Mobile App Prototype: Telemedicine for Mental Health Care During Pandemic

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Abstract—At the end of 2019, the communicable disease COVID-19 was first detected in the city of Wuhan, China. It affected every country in the world. The Peruvian government announced quarantine and social distancing measures to prevent the spread of the virus. As a result of the measures implemented economic and social well-being of people were affected causing an increase in stress, depression and anxiety, which are emotional disorders that affect mental health. Added to this is the lack of access to mental health services. The objective is to develop a telemedicine mobile application prototype for mental health services based on android. The methodology applied was Rational Unified Process (RUP) methodology because it allows documenting, ordering and structuring software development. The result obtained was a prototype of a telemedicine mobile application with a design and functionalities that make access easy for patients and specialist to mental health services. The quality of the prototype was evaluated through the judgment of experts, who assessed its efficiency, usability and security Obtaining after the calculation, 4.66 average or mean; this indicates that according to the established quality range, the quality of the mobile prototype is high. In conclusion, it was possible to develop an efficient, easy-to-use and safe mobile telehealth prototype that provides a solution facilitating patient access to mental health care services for their emotional, psychological and social well-being.

Keywords—mobile application, COVID-19, emotional, RUP, psychological, mental health, social, telemedicine

1 Introduction

Currently, the infectious disease COVID-19, caused by the new SARS-CoV-2 coronavirus was first detected in Wuhan, China. Since then, the virus has affected global society, including Peru, spreading at an accelerated rate, having a catastrophic effect worldwide [1], [2]. The international community and local governments were forced to implement restrictions and social distancing as measures to minimize the spread of this new coronavirus [3], [4]; as a consequence of these measures implemented, economic

and social activity was affected causing an increase in anxiety, stress and depression in people around the world, as these are effects of emotional disorders that specially affect mental health [5]. Since pandemic, health services were one of the most affected sectors by the demand for medical attention, which prevented patients from receiving suitable care [6]. In addition, the COVID-19 pandemic is an unpredictable condition. As the virus is constantly changing due to a mutation that generates a new viral variant which is potentially contagious and it goes along with a great deal of uncertainty [7]. As a consequence, individuals with pre-existing conditions and poor health status are vulnerable to health sequelae and are associated with an increased risk of poor mental health during pandemic [8]. Therefore, interventions to soften the psychological impact caused by pandemic illness are urgently needed. That it is still unknown whether mindfulness practice can protect against the harmful emotional effects of a pandemic crisis such as the one recently experienced with COVID-19 [9]. Thus, the research work offers the solution to the problem through a mobile telemedicine or telehealth app based on the Android operating system, applying the RUP methodology (since this methodology provides a structured way for visualizing the software development process); By having this type of technology, there is no need to go to the healthcare service providers. Which is very convenient, especially for those people who have a tight schedule or have difficulty moving around easily. It also makes health service more accessible to those who have been unable to access mental health services, including people in emergencies, no matter where they are. Likewise, the study opens doors to new opportunities benefiting all those who require help, consultation or psychological care. It also facilitates access to mental health services without the need to leave home or go to the hospital, clinic or healthcare facility or without the specialist coming to your home. In addition, it helps mental health specialist to provide immediate care to their patients remotely and in real time through video calls for the benefit of the patient's emotional, psychological and social well-being. After analyzing the problem under study, the following question is addressed: To what extent can the mental health treatment of people in times of pandemic be improved?

The objective of the research is to develop a prototype of the Android-based mobile telemedicine application, using RUP methodology; for mental health services for the benefit of emotional, psychological and social health well-being of people in times of pandemic.

In section 2, the article reviews the literature related to the research work, in Section 3, the established methodology is defined, in Section 4, the development of case studies of the research; Section 5, introduces the results achieved with the research; in Section 6, the discussions; and finally, in Section 7, the conclusions and future work.

2 Literature review

In this section, the topic of the mobile application for the mental health service through telemedicine was approached; therefore, different scientific articles related to the research work were investigated, where they provide us with their observations and results achieved.

Authors, Miranda et al. [10], argue that telemedicine helps to solve the problem of limited access to health services, especially in times of pandemic, such as COVID-19. Therefore, their research objective is to develop a telemedicine application based on mobile applications that help people obtain health services under the design method, the cascade model. The results showed a positive response to the telemedicine mobile application by the public to access health service during the pandemic. In this sense, the telemedicine technology through the mobile application allows accessing the health service remotely no matter where they are.

