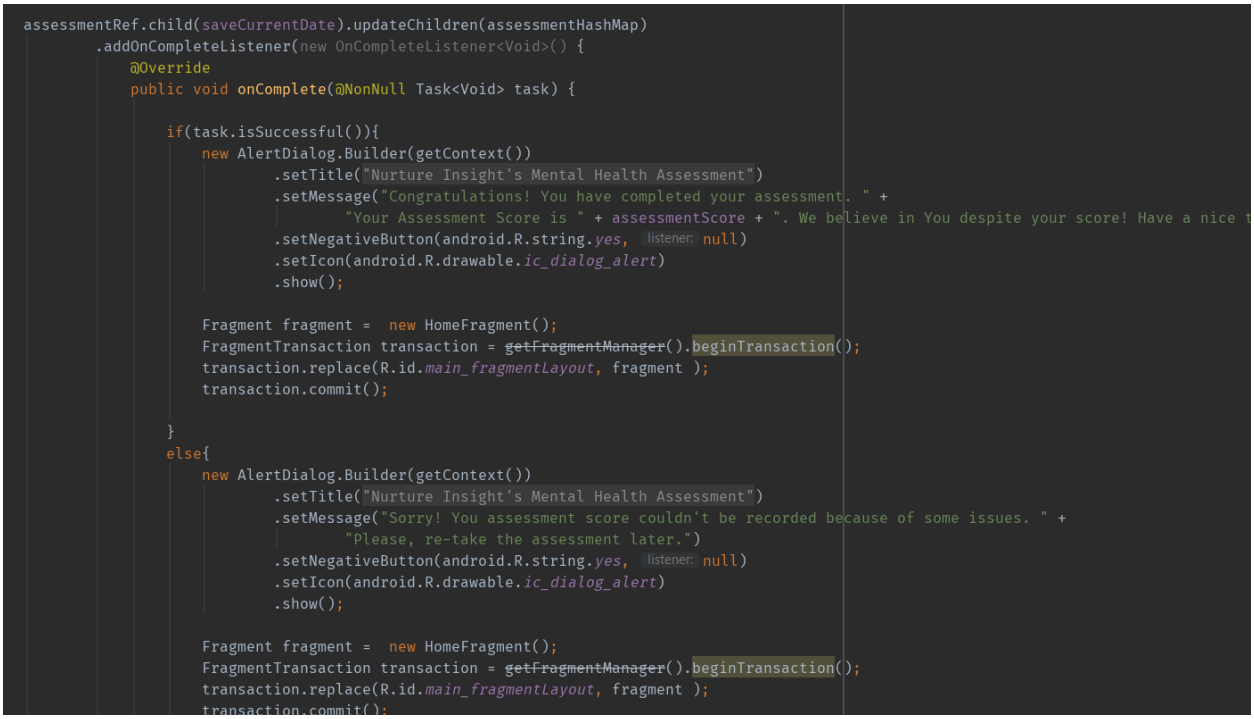
Fig 31: Code sample to send SOS emergency message when SOS button is clicked.

6.6 Weekly Assessment Feature Implementation

Lastly, the weekly assessment feature which assesses the user's mental health condition has been implemented using the following lines of code.

```
private void displayQuestions() {
    question.setText(questionList[questionNo][0]);
    option1.setText(questionList[questionNo][1]);
    option2.setText(questionList[questionNo][2]);
    option3.setText(questionList[questionNo][3]);
    option4.setText(questionList[questionNo][4]);
    option5.setText(questionList[questionNo][5]);

    assessmentOptions.check(choseAnswer[questionNo][1]);
    option5.setError(null);
}

private String[][] getQuestions() {
    String[][] questionsAnswers = new String[5][6];
    String[] questionOptionsList = getResources().getStringArray(R.array.assessmentQuestionAnswers);

    for(int index=0; index<5; index++){
        String [] questionsOnly = questionOptionsList[index].split( regex: ",");
        for(int newIndex=0; newIndex<6; newIndex++){
            questionsAnswers[index][newIndex] = questionsOnly[newIndex];
        }
    }

    return questionsAnswers;
}
```

Fig 32: Code sample to display assessment questions.



```
assessmentRef.child(saveCurrentDate).updateChildren(assessmentHashMap)
        .addOnCompleteListener(new OnCompleteListener<Void>() {
            @Override
            public void onComplete(@NonNull Task<Void> task) {

                if(task.isSuccessful()){
                    new AlertDialog.Builder(getContext())
                            .setTitle("Nurture Insight's Mental Health Assessment")
                            .setMessage("Congratulations! You have completed your assessment. " +
                                    "Your Assessment Score is " + assessmentScore + ". We believe in You despite your score! Have a nice t
                            .setNegativeButton(android.R.string.yes,  listener: null)
                            .setIcon(android.R.drawable.ic_dialog_alert)
                            .show();

                    Fragment fragment =  new HomeFragment();
                    FragmentTransaction transaction = getFragmentManager().beginTransaction();
                    transaction.replace(R.id.main_fragmentLayout, fragment );
                    transaction.commit();

                }
                else{
                    new AlertDialog.Builder(getContext())
                            .setTitle("Nurture Insight's Mental Health Assessment")
                            .setMessage("Sorry! You assessment score couldn't be recorded because of some issues. " +
                                    "Please, re-take the assessment later.")
                            .setNegativeButton(android.R.string.yes,  listener: null)
                            .setIcon(android.R.drawable.ic_dialog_alert)
                            .show();

                    Fragment fragment =  new HomeFragment();
                    FragmentTransaction transaction = getFragmentManager().beginTransaction();
                    transaction.replace(R.id.main_fragmentLayout, fragment );
                    transaction.commit();
```

Fig 33: Code sample to upload assessment score of the user

```
else{
    if(dayOfTheWeek.equals("Saturday")){
        checkAssessment();
    }
    else{
        getSupportFragmentManager().beginTransaction().replace(R.id.main_fragmentLayout, new HomeFragment()).commit();
    }

}
```

Fig 34: Code sample to display assessment automatically every Saturday.

The prototype product was developed successfully where most of the features proposed were implemented, out of which some of the important features' implementation code has been displayed in the above code snippets.

6.7 Product Testing

The developed prototype product was tested using various testing techniques, the feature's working performances were tested using in-app testing with the help of logcat and debugging features of android studio. In addition, white-box testing, a software testing mechanism where the structure of the implementation codes is known, was performed.

Similarly, black-box testing, a testing mechanism where the structure of the implementation is not informed to the user, was performed. In addition, feedback from a mental health professional was recorded using an application feedback form. The testing results of all the features of the application have been displayed below.

Testing and Evaluation Report

Actions	Expected Result	Remarks
Application Start Up after new Installation	Welcome Screen and Message should appear and should never be displayed once 'Get Started' button is clicked.	pass
Sign Up User	Username, phone number, email and password should be validated for empty, incorrect and invalid credentials.	Pass
Login User	Phone Number and Password should be validated for empty or incorrect attempts.	pass
User's First Login	Users should be asked to confirm their phone no via OTP code which will be sent to their phone number.	Pass
	Mental health Assessment and Self-care assessment should be performed when first logged in.	pass
	If the user is therapist, they should be asked to enter their professional details to enlist in the browse therapist section.	Pass
Application Start Up	Application should start with splash activity every time when opened and if user's login information is saved, it should log in without asking credentials.	Pass
View Home Page	Self-care exercises on home page should be determined by the option selected in self-care assessment.	Pass
	Different pages on the basis of their titles should appear.	Pass
	Mood question should be displayed with reaction if mood not tracked for the day. If tracked mood levels of past 7 days should appear as graph.	Pass
	Articles should be displayed when clicked.	Pass
	All events added by the therapist should appear on home page and event details should be displayed when each event clicked	Pass
Click SOS button	Users should be asked to enter phone number of their closed one's to contact during emergency.	Pass
	If contact is stored, users should be asked to send message, if yes pressed, message should be sent to their emergency contact.	Pass
Perform Mental Health Assessment	Mental health assessment should be asked every Saturday automatically	Pass
	If user clicks assessment grid at home, assessment page should inflate.	Pass
	Mental health assessment must have validations.	Pass
	The assessment score should be displayed to user after the assessment. If the score is less than 8 then send message option should appear.	Pass
Utilization of Chat Community	Ask user to be anonymous before every chat entry. Message should be posted anonymously if they are anonymous.	Pass
	Messages should be saved when swiped right and deleted when swiped left (Only logged user's post should be deleted).	Pass
	Saved messages should appear in saved section and all posts of that user should appear inside my post section.	Pass
	User should be able to view chats and comments. Therapist should be able to view chats and comment on them.	Pass

Utilization of Habit Tracker	List of habits should appear in the habit tracker page when new habit is clicked. If the habit is already added then should alert user about it	Pass
	On long click over added habits, users should be asked to remove the habit from schedule	Pass
	On click over added habits, user should be asked if they performed the habit, if performed they should be able to track them according to date.	Pass
Utilization of Journal Feature	Journal memory should be displayed when date is clicked if the journal was not written on that day, journal not found message should appear.	Pass
	If the date is today, user should be asked for new Journal entry, in case journal is written for the day, they should be able to edit.	Pass
Utilization of Explore Page	List of all self-care packages should be displayed in the explore page. When package clicked, list of exercise should be displayed.	Pass
	Each self-care exercise should have a dedicated video along with the name, description, category, duration, and video uploader's channel name.	Pass
Utilization of Therapist Dashboard	Therapist dashboard button should be displayed to therapists in their profile section. When clicked should redirect to therapist dashboard.	Pass
	Therapists should be able to add user as their patient but user should provide the OTP code if therapist wants to add them as a user.	Pass
	Therapist should be able to view their patients profile page, and view their journals.	Pass
	Therapist should be able to remove patient from their patient's list and should disappear from dashboard.	Pass
	Therapist should be able to add new events, event adding form must be validated and new events should automatically appear on home page and therapist dashboard.	Pass
	Events details should have all the information about the event and Therapist should be able to delete their particular events only.	Pass
View User's Profile	User profile page should have mood tracker and journal progress which updates automatically.	Pass
	If the user is connected to therapist, their therapist information should be displayed in profile.	Pass
	Assessment score of each date should appear on the profile page.	Pass
	User should be able to edit their details from edit section in the profile.	Pass
Notification Action	Notifications should be sent on desired date and time and when clicked should open the application.	pass

Fig 35: The testing documentation of the proposed prototype product.

Furthermore, the application was demonstrated to a Mental Health Professional, Shreeya Giri (Happy Minds Health) who was then asked to fill feedback form whose snippets have been attached below.

Nurture Insight – Application Feedback Form

How smoothly does the app run?
The app crash has improved, improved by 95%

How do you like the design of the app?
It's simple, user friendly

In which situation do you think this app will the most useful for you?
To log moods/habits and help with quick remedies

Do you think the app will help you to achieve your self-care goals?
It might

What features do you find the most effective in the app?
The therapist pool, communication + Relaxation remedies access without having to surf through YouTube

Are there any functions that you would want in this app?
Notification pop-up for positive affirmation or gratitude or breathing for someone who needs self-care and self-love reminders + Nepali text/videos if you are targeting Nepali audience

How would you rate this app in overall?
8/10 (features and idea is great)

Would you recommend this app to your friends/patients?
Definitely

Would you like to give a review?
The SOS and journaling tabs on the app are great, many could benefit.

Date of Feedback: 6th July 2021
Feedback by: Shreeya Giri, MD Happy Minds.

Fig 36: Feedback form filled by Shreeya Giri after the product was demonstrated

These test results have been recorded based on testing and evaluation performed to assess the features of the application. Multiple testing strategies like black-box testing, white-box testing, third-party testing, and run-time testing have been performed with the completed product whose results have been displayed. In case if the complete testing document is required, it will be available from the folder testing and evaluation which can

be found inside of the project monitoring and controlling section of the project folder uploaded.

7. Product Evaluation

Evaluation is a significant stage in every project as it provides a systematic method to study the success of the project in accordance with achieving objectives. This section of the report evaluates the prototype product developed for the research. The product was initially planned to have features that were recorded in the requirement analysis document after problem identification and research. The requirement catalog has been added as a complete document in the appendix. The evaluation of the product as compared to that analysis has been discussed below.