On the other hand, authors Mulgund *et al.* [11] conducted a study with the aim of designing, developing and evaluating a telemedicine platform (mobile application for patients, web application for providers, dash-board for reports and a chatbot) called Ognomy, for patients with sleep apnea. The method applied is the design science methodology. Similarity, to collect information they conducted a brainstorming workshop and interviews with 6 experts for requirements gathering. The results demonstrate the successful application of the telemedicine platform for sleep apnea patients and their providers. Definitely, it is very important to have expert judgement to develop this type of technology, as the authors of the research did.

Likewise, authors Hwang and Jo [12] conducted research for the development of a telemedicine system for therapy and monitoring of patients' eating disorders. To contribute to the solution, they developed vital tools for both patients and caregivers. As a result, a mobile application that updates patients' medical and psychological statuses was developed to access phycological counseling services for patients with emergency and social anxiety. With this type of application, as the authors of the research realized, it is possible to follow up and provide counseling to patients in timely manner, which is very important for their mental well-being.

Similarly, author Hodges, [13] conducted a study with the objective of exploring the creation and development of a mobile health care (telemedicine) application. To do this, he conducted a study of a rural health plan that has low income in southwest Georgia. The telemedicine platform was developed with the purpose of simplifying health care access and medical appointment scheduling electronically between consumers and providers to reduce long term health care costs. Finally, the contributions of the study include the development of methods to reduce the assimilation gap associated with the use of the adopted platform. It is important to highlight that telehealth not only allows access to health services but also reduces the cost of care, which benefits low-income people, as presented by the author in his research.

Authors Lahti et al. [14], argue that in low- and middle-income countries such as South Africa and Zambia, the high prevalence and mental illness of youth is higher than in other high-income countries. They also claim that many professionals lack knowledge of youth depression. Therefore, their aim is to develop a mobile application for mental health assessment to provide youth with access and appropriate health care in South Africa and Zambia. The method applied is the mixed multicenter study design. The result evidences that the mobile app improves the depression care provided to young people in Sothern Africa and Zambia. It is unfortunate that young people have depression problems that damage their mental health, especially in emerging countries. However, the application of telemedicine helps to mitigate this type of problem for the welfare of society.

In addition, authors Ardi et al. [15] state that, during university education, many students experience changes related to their mental health condition. To this is added academic stress, personal-emotional problems, etc. That obstructs their mental health development, to which, COVID-19 pandemic increased changing social life. Therefore, the study aims, to develop and validate an Android-based online psychological assessment mobile application for monitoring students' mental health. Data analysis was performed using Aiken's V coefficient test, confirmatory factor analysis and Rasch model analysis, and ten experts in counseling and software development. The results show that the application effectiveness is very good in mapping students' mental health conditions. However, it is not only enough to map the mental health of university students, but it is also necessary for the telemedicine application to provide real-time support through video calls in order to provide a better solution to the mental health problem.

On the other hand, the authors Rashid Soron and Chowdhury [16] mentioned that in Bangladesh, people do not have easy access to mental health care services due to lack of specialists. Therefore, to solve the problem they designed, developed and implemented "Monerdaktar" a web application and mobile application. For this, they used literature review and observation of mental health service provided in hospitals in Bangladesh. According to the feedback from patients, mental health specialist and IT professionals, they developed the prototype web and mobile application. The result shows, the opportunity to connect remotely health specialist, both psychiatrics and clinical psychologists. In addition, during COVID-19 pandemic, Monerdaktar provided free access to more than 700 patients. Finally, the Monerdaktar app solved the problem of access to mental health care in Bangladesh from anywhere. It is very important to collect and take into account the feedback from patients, psychologists, etc. to develop the app, as the authors did.

According to the author, Johnson [17], the mobile application is important to address the mental health problem, and states that there were few successes in this area. Therefore, the purpose of his research is to design a mobile application to use during mental health crisis, using a user-centered design approach. He developed in three phases: In phase 1, he gathered information; in phase 2, he built a prototype based on the first phase; in phase 3, he conducted testing. The results of phase 1 and 3 analyzed with qualitative and quantitative method. The main finding was that the need for support focuses on crisis awareness. Finally, the construction and operation of the Connections mobile application was conducted guided by the finding. Definitely as the author mentions, currently there is not much success of telemedicine because of little research in this field for mental health.

On the other hand, the authors Islam et al. [18] argue that, crisis caused by COVID-19 pandemic has an alarming effect on mental health in all the affected countries, and state that, attention has not been taken as it should be in developing the digital solution to provide mental health support, especially in Bangladesh. Therefore, the objective of the study was to gather the requirements and develop a digital solution based on a mobile application to provide mental health support to the people of Bangladesh. They developed in three phases: one, gathering the requirements through semi-structured interviews with 37 participants; two, the design and development of the mobile application called 'Muktomon' [open mind] was conducted; finally, the usability and usefulness was evaluated. The results achieved show that the application is usable and useful for

the mental health service during pandemic. Definitely as the author states, the ongoing pandemic has affected and is affecting mental health, and digital solutions have not been developed adequately.

Similarly, authors Callan et al. [19] developed a mobile application called CBT MobileWork, which promotes the practice of CBT skills for the benefit of mental health. For this, they applied a user-centered design method, where 8 depressed patient and 5 therapists participated to carry out the initial development and testing. Then, they conducted an evaluation with 15 patients and their therapists, for completeness. The results show that the application satisfies the patients and therapists, who rated it as very useful during testing. Finally, the CBT MobileEork mobile app has feasibility and benefit patients in their mental health. Definitely, the app not only benefits the patient but also the caregivers by facilitating access, especially in times of pandemic.

In conclusion, the authors propose solutions that allow monitoring the status of patients according to the data collected. In the same way, for online appointment registration, online mental health assessment and psychological counseling. Above all, it facilitates access to mental health services. However, on the above-mentioned solutions, the function of the applications is not for real-time patient monitoring by specialists. This research will enable the implementation of a mobile telemedicine application based on real-time monitoring for the well-being of people's mental health.

3 Methodology

This section will focus on defining the steps or phases of RUP methodology and the development tools that allowed the development of the prototype mobile application that provides society with a solution to the problem of lack of access to mental health services during the COVID-19 pandemic.

3.1 RUP Methodology

RUP is a software development methodology, focused on object-oriented, used to carry out projects efficiently and develop quality software. According to the authors [20] RUP is an iterative and incremental software development method based on the architecture, and in turn, during the software development involves the customer, to achieve the result according to the customer's wishes. It is distributed in 4 phases which are, Inception, Elaboration, Construction and Transition. Figure 1 shows the process flow of the RUP methodology.

Inception. In this first phase, the scope of the project is defined and focused on the business model and its requirements. Likewise, the initial risks associated with the project are identified, and the general vision of the software architecture is detailed, as well as the subsequent iterations.

Elaboration. In this second phase, the selection of use cases that help or allow the definition of the system's base architecture is carried out. In the same way, the specification of each of the selected cases and the analysis model of the system is carried out.

Construction. In this third phase, the development team carries out the construction of the system through a series of iterations, for which some System Use Cases

are selected. The design is made and its implementation is carried out, and then the respective tests are performed for the transition stage.

Transition. In this last phase, it is ensured to guarantee that the product is available and well prepared to be delivered to the final user. For this, the adjustment of errors and defects found during the testing stage is performed.

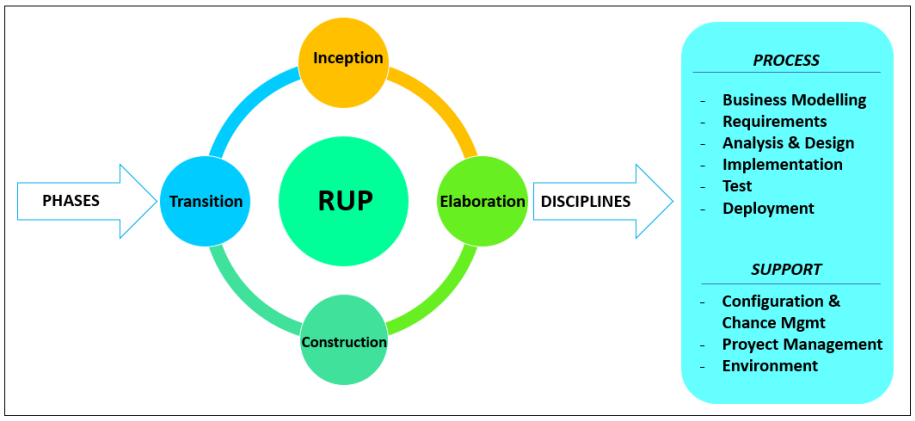


Fig. 1. RUP methodology flow

3.2 Development tools

This section defined all the tools used to develop the prototype of the mobile telemedicine application to provide mental health services to people.

Star UML. It is a tool to visual software modeling that allows the creation of Unified Modeling Language (UML) diagrams. According to the author [21], it is a software that describes the UML, with which you can create processes or flows such as use case diagrams, etc. to understand the system model.

Figma. It is a cloud-based design tool, i.e., an online tool; which serves to design user interfaces collaboratively in real time. According to the authors [22] it is a vector graphics editor and a web-based prototyping tool.

Android studio IDE. It is an official IDE for developing Android OS mobile applications; which is specially designed to speed up development and help create high quality applications. According to the author [23] Android Studio IDE provides tools for creating apps for any Android device; it includes code editing, debugging, and flexible compilation for creating and quality apps.