7.1 Successfully added features

A1-001	An assessment focused to user to identify their needs on different self-care practices	**M**
A1-002	A customized self-care packages for users on the basis of their assessment results	**M**

The above-listed feature for Self-care has been successfully implemented as the user will be asked to perform self-care assessment during their first login. Being based on that assessment's answer the self-care exercises will be presented to the user on their application homepage.

A1-003	An information portal where user can browse articles, journals, and videos to get various information on mental health related topics.	**M**
A1-004	An instant help section which will display simple and easy exercises to cope with different mental issues.	**M**

The product was initially planned to have an information portal and instant help section which has been successfully implemented in the developed product and has been

displayed on the homepage. The instant help section has been displayed as a grid where calm down exercise, live in present exercise, uplifting quotes, positive affirmations, and some more grids are available. Similarly, the information portal has been displayed as 'Nurture Insight Resources' where users can browse articles that help users to gain insights on the causes, symptoms, effects, and coping strategies of particular mental health problems.

A1-005	A weekly assessment form to track mental health state of the user	**M**

The weekly assessment feature has been implemented in the prototype where five different questions will be displayed to the user to assess their weekly mental health state. The assessment has been scheduled for Saturday by default.

A1-006	A SOS button, which will allow users to select people from their contacts, in order to send text message when user presses the button.	**S**

This feature has been implemented in the product but with a different approach. Users can add the contact number of their closed ones in the SOS although it was planned to have been chosen from the contacts section of the user's phone. However, the added contact will be sent with a text message when the user presses the SOS button.

A1-007	List of different habits from which user can select different habits and regular tracking of those habits	**S**

The product also has a list of 12 habits that can be added to the daily tracking schedule and can be tracked daily. In addition, the product features to view the tracked habits with the help of a calendar.

A1-008	A simple assessment to track user's mood everyday	**S**

The mood tracker feature has been implemented where the user will be asked to record their mood every day. Moreover, the graph of results of mood tracked in the past week will be displayed to the user once the mood is tracked for the day.

A1-010	Browse list of therapists along with their personal and contact details	**S**

The browse therapist feature has been implemented and displayed in the instant help grid where users can browse the list of all therapists who have been enrolled in the application.

A1-009	A chat community where users can post stories and thoughts and also pass comments on others' stories	**S**
A1-013	Store chat community stories and thoughts to favorite which can be viewed at any time.	**C**

The chat community feature has been added to the product where users can write and share stories. In addition, they will have the feature to save the post for later which can be viewed from the saved post section of the chat community. Each chat message can be viewed separately along with the comments added in each chat post.

A1-011	List of events on mental health along with their details	**C**

The product features display mental health events at the bottom of the homepage. The details of the events can be viewed by tapping on each of them.

A1-014	A journaling section, with multiple journaling ideas, where users will be asked questions to journal their thoughts efficiently	**C**
A1-016	Browse and read personal journals at any time on the basis of date.	**C**

The journaling feature has been added successfully where users can write journals for the day by answering the questions in the journal. In addition, they will have the option to view their journal writing of the past using the calendar date picker option.

B1-001	A registration form which collects user's information along with terms and condition checkbox	**M**
B1-003	Customer's details verification via email confirmation	**S**

B1-001	A registration form which collects user's information along with terms and condition checkbox	**M**
B3-001	View personal profile with personal details, track records, completed packages, therapist information, and journals.	**M**
B3-002	An option to delete the user account from the application	**M**
B3-003	Notification management and integration with mobile functionality	**C**

All the features from B1-001 to B3-003 above have been implemented successfully as planned. Users will have the facility to register and login, log out once logged in, view their profile, delete their accounts and manage notifications.

C1-002	Manage therapist's personal profile by editing personal details using form	**S**

C2-001	Enroll patient to list of current patients for each particular therapist	**M**
C2-002	View complete profile of each patient showing personal details, track records, and completed packages	**M**
C2-003	Remove a patient from the list of current patients	**M**
C2-004	Browse list of all patients along with their basic information	**S**
C2-005	Confirm patient's enrollment via email	**S**

The features listed from C1-002 to C2-005 above has been implemented in the product where therapist user of the application can manage their profile, enroll new patients, view their profile, and remove patient. However, the confirmation to enroll a new patient has been implemented using OTP code along with phone rather than using email.

7.2 Features not added as planned

A1-012	Self-care packages allowing users to track their completion status within each package	**C**

Each self-care package tracking feature has not been implemented although it was planned because the user has the facility to browse the same package multiple times thus tracking feature was not supposed to be convenient.

A1-015	An option to share the contents of journals with therapists	**C**

The feature to share contents of journals with the therapist has not been implemented however each therapist will have the facility to view their patient's journal with having the user share them once they are enrolled.

B1-002	Facility to continue registration using google accounts	**S**
B1-003	Customer's details verification via email confirmation	**S**

Although the above-listed feature was planned, it has not been implemented as planned but has been implemented with a different approach. As mental health is personal every individual use of email seemed more insecure thus, it has been replaced with a phone number instead. In addition, users will be asked to confirm their phone number with an OTP code which will be sent to their phone number during the first login attempt.

C1-001	An option to login into the application as a therapist	**M**

The therapist login feature has not been added separately however therapist dashboard button has been displayed to each therapist in their profile which will direct them to the therapist's section of the application.

7.3 New Features added to the product

Most of the features were implemented as planned however during the development of the product other features were considered to be necessary and thus have been added even though they were not planned initially. The newly added features have been discussed below.

NF-001	Display mental health assessment score to user and prompt to send SOS message if the score is tentatively low than usual.

The feature has been implemented by managing the scores to each answered question of the assessment. The total score of the assessment is 25 however if the score is less than 8 then the user will be asked to send an emergency message to their contact.

NF-002	Once the user tracks the mood for the day, display a mood tracker history graph showing mood levels of the past week

This feature has been added to motivate users to track their moods every day and will also be helpful to view mood levels to track mental health conditions.

NF-003	Only therapist users should be able to add comments on chat post while everyone should be able to view them.

The above feature has been added so that therapists can react to each message and suggest users do activities based on the written message. However, other users are not allowed to comment because they are not supposed to be professionals who would suggest their fellow users.

NF-004	Ask user to continue anonymously or publicly before continuing to chat community

The above feature has been added to make the user comfortable while sharing their thoughts as they would not hesitate to post anonymously. Moreover, Anonymity helps users to fight against mental health stigma.

NF-005	An option to add new mental health events should be available to therapist users

Finally, the option to add events by the therapist has been added to engage users and therapists of the application together. This would be beneficial to educate and aware users of mental health-related topics.

Therefore, after evaluating the features planned and added to the application, it can be concluded that the development of the prototype product was successful. Most of the features planned during the initial phase have been implemented although some of them were modified and were not implemented. In addition, some new features were added to increase the efficiency of the product on various bases. The product has been designed minimally and to increase the user experience, various self-care videos, progress charts, assessment scores, bar graphs, and date pickers to track progress have been added which are supposed to engage the user to the application. Thus, in accordance with the evaluation, the development of the prototype product was successful and it will perhaps be helpful to users to nurture their mental health.

8. Project Evaluation

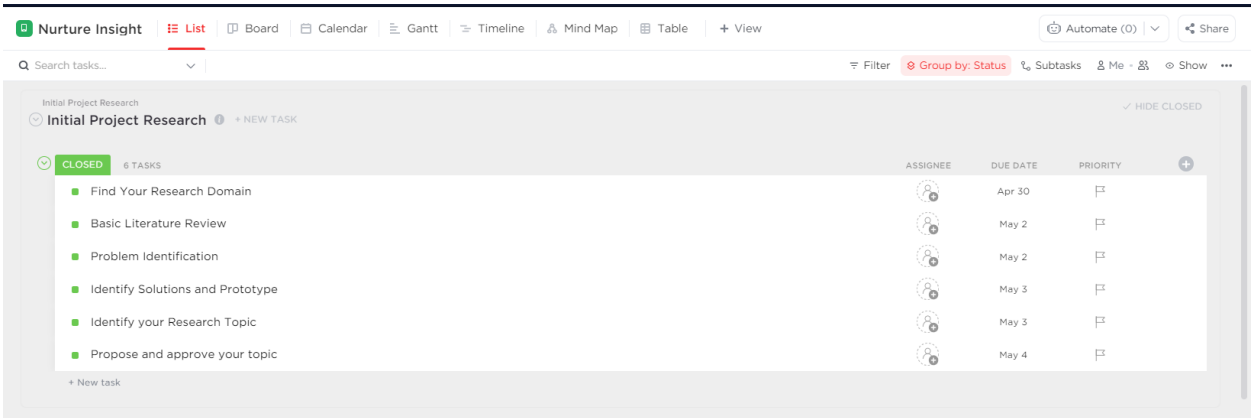
This section of the report reflects upon the objectives of the project to evaluate the level of achievement and success of the project. The primary aims and objectives along with the project management techniques that have been implemented throughout the project have been discussed in this section of the report.

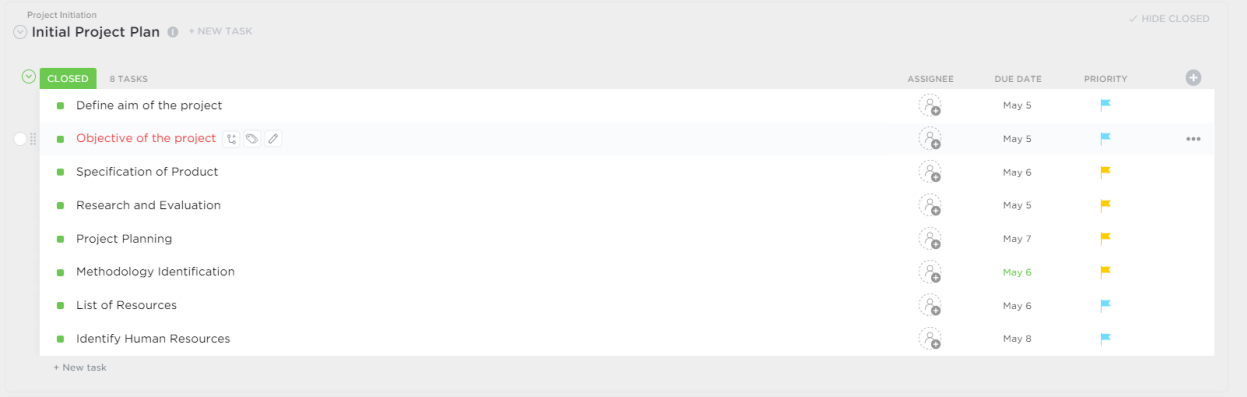
8.1 Project Management Techniques Applied

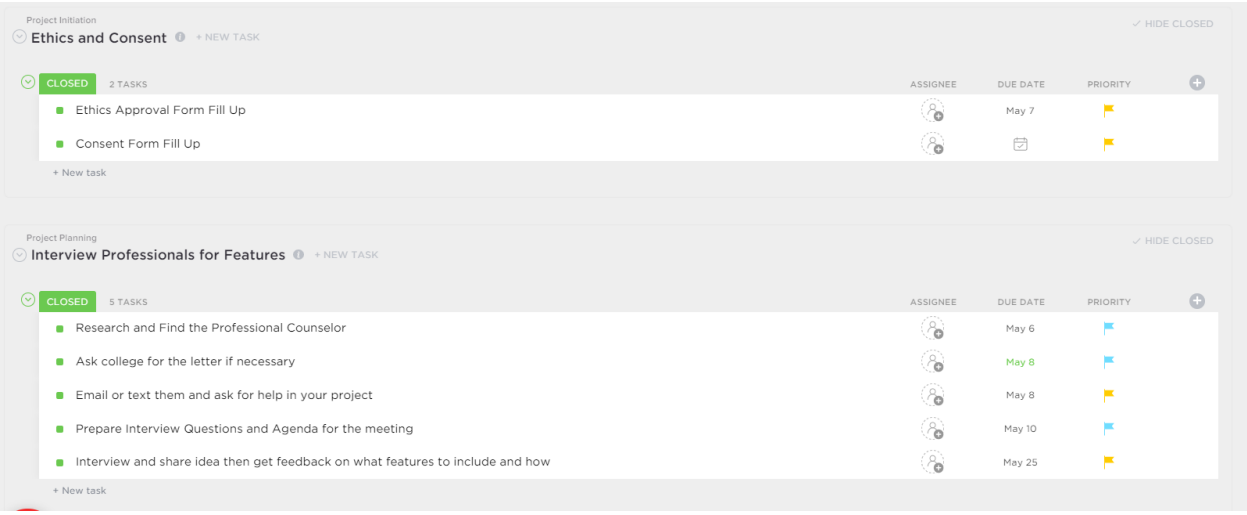
The role of project management techniques for any project is significant for the overall success of the project. It helps in planning the project which is perhaps necessary to increase the productivity of the project. Thus, this project used various project management techniques to plan project. The project management tool used by the project is Click Up, a cloud-based project management tool. Some techniques like Work Breakdown Structure, Gantt Chart, Project timeline, and calendar blocking have been used in this project which has been evidenced and discussed below.