Kotlin. It is a programming language officially annealed by Google for Android app development; it supports object-oriented and functional programming for mobile application development. It allows less code to be written and is compatible with Java. According to the authors [24] it is a new programming language, as an alternative to Java and is oriented to Java Virtual Machine (JVM), it is able to solve already known limitations of Java language.

Firebase. It is a cloud-based platform for creating mobile and web applications, seeking to make the development of applications for mobile and web devices faster, without sacrificing the quality of the app. According to the author [25] Firebase is a platform for the development of mobile and web applications that includes tools and infrastructure with which developers can create high quality applications.

MySQL. MySQL is a relational database management system, based on structured query language (SQL) and client-server model. It is very fast, uses several layers of security and is cross-platform. Above all, as the author states [26] MySQL is simple to configure and easy to use.

4 Case study

In this section, the selection and development of each of the phases of the selected methodology was carried out.

4.1 Comparison of methodology

This section introduces the evaluation of the methodologies between RUP, Mobile-D and Test-Driven Development (TDD) to determine which one is the most suitable for developing the proposed mobile application prototype. The evaluation was performed on a scale of 1 to 5. Where, 1 indicates that the methodology in terms of the evaluative condition is not suitable for developing the prototype, and 5 indicates favorable for the development of the project. As can be seen in Table 1, the RUP methodology has a total score of 23, the Mobile-D methodology has a score of 16 and the TDD methodology has a score of 17. In conclusion, from the results obtained, we can say that the RUP methodology is the most suitable for developing the proposed mobile application, since it has a higher score than all the methodologies evaluated.

Table 1. Comparison of methodologies

Evaluative Condition	**Methodology**		
	RUP	**Mobile-D**	**TDD**
	Score	**Score**	**Score**
Available budget	3	4	2
Project size	5	3	4
Limited delivery times	2	2	3
Need for documentation	5	2	3
Personnel required	5	2	2
Adaptability and response to changes	3	3	3
Total Score	**23**	**16**	**17**

Next, each of the phases of the methodology selected through the evaluation is developed.

4.2 Inception

Business modeling. In this section the abstract description of the business was made to understand the processes to develop the mobile telemedicine application.

Business use cases. This section introduces the business use diagram. As shown in Figure 2, the interaction of the actors (Patient, Assistant and Mental Health Specialist) with the business use case is visualized in a general way.

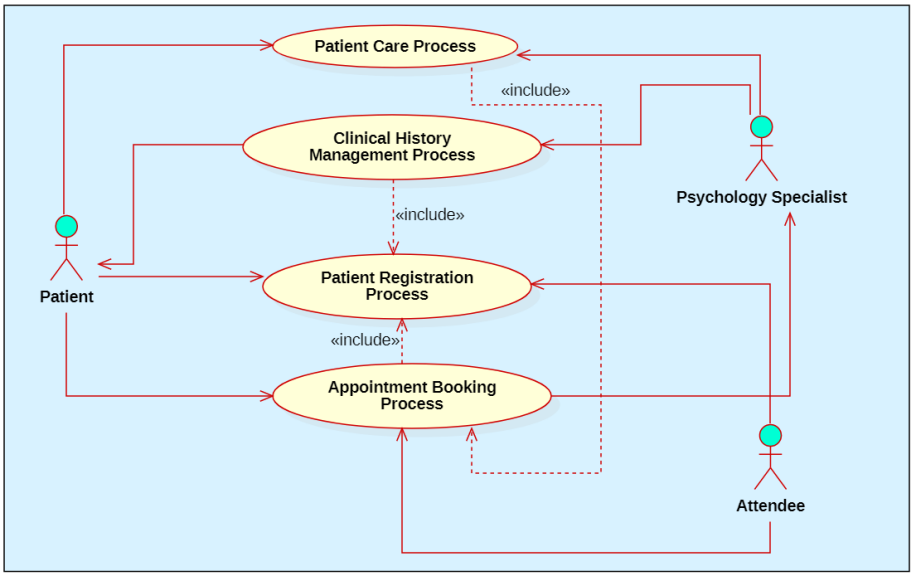


Fig. 2. General diagram of business use cases

Business activity diagram. This section presents the business activity flow diagram. As shown in Figure 3, it visualizes the flow of activities performed by the patient, Assistance and Mental Health Specialist, from appointment booking to completion of patient care.