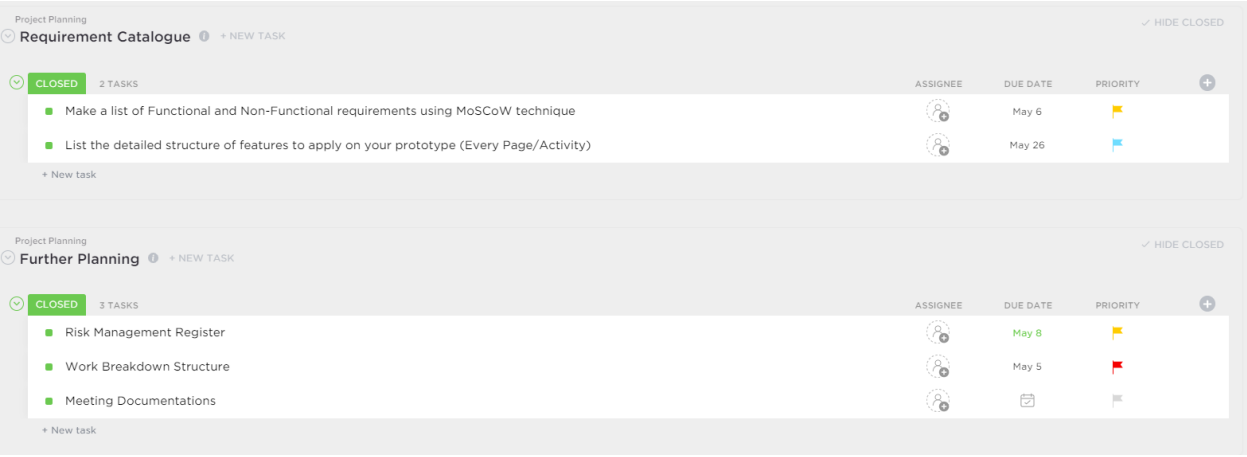
Work Breakdown Structure (WBS)

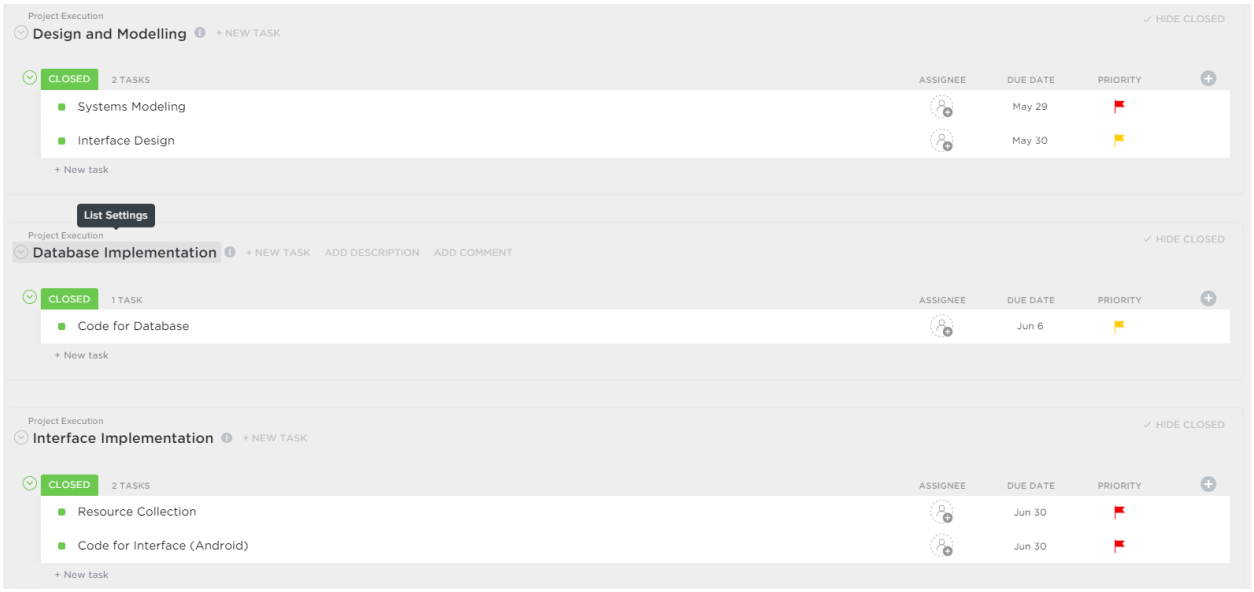
A work breakdown structure helps to organize the tasks of a project by breaking them into multiple small tasks which are more achievable and manageable. This technique helps project participants to track the progress of the project as small tasks for each date are separated to achieve all the goals of the project.

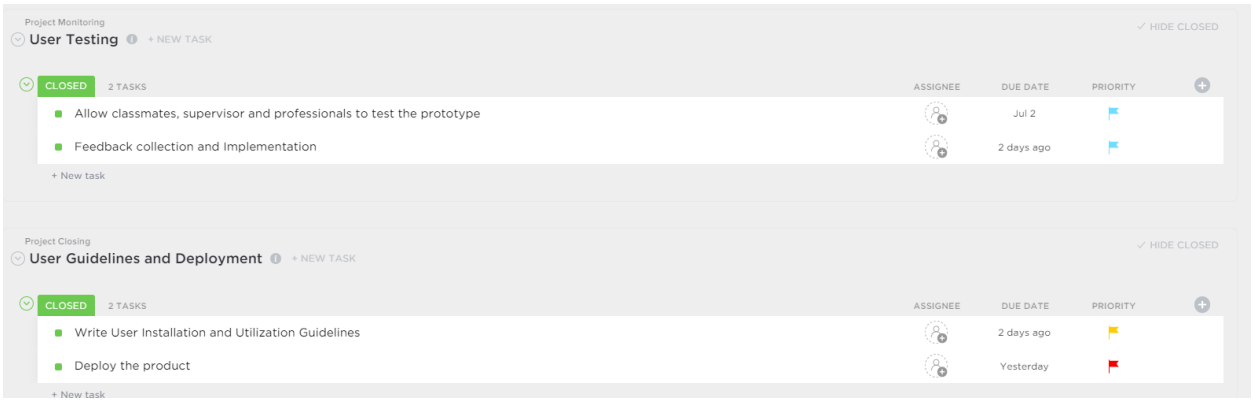



Project Initiation
Initial Project Plan
+ NEW TASK
HIDE CLOSED
CLOSED
8 TASKS
ASSIGNEE
DUE DATE
PRIORITY
Define aim of the project
May 5
Objective of the project
May 5
Specification of Product
May 6
Research and Evaluation
May 5
Project Planning
May 7
Methodology Identification
May 6
List of Resources
May 6
Identify Human Resources
May 8
+ New task


Project Initiation
Ethics and Consent
+ NEW TASK
HIDE CLOSED
CLOSED
2 TASKS
ASSIGNEE
DUE DATE
PRIORITY
Ethics Approval Form Fill Up
May 7
Consent Form Fill Up
+ New task
Project Planning
Interview Professionals for Features
+ NEW TASK
HIDE CLOSED
CLOSED
5 TASKS
ASSIGNEE
DUE DATE
PRIORITY
Research and Find the Professional Counselor
May 6
Ask college for the letter if necessary
May 8
Email or text them and ask for help in your project
May 8
Prepare Interview Questions and Agenda for the meeting
May 10
Interview and share idea then get feedback on what features to include and how
May 25
+ New task


Project Planning
Requirement Catalogue
+ NEW TASK
HIDE CLOSED
CLOSED
2 TASKS
ASSIGNEE
DUE DATE
PRIORITY
Make a list of Functional and Non-Functional requirements using MoSCoW technique
May 6
List the detailed structure of features to apply on your prototype (Every Page/Activity)
May 26
+ New task
Project Planning
Further Planning
+ NEW TASK
HIDE CLOSED
CLOSED
3 TASKS
ASSIGNEE
DUE DATE
PRIORITY
Risk Management Register
May 8
Work Breakdown Structure
May 5
Meeting Documentations
+ New task


Project Execution
Design and Modelling
+ NEW TASK
HIDE CLOSED
CLOSED
2 TASKS
ASSIGNEE
DUE DATE
PRIORITY
Systems Modeling
May 29
Interface Design
May 30
+ New task
List Settings
Project Execution
Database Implementation
+ NEW TASK
ADD DESCRIPTION
ADD COMMENT
HIDE CLOSED
CLOSED
1 TASK
ASSIGNEE
DUE DATE
PRIORITY
Code for Database
Jun 6
+ New task
Project Execution
Interface Implementation
+ NEW TASK
HIDE CLOSED
CLOSED
2 TASKS
ASSIGNEE
DUE DATE
PRIORITY
Resource Collection
Jun 30
Code for Interface (Android)
Jun 30
+ New task


Project Monitoring
User Testing
+ NEW TASK
HIDE CLOSED
CLOSED
2 TASKS
ASSIGNEE
DUE DATE
PRIORITY
Allow classmates, supervisor and professionals to test the prototype
Jul 2
Feedback collection and Implementation
2 days ago
+ New task
Project Closing
User Guidelines and Deployment
+ NEW TASK
HIDE CLOSED
CLOSED
2 TASKS
ASSIGNEE
DUE DATE
PRIORITY
Write User Installation and Utilization Guidelines
2 days ago
Deploy the product
Yesterday
+ New task

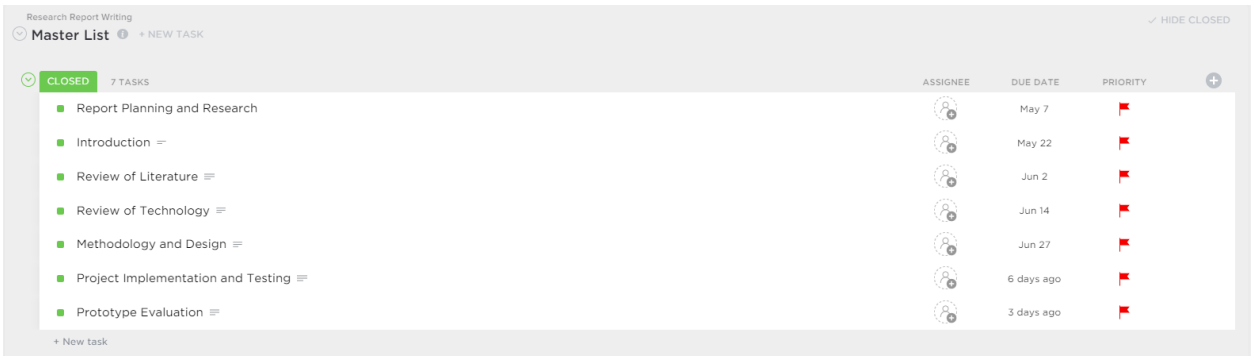

Research Report Writing
Master List
+ NEW TASK
HIDE CLOSED
CLOSED
7 TASKS
ASSIGNEE
DUE DATE
PRIORITY
Report Planning and Research
May 7
Introduction
May 22
Review of Literature
Jun 2
Review of Technology
Jun 14
Methodology and Design
Jun 27
Project Implementation and Testing
6 days ago
Prototype Evaluation
3 days ago
+ New task

Fig 37: Snapshots of Project Management technique: Work breakdown structure applied to manage the project.

Gantt Chart

Gantt Chart is a visual representation of the tasks of the project which schedules tasks over one or multiple tasks. It helps in organizing tasks based on their dependencies where deadlines of each upcoming task can be viewed along with its dependency with other significant tasks.

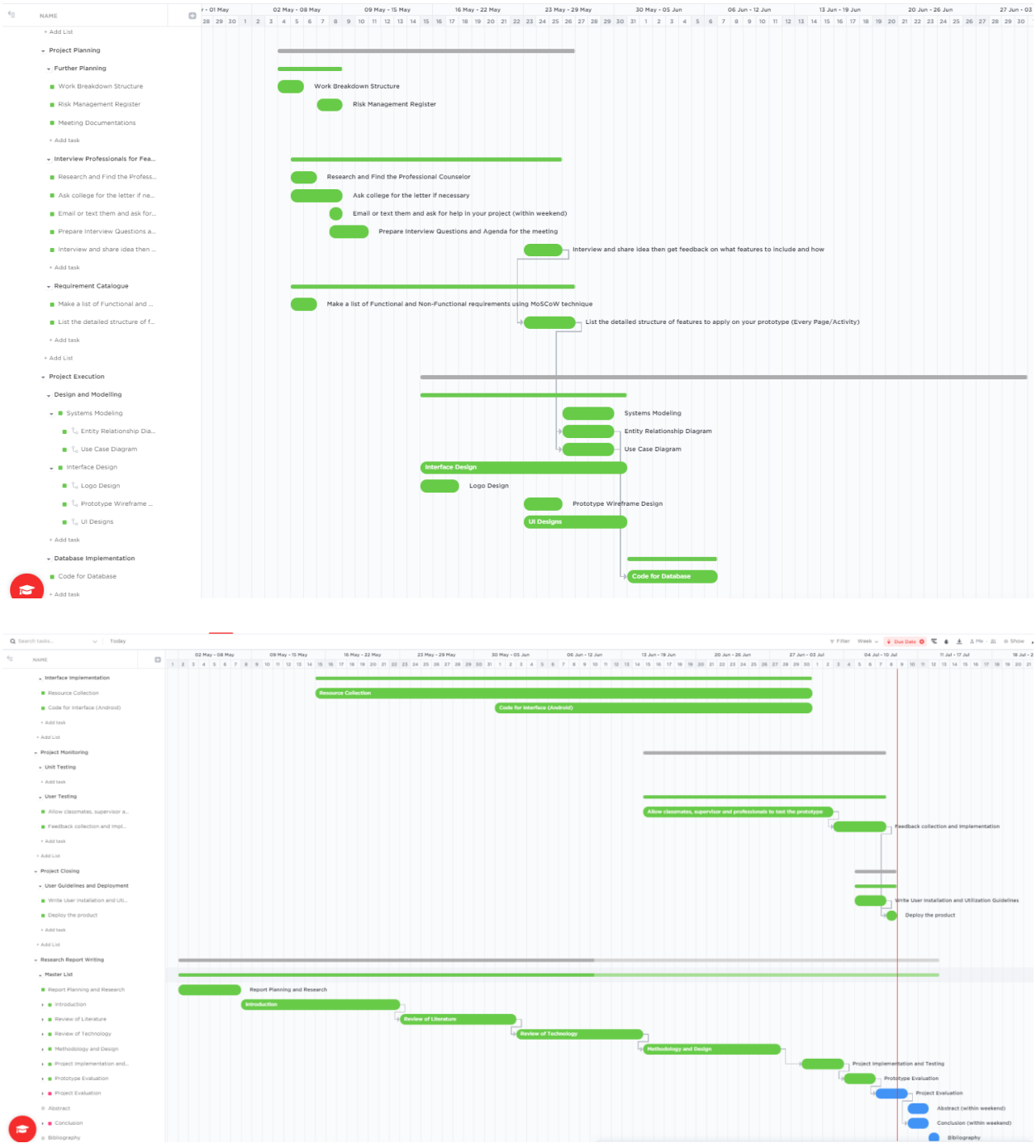


Fig 38: Snapshots of Project Management technique: Gantt Chart applied to manage the project

Project Timeline

As the name suggests, a project timeline is a project management technique that helps to visualize the project throughout a period. It helps any project to set a clear direction by prioritizing tasks and visualizing them from the start date to the finish date.

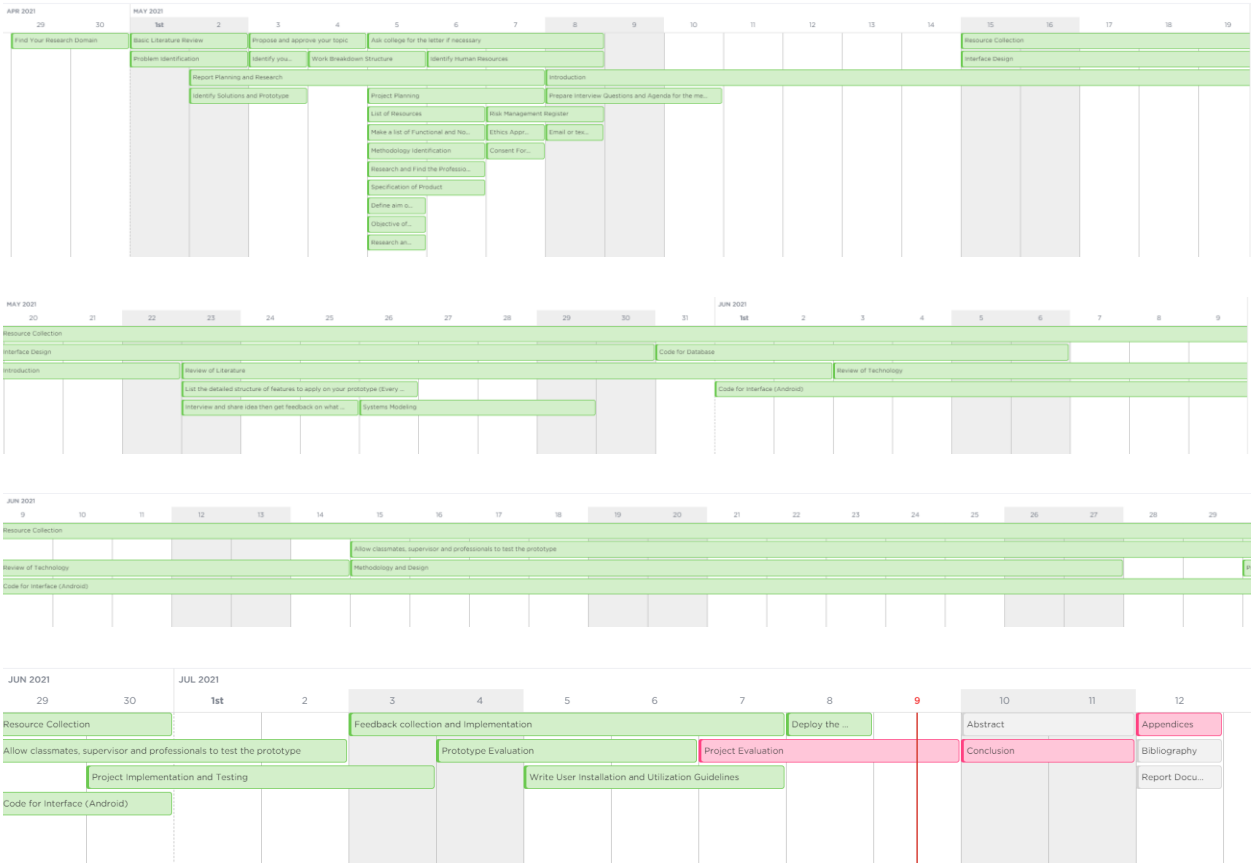
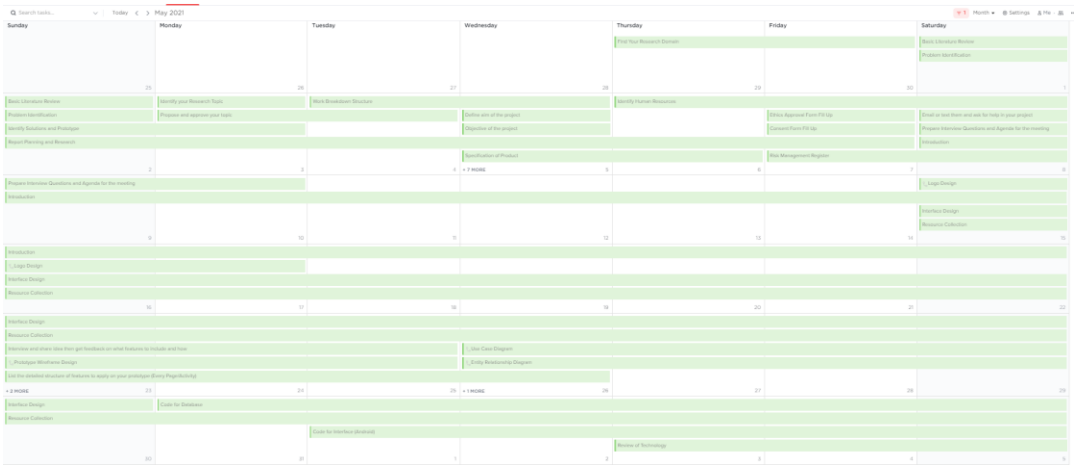


Fig 39: Snapshots of Project Management technique: Project Timeline applied to manage the project

Calendar Blocking

This is a technique that pairs with each task of the project and schedules them as an individual task on a calendar. It helps project participants to view particular tasks that are to be performed on each particular date along with the deadlines for the tasks.