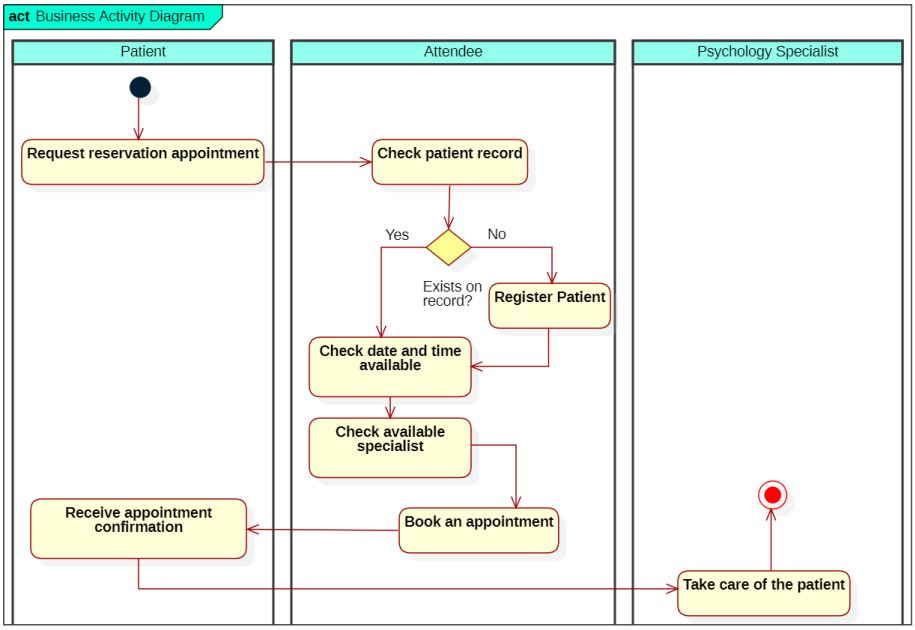


Fig. 3. Business activity diagram

Requirements capture. In this section the identification of the system's functional and non-functional requirements was performed.

Functional requirement. This section shows the functional requirements of the system, which define the function of the mobile application. As shown in the Table 2, sixteen identified functional requirements are shown, with their respective use cases and priority.

Table 2. Functional requirement

ID	Functional Requirement	Case of Use	Priority
RF1	Allow the user to authenticate.	Authentication	High
RF2	Allow to create new account.	Create Account	High
RF3	Allow to confirm the authenticity of the user when creating the new account.	Confirm Registration	High
RF4	Allow managing the profile (edit or update and delete).	Manage Profile	High
RF5	Allow to see the profile of the specialist in psychology.	See Specialist Profile	Medium
RF6	Allow managing the patient's clinical history.	Manage Clinical History	Medium
RF7	Allow sending messages via chat (text, files and audio).	Send Message	High
RF8	Allow start video call.	Start Video Call	High
RF9	Allow to register appointment reservation.	Book Appointment	High
RF10	Allow entering data for appointment booking.	Enter Patient Data	High
RF11	Allow selecting the available date for appointment reservation.	Select Date	High
RF12	Allow selecting the time available for appointment booking.	Select Time	High
RF13	Allow to cancel the appointment reservation.	Cancel Medical Appointment	High
RF14	Allow selecting the specialist in psychology to book an appointment.	Select Specialist	High
RF15	Allow to search for the specialist in psychology.	Find a Specialist	High
RF16	Allow the psychology specialist to be shown in the list.	List Specialist	High

Non-functional requirement. This section presents the non-functional requirements of the system. As shown in Table 3, ten non-functional requirements were identified, with their respective priorities. For this purpose, they are classified into three types: efficiency, security and usability.

Table 3. Non-functional requirement

Classification	ID	Description	Priority
Effectiveness	RNF1	The response time of the request must not exceed 3 seconds.	High
	RNF2	The video call connection should not generate slowness when connecting.	High
	RNF3	The application to be easy to run.	Medium
Security	RNF4	The application must keep the stored data safe and secure.	High
	RNF5	The app must not display ads.	High
	RNF6	Access to the application must be only for registered users.	High
Usability	RNF7	The application must be easy to use.	Medium
	RNF8	The application requires use of camera and audio.	High
	RNF9	The application interface must be friendly and intuitive and of quality.	Medium
	RNF10	The application must provide contact information for the clinic.	Medium

4.3 Elaboration

System use case diagram. This section presents the system use case diagram. As shown in Figure 4, the interaction of the system actors (Users) with each of the system use cases is visualized. The patient actor is the person who requires help or performs a mental consultation for emotional, psychological and social well-being, and the Specialist actor is the person who provides care to the patient.