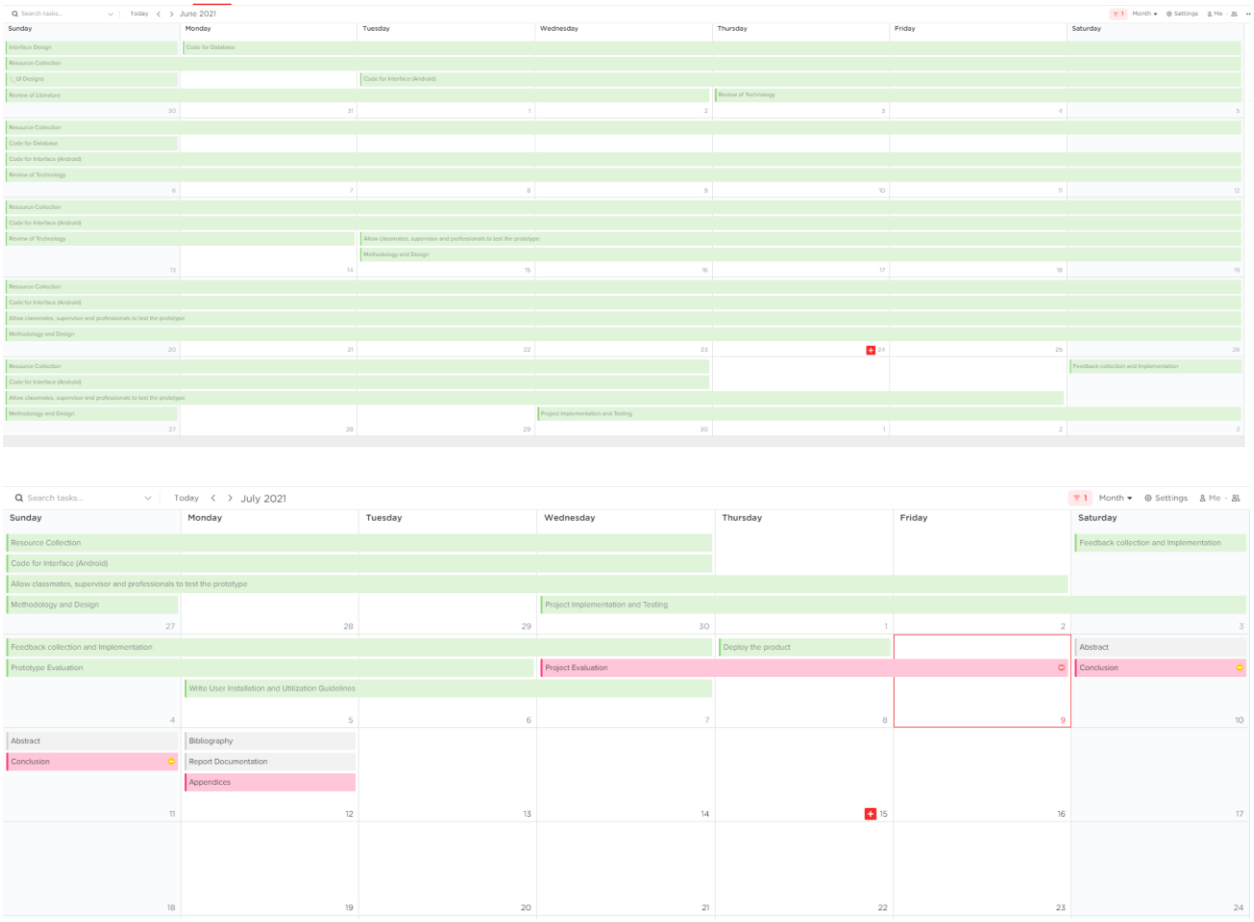
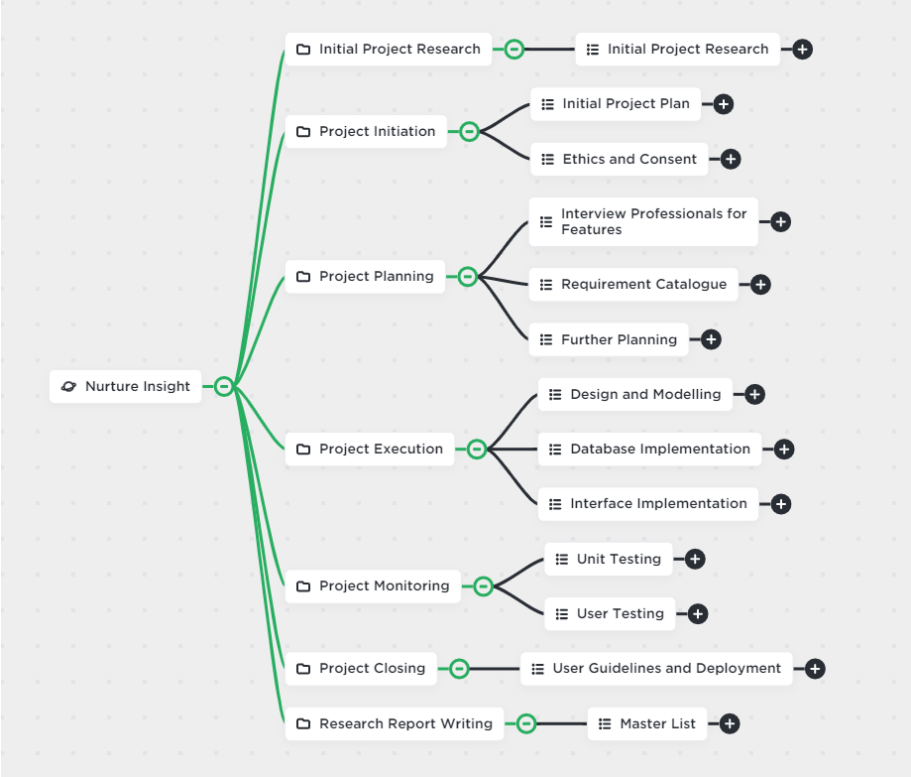


Fig 40: Snapshots of Project Management technique: Calendar blocking applied to manage the project

Project Mind map

Mind map in project management involves daily decision making by outlining upcoming tasks in a visual map increasing the decision-making process of the participants for each task. The concept of the project is represented in a mind map along with the tasks to be completed to achieve the objective of the project.



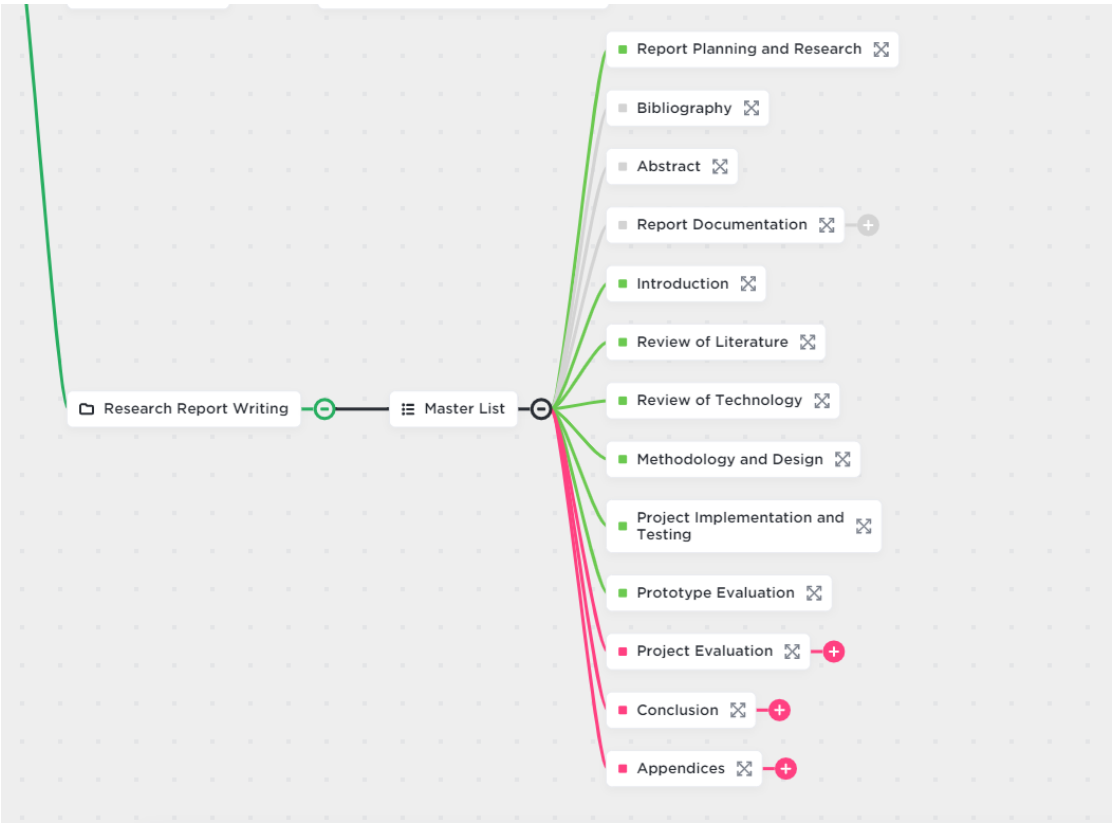


Fig 41: Snapshots of Project Management technique: Mind map applied to manage the project

These project management techniques have been implemented for the planning of the project which was indeed encouraging to manage, prioritize and achieve each task of the project. The use of these techniques has helped to track the progress of the project. Moreover, the productivity of the project was determined by the applied techniques which helped in achieving the objectives of the project.

8.2 Aim and Objectives Evaluation

The objectives of the research project were discussed in the introduction section of the report. However, this section of the report evaluates to which extent those objectives and aim of the project have been achieved determining the overall success of the project.

As mentioned earlier, one of the objectives of the research was to identify major problems faced by mental health patients by researching the existing mental healthcare system. A wide range of research on the prevailing system was performed which helped in identifying problems which were lack of awareness, mental health stigma, low financial support, limitations in services, and lack of resources. The evidence of the problems identified has been presented in the previous sections of the report.

Secondly, the project planned to develop an information portal that allowed people to educate themselves about mental health. The developed prototype product includes a section where mental health resources along with their information, causes, symptoms, and coping strategies have been discussed which evidences the achievement of this objective.

The other objective of the project was to design a platform that would help people to cope with mental health problems using CBT, positive psychology, mindfulness, and self-care activities. Comprehensive research on the effectiveness of these techniques has been discussed in the report. In addition, these techniques have been implemented with the help of a habit tracker, mood tracker, journaling section, self-care packages applied within the product, confirming the achievement of this objective.

Similarly, the project had an objective to develop a technological platform where a therapist could connect to their patients. Thus, the developed prototype includes a therapist's dashboard which allows them to connect to the other users who can be enrolled as their patients. Moreover, the therapist will be able to view the profile, track their progress, and view journals which helps them to monitor the mental state of their patient regularly.

Lastly, the final objective of the research was to develop an online community that helps in reducing stigma by sharing personal opinions and success stories. This objective has been successfully achieved as the developed product includes a chat community where users can publicly or anonymously add opinions and stories. In addition, the therapist users will be able to add comments which encourage users to talk more about mental health issues reducing the stigma.

Therefore, the aim of the project has been successfully achieved as the objectives which intended to achieve the aim have been accomplished. In addition, many other features have been researched, discussed, and applied in the developed product which adds up to enhance the aims and objectives of the research.

8.3 Issues faced during the research

The improvements and recommendations of the research could have been implemented within the prototype product however, there were some complications and problems faced during the research project. The lockdown due to the coronavirus pandemic has affected the research project on various factors some of which have been attached in the risk register below.

Appendix A: Risk Management Register

ID	Risk Description	Likelihood	Impact	Severity	Owner	Mitigation	Status
1	Ethical approval issues with human participants	High	High	High	Avhimanhu Sapkota	Human participation information and consent form will be provided, to additional human participants, which will confirm the ethical approval once they fill it up along with their signature.	Open
2	Online Communication issues while contacting research participants	Medium	High	Medium	Avhimanhu Sapkota	Multiple online communication via Google meet, Discord and Viber will be conducted with supervisors and other human participants for successful communication	Open
3	Unavailability of Project Management Software	Low	Medium	Low	Avhimanhu Sapkota	Research on free project management software available will be conducted and the best free software will be chosen to manage the project.	Closed
4	Prototype implementation and application development issues	Medium	High	High	Avhimanhu Sapkota	Tutorials and videos relating to coding issues and bugs will be reviewed. Meanwhile, suggestions from supervisors will be considered to solve the issue. If none of the mitigation measure works properly, alternative solutions will be researched and applied.	Open
5	Inefficient and less productive prototype content	Low	Medium	Medium	Avhimanhu Sapkota	Suggestions during requirement analysis and resources collection will be taken from the content professionals. Also, efficiency of the content added to the prototype application will be confirmed after feedback collection from professionals and target group.	Open
6	Prototype Installation and Deployment Issue	High	Medium	Medium	Avhimanhu Sapkota	A proper user installation and utilization guidelines will be written and shared amongst prototype users to avoid installation and deployment issues. Furthermore, video tutorials for installation will be shared in case of further issues during deployment.	Open
7	Delay during online Feedback collection	Low	Medium	Low	Avhimanhu Sapkota	A regular check-in for feedback will be conducted, with people who are testing the prototype, via online communication platforms.	Open

Fig 42: Snapshots of risks register which documents error encountered during the project

Although all the aims and objectives of the project have been accomplished the project has some implications. The self-care exercises implemented within the product are self-guided which might not be the best approach as people might not go back to the application to practice mental well-being. In addition, technology cannot be identified as the solution for mental health problems as serious mental health problems have to be handled professionally by certified personnel at an individual level. Thus, technology is a tool to help people in the mental healthcare journey however it is not the treatment or the cure for mental health problems.

Therefore, the evaluation of the project management techniques, issues faced and the objectives accomplished within the research has determined the overall success of the project. The project management techniques including work breakdown structure, Gantt chart, project timeline, mind map have helped to manage the project supporting throughout the project. Most of the aims and objectives of the project have been

accomplished with the help of various research and developed prototype although some issues were encountered because of the coronavirus pandemic. In conclusion, the research project was successful in terms of uplifting the mental healthcare system and helping people to nurture and track their mental health whose evidence has been discussed within the report.

9. Summary and Conclusions

In conclusion, a comprehensive research was conducted within the prevailing mental healthcare system to identify the problems and suggest solutions for 'Mental well-being and self-care using Mobile Application Technology'. In the meantime, the research identified mental health to be one of the most important factors of human health which would determine the overall well-being of an individual, a community. However, almost 13% of global diseases were mental disorders, and almost 450 million people worldwide were estimated to have a mental disorder (Murray et al., 2012) (WHO, 2017).

The research for problem identification concluded that lack of awareness, mental health stigmatization, limited treatment services, lack of resources, and low budget funding were the major problems that constituted the treatment gap in the mental healthcare system. The paper identified that only 40% of mentally ill people got proper treatment. Similarly, 28% of the countries had no budget specified for mental health where 36% allocated less than 1% of their health budget (MentalHelp, 2021) (Rathod et al., 2017). The survey conducted by Happy Minds Health was helpful to conclude that 30% of students surveyed from The British college were not aware of mental health problems which confirmed a lack of awareness and high mental stigma amongst them which have been used to identify the features that have to be added in the application.

In accordance, research on possible solutions for the problem was conducted where many papers argued on various solutions like decentralization of resources, proper health governance, use of technology, and high priority financial funding. After an evaluation of researches, survey reports, and discussion with a mental health professional, the research identified that the use of mobile technology would be the best tool to help people

take care of their mental well-being. Thus, the research proposed a prototype mobile application.

The prototype product was successfully developed which included features to help solve the problems identified. For instance, the information portal and chat community features were incorporated to solve the problem of lack of awareness. Similarly, the problem of limited mental health resources and treatment was supposed to be solved with the browse therapist and connect therapist with user features of the application. The mental health stigma problem was maintained using the chat community features where users can post success stories and uplifting posts which would help users to talk more about mental health. Moreover, the anonymity feature applied in the chat community has been identified to resolve the problem of stigmatization. Lack of financial funding which would increase treatment expenses was identified to be solved using browse therapist options where users can view multiple therapists and contact them personally without having to pay instantly or excessively. Furthermore, mood tracking, journaling, self-care exercises, weekly assessment, SOS emergency messaging, and therapist dashboard features planned initially were implemented to help users nurture themselves to stay away from mental illness ultimately reducing the necessity of treatment. The prototype was further evaluated by the professional mental healthcare facilitator whose feedback confirmed the effectiveness of the product in solving or at least uplifting the identified problems.

Therefore, the research concludes that the technical tools and psychological techniques applied within the mobile applications were effective and would help to promote mental well-being and self-care amongst people. In addition, it could be concluded that the use of technology is not the cure for mental health problems however it is the most effective tool to help people nurture and track their mental health and it would indeed help to reduce the treatment gap of the mental healthcare system. The overall research was successful as it accomplished all the aims and objectives with the development of mobile application although some improvements on the developed technology would further enhance the efficiency of the developed prototype product.

9.2 Improvements and Recommendations

Despite the accomplishment of the aim and objectives and the success of the research, it has some room for improvements as the mental healthcare system is a large section to be analyzed. The developed prototype could have implemented some more features which would increase the efficiency of the product. Two of the recommended features have been discussed below.

Sleep Tracking

The sleep of an individual plays a vital role in determining the psychological state. People with mental disorders like anxiety, depression, bipolar disorder, and ADHD are more likely to have sleep disorders. Thus, the product could have added a sleep tracking feature within the application which could have been used to identify the mental health condition of the user. In case of less sleep, the application could aware users of their sleep and recommend them to perform various activities which would improve their sleep ultimately improving the mental well-being of the user.

AI Chatbot

Another feature that could have been added to the product was the chatbot feature with the help of Artificial Intelligence. The chat feature of the product currently allows users to write posts however, case if a user requires instant help by talking to someone it could not be achieved with the developed product. Nevertheless, the product could implement AI-chatbot which would chat with users and help them with their problems instantly. The chatbot could be trained with the help of various chat questions and their answers which can be discussed with mental health professionals to determine the effectiveness of the chatbot. The chatbot could be used to promote mental health and recommend users with nurturing techniques that would uplift the mental well-being of an individual.

Virtual Reality Integration

Although virtual reality is relatively new and has not yet been researched much for mental health well-being and treatment, some technologies use virtual reality to treat mental illness. VR technology can be used to help mentally ill people to desensitize and to develop emergency coping abilities. It can be used within the application to help users

who suffer from depression, anxiety, and other traumatic disorders by adding VR videos that have been identified to be effective in treating mentally ill people.

The utilization of the above-mentioned features would act as a cherry on top which would help the users to take care of their mental health and would help in reducing the mental health problems faced by people.

9.3 Future Work

The research proposed and developed a prototype product that was intended to uplift the mental health of people. Meanwhile, there were some research gaps identified during the prototype development which could be reduced if research on some sections would be conducted in the future. Some of the recommendations for future research have been listed below.

- Research on the efficiency of self-guided mental health exercises can be conducted and should be implemented to attract users to do everyday exercises.
- Research on the use of data collection and artificial intelligence to uplift mental healthcare facilities should be performed and applied in the developed product.
- Research on behavior pattern detection amongst mentally ill people with the help of technology should be implemented after research which would benefit users by detecting their everyday behaviors.

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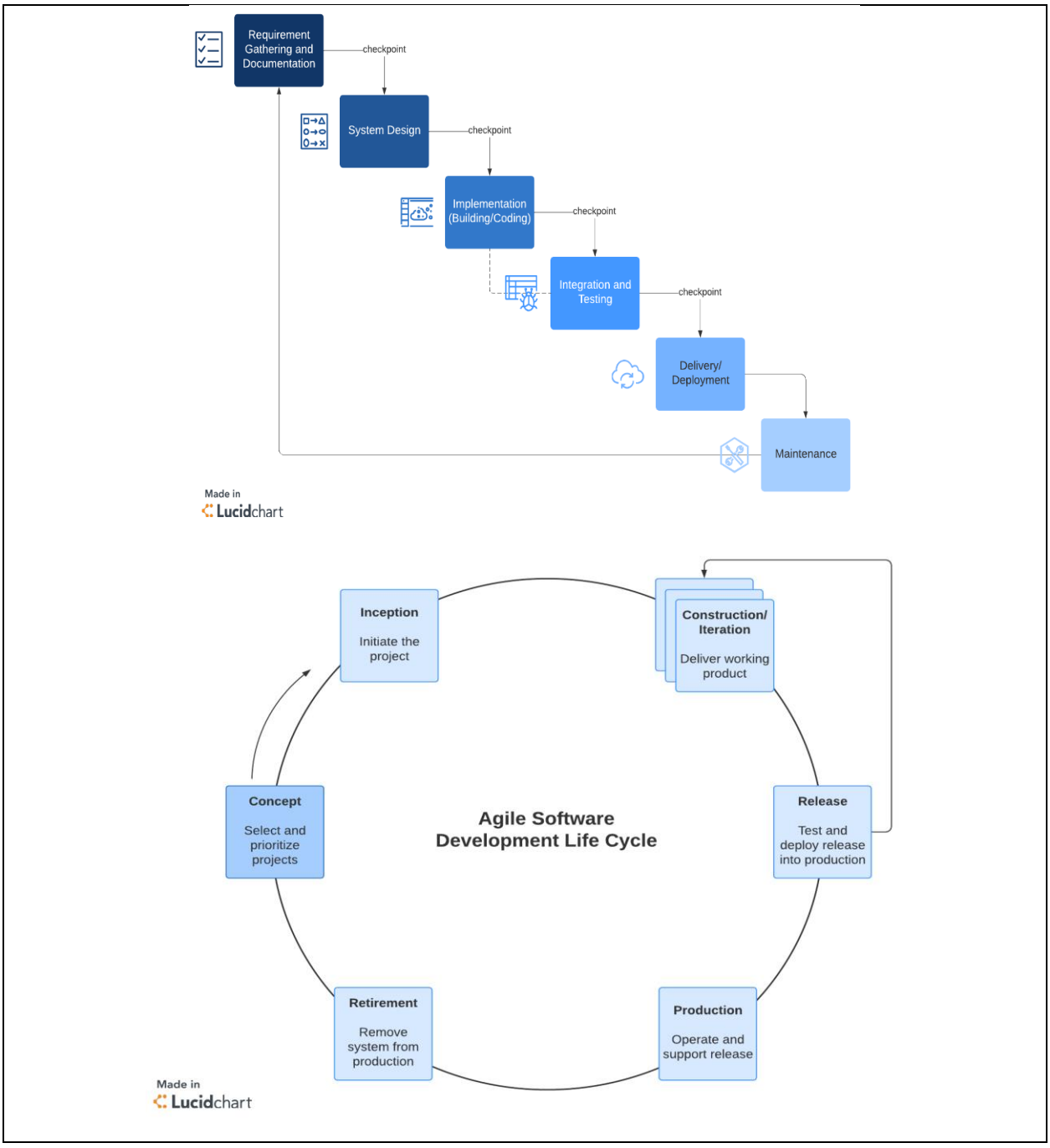
11. Appendix

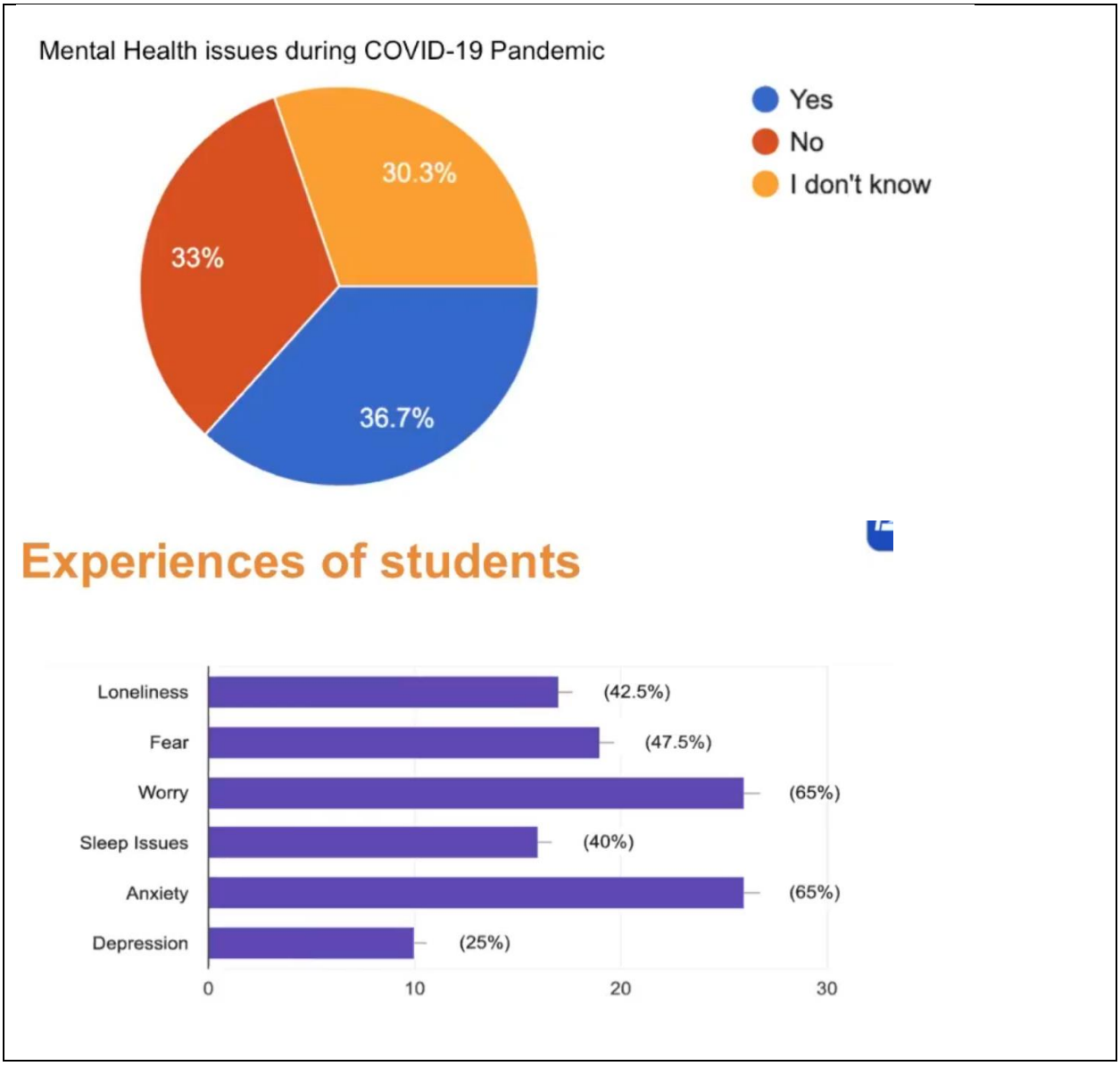
Appendix A

The development phases of Waterfall methodology (Lucidchart Content Team, 2020)