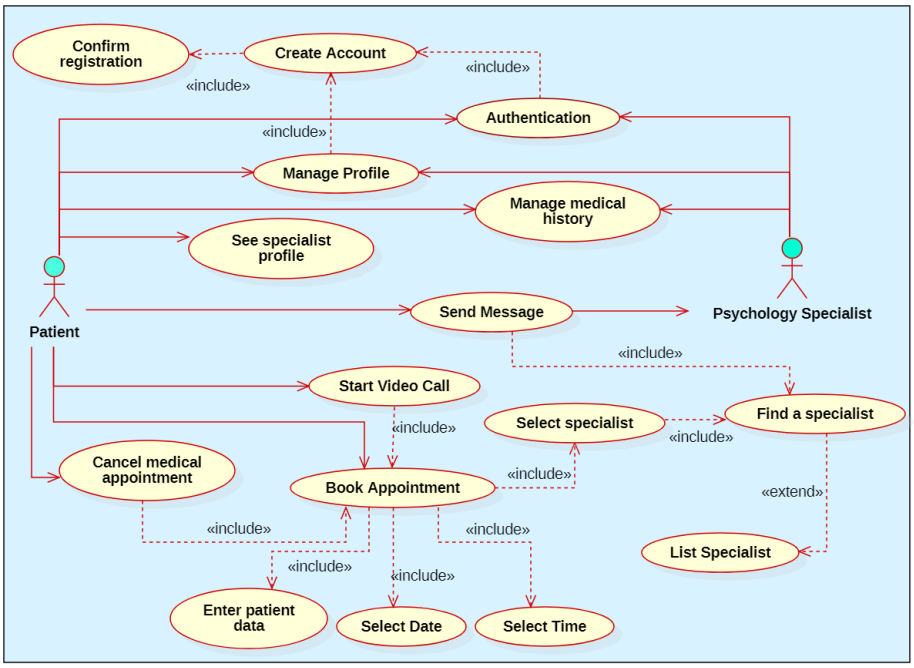


Fig. 4. General diagram of system use cases

System activity diagram. This section presents the flow diagram of the video calls through the mobile application; as shown in Figure 5, which illustrates the flow of activities performed by the patient, the mental health specialist and the mobile application, for the mental health care of the patient, from the beginning to the end of the video call.