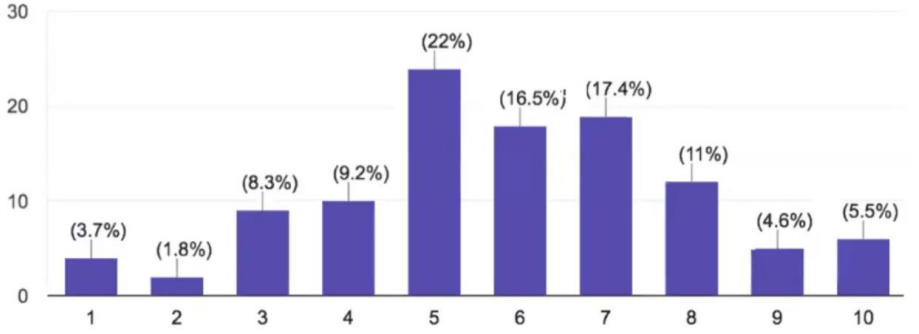


Appendix B

Happy Minds Health survey reports conducted within The British College.



Stress Level/Mood



Appendix C

Participation Information Sheet and Ethical Consent Form signed by Shreeya Giri.

The British College

Affiliated to Leeds Beckett University

Information Sheet and Consent Form for Research Participants

Research Project Title:

Mental Well-being and Self-care using Mobile Application Technology

I would like to invite you to consider taking part in the research project on the mentioned title. The primary reason for the research is to support my BSc Computing studies at The British College which is affiliated to the curriculum of Leeds Beckett University. Before deciding on whether or not to take part in the research, I would like you to take some time to understand the project specifications. You may contact me if you require more information regarding the research.

What is the purpose of the research project?

The primary aim of the project is to gain insight into mental healthcare system in order to develop an android application which allows people to reflect on their mental well-being, nurture themselves and reduce the treatment gap within the system.

The main objectives of the research have been enlisted below:

- To identify five major problems faced by mental health patients by performing research on the existing mental healthcare system.
- To develop an information portal which helps people to get insights into mental health issues and treatments, by ensuring flow of information
- To design a platform which helps people to cope with mental health problems using Cognitive Behavior Therapy (CBT), positive psychology, mindfulness and self-care activities.
- To create a technological platform where certified mental health professionals can connect to patients to monitor their mental state regularly.
- To develop online community which helps in reducing mental health stigma by sharing personal opinions and peer success stories.

What do you have to do?

If you decide to participate, please complete the consent form at the end of this document and forward it to me. You will be asked to participate in a conversation where we will

discuss and brainstorm features to be added in the prototype application and talk about how to accomplish those features. Likewise, you may be asked to provide feedback on whether the mental health treatments and self-care activities incorporated within the project are effective for mental health prevention and self-care.

I would like to inform you that no data allowing your identification, as an individual, will be published however your name will be listed on the human resource list contacted to support the project. You may withdraw your information from the project at any time until it is transcribed for use in the final report, which will be submitted by 12 July, 2021. The recordings and other miscellaneous information provided will be removed upon transcription.

I hope you will support me by participating in my research in order to complete my BSc Computing - Production Project. If you have any further concerns, please don't hesitate to contact me via email or by phone at your convenience. Thank you for your valuable time and consideration.

Consent Form

Project title: Mental Well-being and Self-care using Mobile Application Technology

Researcher's Name: Avhimanhu Sapkota

This consent form has two parts, participant information sheet and confirmation of consent form. Please tick (x) the boxes to confirm you have read and agreed to each point.

N.B. To add the tick inside the box beside each point please copy the tick symbol above and click inside the box then paste the symbol.

1. I have read the Participant Information Sheet and the purpose of the research project has been explained to me	x
2. I have had the opportunity to ask questions and I have received satisfactory answers to all my questions	x
3. I understand the purpose of the research project, my involvement in it and I agree to participate.	x
4. I understand that my participation is voluntary and that I may withdraw from the research at any stage, without giving any reason.	x
5. I understand that information gained during the study may be used to generate effectiveness and may be included in a published report.	x
6. I understand that my personal details will remain confidential and that all data will be anonymized prior to publication	x
7. I agree to the consultation being audio and digitally recorded	x
8. I understand that data will be stored as electronic copies, hardcopies or as audio recordings and will be accessed by the researcher and the supervisor until the submission of the research report.	x

9. I understand that any data, images, videos, or audio recordings captured during this research project will be held securely and will not be used after completion of the research project. [x]

10. I understand that I may contact the researcher (Avhimanhu Sapkota) or supervisor (will be informed soon) if I require further information about the research by emailing, and that I may contact research ethics coordinator of The British College, if I wish to withdraw from the research project to make a complaint relation to my involvement in the research. [x]

I have read the above information. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research project.

Shreeya Giri

Date: 5th June, 2021

Participant's Name: Shreeya Giri

Participant's Profession: Managing Director, Happy Minds.

Researcher's Signature

Contact Details

Researcher: Avhimanhu Sapkota (av.sapkota999@gmail.com, 9860970274)

Program Leader: Rohit Raj Pandey (rpandey@thebritishcollege.edu.np)

Supervisor: Arun Joshi (ajoshi@thebritishcollege.edu.np)

Appendix D

Functional and Non-Functional Requirements with MoSCoW rule applied.

Functional Requirements		
Part A: Application Interface		
Requirement ID	**Description**	**MoSCoW**
A1	**Facilities that will allow users to browse and utilize application features**	
A1-001	An assessment focused on the user to identify their needs on different self-care practices	**M**
A1-002	Customized self-care packages for users based on their assessment results	**M**
A1-003	An information portal where users can browse articles, journals, and videos to get various information on mental health-related topics.	**M**
A1-004	An instant help section that will display simple and easy exercises to cope with different mental issues.	**M**
A1-005	A weekly assessment form to track the mental health state of the user	**M**
A1-006	An SOS button, which will allow users to select people from their contacts, to send a text message when the user presses the button.	**S**
A1-007	List of different habits from which users can select different habits and regular tracking of those habits	**S**
A1-008	A simple assessment to track user's mood every day	**S**
A1-009	A chat community where users can post stories and thoughts and also pass comments on others' stories	**S**
A1-010	Browse a list of therapists along with their personal and contact details	**S**

A1-011	List of events on mental health along with their details	**C**
A1-012	Self-care packages allowing users to track their completion status within each package	**C**
A1-013	Store chat community stories and thoughts to favorites which can be viewed at any time.	**C**
A1-014	A journaling section, with multiple journaling ideas, where users will be asked questions to journal their thoughts efficiently	**C**
A1-015	An option to share the contents of journals with therapists	**C**
A1-016	Browse and read personal journals at any time based on date.	**C**
Part B: User Interface		
Requirement ID	**Description**	**MoSCoW**
B1	**Facilities that will allow the user to register in the application**	
B1-001	A registration form that collects user's information along with terms and condition checkbox	**M**
B1-002	Facility to continue registration using google accounts	**S**
B1-003	Customer's details verification via email confirmation	**S**
B2	**Facilities that will allow the user to login into the application**	
B2-001	The login form will accumulate the customer's username and password once user logs out of the application	**M**
B2-002	An option to log out of the application, once the user is successfully logged in	**M**
B3	**Facilities which will allow the user to perform personal tasks**	
B3-001	View personal profile with personal details, track records, completed packages, therapist information, and journals.	**M**

B3-002	An option to delete the user account from the application	**M**
B3-003	Notification management and integration with mobile functionality	**C**
Part C: Therapists' Interface		
Requirement ID	**Description**	**MoSCoW**
C1	**Facilities that will allow the therapist to manage their profile**	
C1-001	An option to login into the application as a therapist	**M**
C1-002	Manage therapist's profile by editing personal details using the form	**S**
C2	**Facilities that will allow the therapist to enroll, manage and browse patients**	
C2-001	Enroll patient to list of current patients for each particular therapist	**M**
C2-002	View complete profile of each patient showing personal details, track records, and completed packages	**M**
C2-003	Remove a patient from the list of current patients	**M**
C2-004	Browse the list of all patients along with their basic information	**S**
C2-005	Confirm patient's enrollment via email	**S**

Non-Functional Requirements

Requirement ID	**Description**	**MoSCoW**
E1	**The application will fulfill below mentioned non-functional requirements**	
E1-001	Multiple landscapes and portrait designs to maintain the orientation of the application	**M**

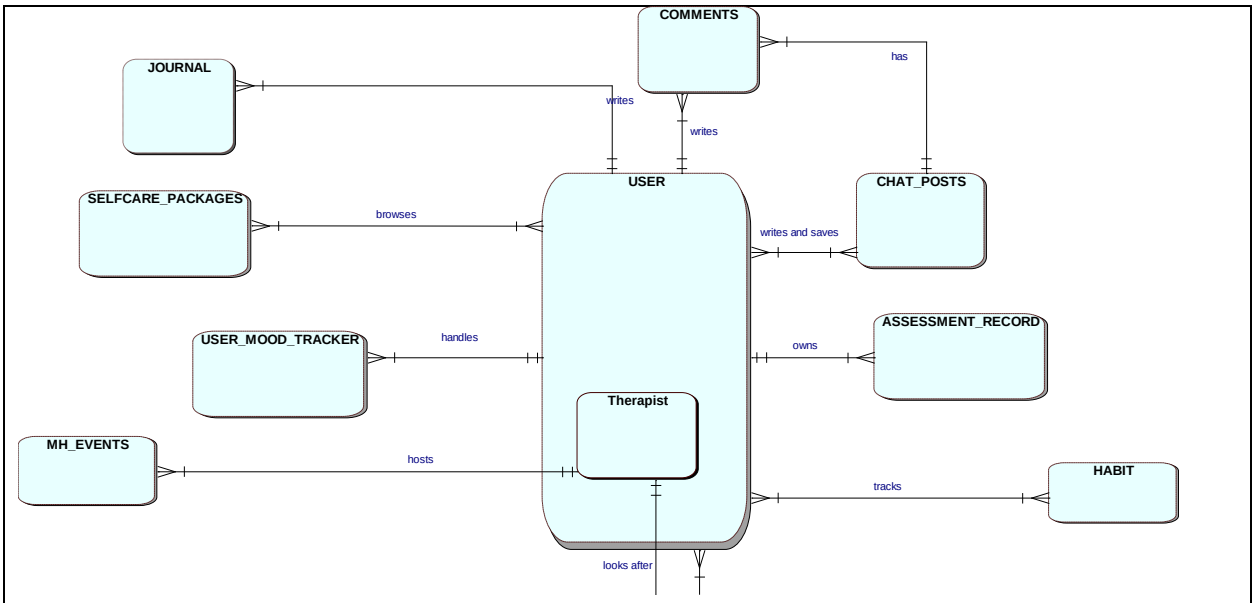
E1-002	A similar template applied throughout the application	**S**
E1-003	A professionally built application for maintainability including organized files and folders, comments, and professional programming techniques.	**C**
E1-004	Alternate user interface designs, like for dark more and color themes will be useful for several situations	**W**