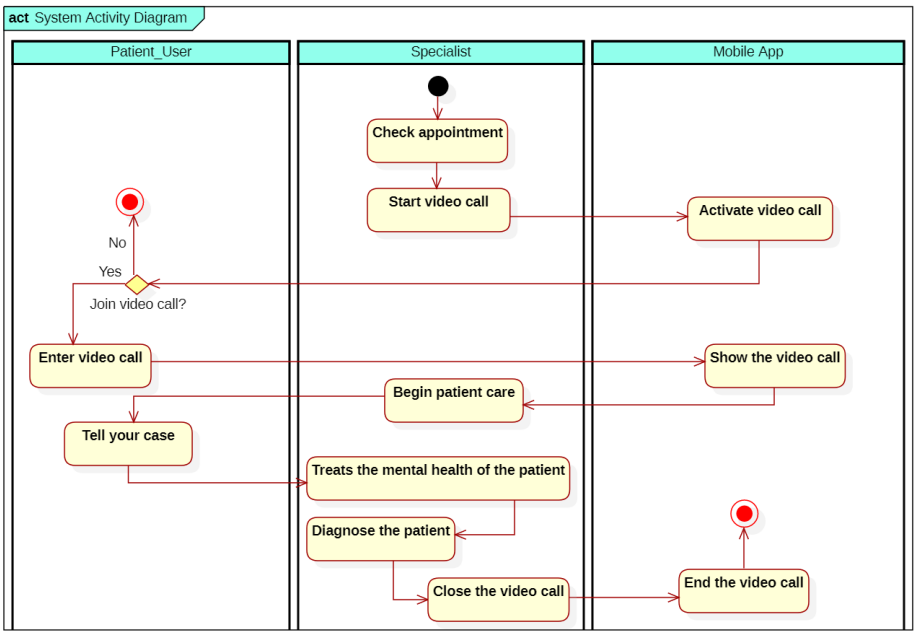


Fig. 5. System activity diagram – video call

4.4 Construction

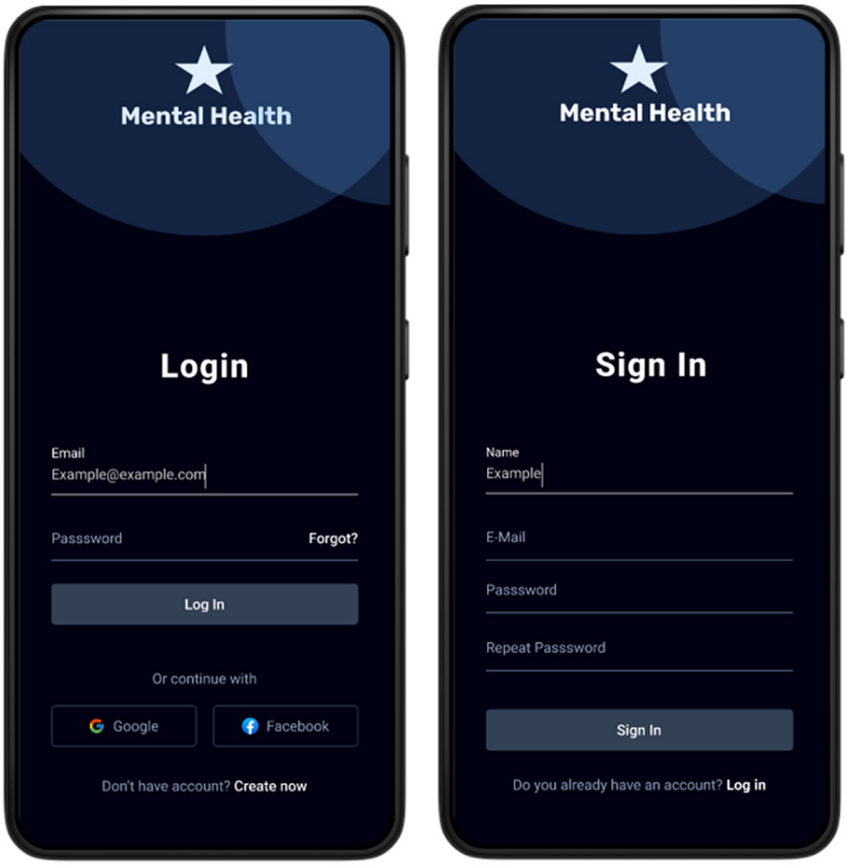
Mobile application prototype. In this section the prototype of the mobile application was built as shown in the following figures:

As shown in Figure 6a, the login prototype is illustrated, where the user (patient) can log in by entering their email and password. They can also log in with Google or Facebook accounts. Figure 6b shows the prototype of creating a new account (registration), entering the requested data and verifying authenticity with a code sent to the e-mail address provided at the time of registration. Since to enter the mental health service it is necessary to log in and have a registered account.

As shown in Figure 7, the prototype of the main menu is displayed, which makes it easier for the user to access his or her registered appointments or to be aware of pending or upcoming appointments, since the main menu shows the user's pending appointments. In the same way, it shows the list of the most prominent specialists, which facilitates the booking of their appointments.

Similarly, as shown in Figure 8a, the list of mental health specialists and the search prototype are displayed, allowing the patient to search for the specialist of his choice by entering his name in the search engine. It also allows the patient to save the appointment reservation. Figure 8b shows the prototype appointment card, where the patient can enter his or her data, the date and time available to the specialist, and save.

Figure 8c shows the prototype of the registered appointment list, where the patient can filter the pending appointments (There are more than two pending appointments) by entering the date in the search box. Likewise, join the video call according to the time and date scheduled in your appointment booking with the mental health specialist of your choice, or cancel the appointment, if desired.