Newly Added Features: Post Requirement Analysis

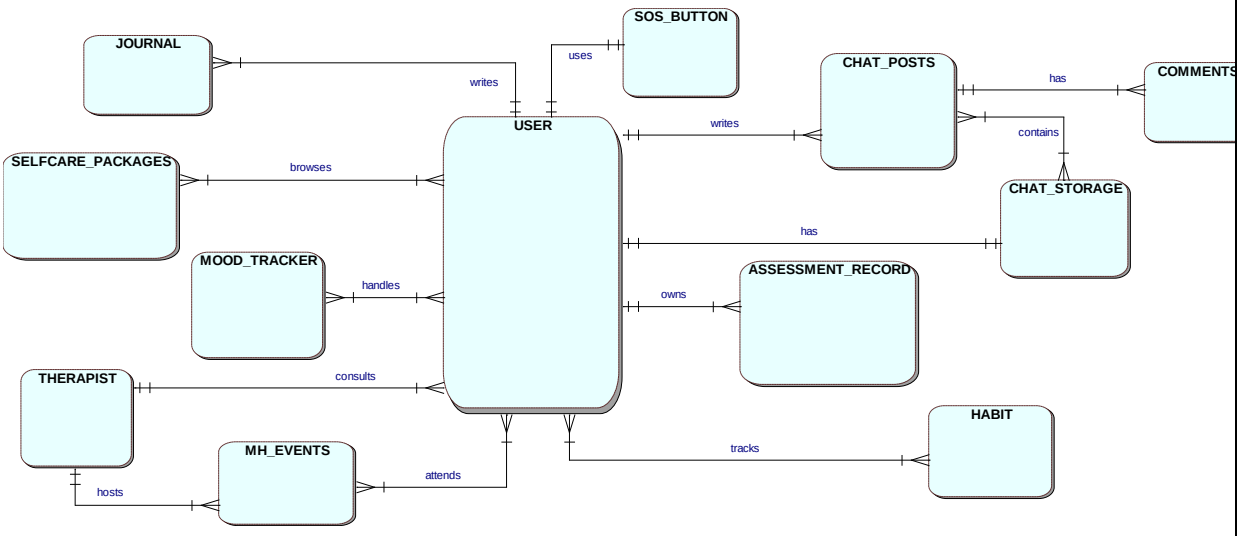
NF-001	Display mental health assessment score to the user and prompt to send SOS message if the score is tentatively low than usual
NF-002	Once the user tracks the mood for the day, display a mood tracker history graph showing mood levels of the past week
NF-003	Only therapist users should be able to add comments on chat posts while everyone should be able to view them.
NF-004	Ask the user to continue anonymously or publicly before continuing to chat community
NF-005	An option to add new mental health events should be available to therapist users

Appendix E

The EERD designed for the prototype product

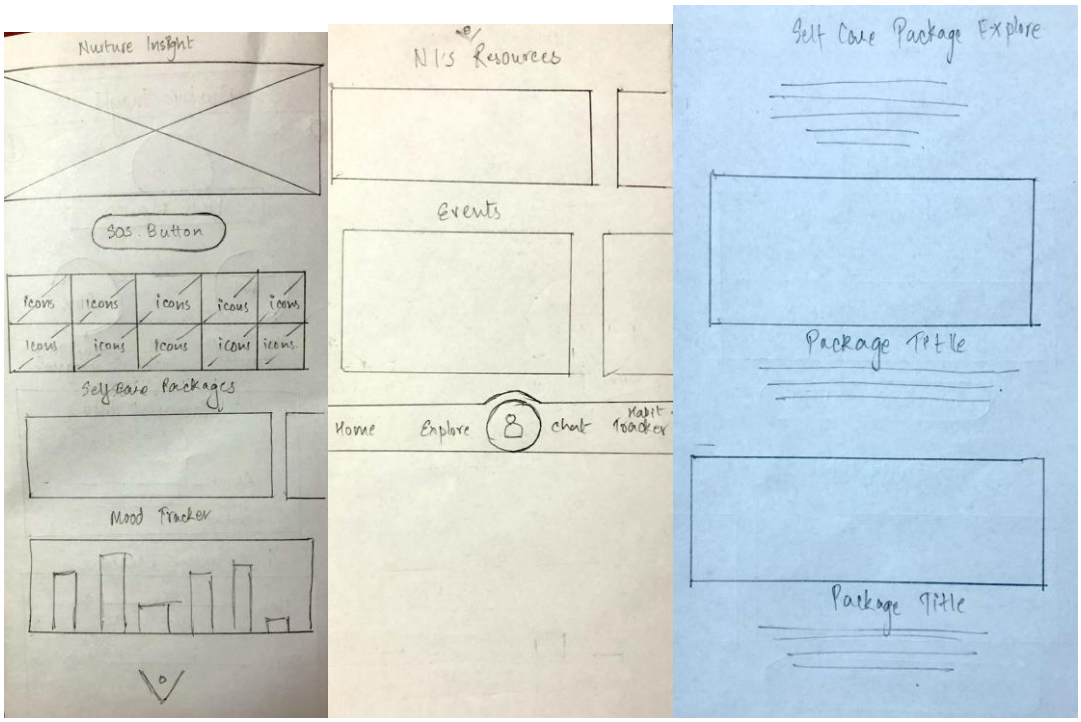


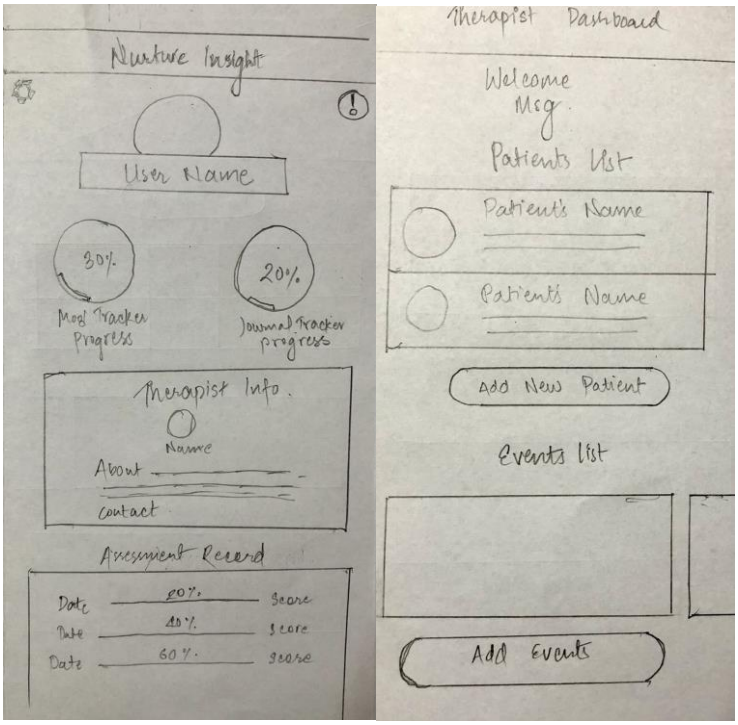
The ERD designed for the prototype product



Appendix F

Prototype's Wireframe – Handmade pictures: Home, Profile, Dashboard and Explore Pages.





Appendix G

Meetings Documentation snapshots which were recorded after each meeting with the supervisor.

School of Computing, Creative Technologies and Engineering 2020/21 **Level 6 Production Project**	
Meeting Record Sheet **Meeting Number: 01**	
Student: Avhimanhu Sapkota	**Student I.D.:** 77202323
Date of Meeting: 19 May, 2021	**Supervisor:** Arun Joshi
Agenda for the meeting (completed or comment):	
1	Project introduction and discussion of project specifications and Initial Project Plan
2	Get suggestions on Report Writing and Research methodologies
3	Discussion of further steps to be taken for the project
4	Get suggestions on application development process and deadlines
5	Discuss on risk register, proposed marking scheme and participation information sheet.
Comments of student (if any): For agenda 5, Is there any limit for risks to be documented? Do we have least limit like at least 5 and at most 10? When is the deadline for risk register and proposed marking scheme?	
Next meeting (date/time)**:** 26 May, 2021 (Yet to be confirmed)	
Agreed Actions to complete before next meeting:	
1	Research for review of literature, review of technologies and come up with ideas to integrate with other applications of the mobile.
2	Download and review Quote Unquote and Little Book of Plagiarism.
3	Complete the participation information sheet and consent form, approve it and send it to other participants.
4	Make changes on Risk Register and complete proposed marking scheme then submit them.

School of Computing, Creative Technologies and Engineering 2020/21 **Level 6 Production Project**	
Meeting Record Sheet **Meeting Number: 02**	
Student: Avhimanhu Sapkota	**Student I.D.:** 77202323
Date of Meeting: 27 May, 2021	**Supervisor:** Arun Joshi
Agenda for the meeting (completed or comment):	
1	Discussion on Research for review of literature and review of technology
2	Get suggestions on Entity Relationship Diagrams and Use Case Diagrams
3	Ask for help to contact the mental health professionals via college
4	Get suggestions on application development process and work in progress presentation details
Comments of student (if any): Discussion on marking scheme, ERD and Use case diagram and some designs of the project was performed in the meeting. Later, suggestions and research areas were suggested by the supervisor.	
Next meeting (date/time)**:** 4 June, 2021 (Yet to be confirmed)	
Agreed Actions to complete before next meeting:	
1	Research on using data from third party application or phone for your application
2	Suggestion on user engaging contents like notifications and graphs for every user, conduct more research on how to perform those.
3	Research on technologies and alert messages techniques to implement in the application.
4	Work on your application prototype and prepare for Work In Progress (happening next week).

School of Computing, Creative Technologies and Engineering 2020/21 **Level 6 Production Project**	
Meeting Record Sheet **Meeting Number: 03**	
Student: Avhimanhu Sapkota	**Student I.D.:** 77202323
Date of Meeting: 6 July, 2021	**Supervisor:** Arun Joshi
Agenda for the meeting (completed or comment):	
1	Application progress demonstration and feedback collection □
2	Academic report discussion and progress presentation □
Comments of student (if any): Discussion on product progress along with minimal demonstration was conducted in order to get feedback from the supervisor. Some sections of report was reviewed by the supervisor.	
Next meeting (date/time)**:** Last meeting before demonstration	
Agreed Actions to complete before next meeting:	
1	Record the meeting and prepare the product for demonstration.
2	Complete the report and email it for further review.

Appendix H

The of User Guidelines which helps user to learn to use the developed prototype application has been added in the Final Portfolio Folder submitted previously. The path for the folder which contains user guidelines:

Avhimanhu_Sapkota_77202323_PP\Project Monitoring and Controlling\User Guidelines\User Guidelines.docx

Appendix I

The Installation Guidelines which help user to learn to run the product in their computer and phones has been added in the Final Portfolio Folder submitted previously. The path for the folder which contains installation guidelines:

Avhimanhu_Sapkota_77202323_PP\Project Monitoring and Controlling\Installation Guidelines\User Installation Guidelines.docx

Appendix J

The Complete codes of the all snapshots added in the implementation section of the report has been added in the Final Portfolio Folder submitted previously. The path for the folder which contains codes:

Avhimanhu_Sapkota_77202323_PP\Project Implementation\Source Code\Android Studio – Java\Nurture_Insight\app\src

The code has been added in the following GitHub link as well:

Avhimanhu-Sapkota/PP_Nurture_Insight (github.com)

12. Acknowledgment

This report is an outcome of the final year production project module conducted within The British College affiliated to Leeds Beckett University. I would like to thank Production Project's module leader Patrick Ingham who designed the module which was beneficial for us to develop our project management, report writing, and software development skills. In addition, this project would not have been possible without the module supervisor Arun Joshi, who has guided me to achieve the best outcome throughout the project. I would like to express my special gratitude to the Managing Director of Happy Minds Health, Nepal, Shreeya Giri for helping me with the psychological techniques which were used in the project to analyze the effectiveness of the developed prototype. Secondly, her feedback on the developed product was valuable to identify the success of the overall project so, thank you for your active participation in my project which encouraged me to finish the product within such a limited time frame. Moreover, I would like to express my thanks to all my fellow scholars who helped me simultaneously during the product development. Finally, I am thankful for all the sources, document writers, and references whose works have helped me to complete the project successfully.