(a) **(b)**

Fig. 6. Login and create a new account

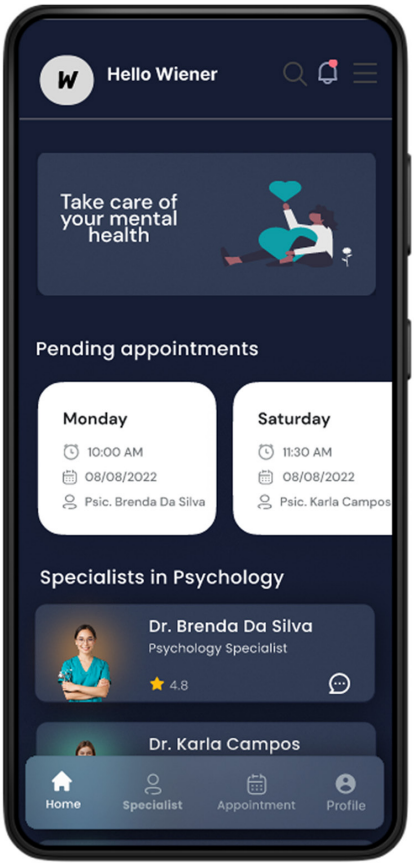
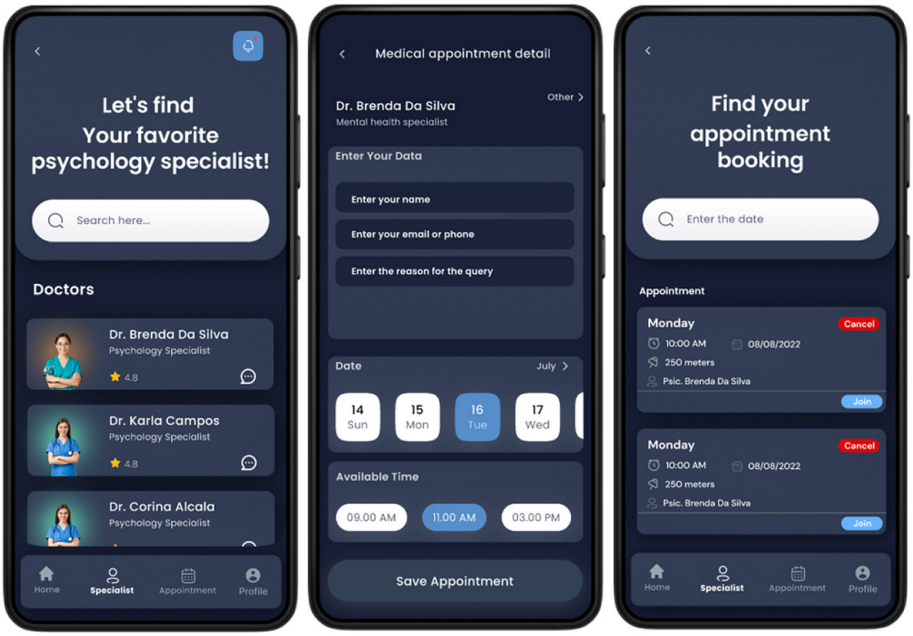


Fig. 7. Main menu prototype



(a) **(b)** **(c)**

Fig. 8. List and search specialist, record appointment reservation, saved appointment reservation list

As shown in Figure 9a, the video call prototype is visualized, since by this means the specialist can attend the patient's consultations live and in real time about his or her mental health for the benefit of the patient's emotional, psychological and social well-being; therefore, it is very important to initiate a video call to treat or provide care to the patient. Likewise, as shown in Figure 9b, the chat prototype is visualized, where the specialist and the patient interact through the use of text message, audio, etc.

(a) **(b)**

Fig. 9. Video call and chat prototype

5 Results

5.1 About prototypes

A prototype of a mobile telemedicine application for mental health services based on the Android operating system was developed to work in mental health care organizations (hospitals, clinics, etc.). As shown in Figures 6, 7, 8 and 9, the prototype has functionalities for logging in, creating a new account, searching for mental health

specialists, and registering a consultation or booking a medical appointment electronically or online. It also has video calls and chats that make it easier for specialists to treat patients remotely and in real time for the benefit of mental health wellness. Likewise, it has functionalities designed so that users (patients) can visualize their data or medical records. In addition, communicate with the mental and emotional health specialists of your choice. Above all, it reduces the cost of care and improves access to mental health services.

5.2 About the people survey

A total of 60 people were surveyed online to learn about the mental health services received since the start of the COVID-19 pandemic and their perception of the mobile telemedicine application; six questions were asked for the survey (see Table 4) with response options based on the Likert scale: 1 (Never), 2 (Almost never), 3 (Sometimes), 4 (Almost always) and 5 (Always). The validation of the survey instrument was carried out by five experts, obtaining an average result of 80%. For the survey to be valid, it must have an average score above 75%, thus fulfilling the validation by content, evaluating the criteria of clarity, relevance and coherence, and responding with a Likert-type scale from 1 to 5; where 1 is equal to 20% and 5 is equal to 100%.

Table 4. Questions raised

ID	Questions
Q1	Have you received mental health services in-person since COVID-19 pandemic started?
Q2	You have little time and difficulty getting to the mental health care center.
Q3	Would you receive mental health services through the mobile telemedicine application?
Q4	Do mental health services through the telemedicine mobile app impact your safety?
Q5	Does the mobile telemedicine application improve access to mental health services?
Q6	Is consultation via telemedicine mobile app an acceptable way to receive mental health care?

According to the results obtained as shown in Figure 10, in question Q1, 100% of the respondents indicated that they never received mental health service since the COVID-19 pandemic began. Likewise, in question Q2, 73% (44 of the 60 respondents) indicated that they always have tight time and difficulties to travel to the mental health service center. Similarly, in question Q3, 50% (30 of the 60 respondents) indicated that they would always receive mental and emotional health service through the mobile telemedicine application. Furthermore, in question Q5, 52% (31 of the 60 respondents) indicated that almost always the mobile application improves access to mental health services.

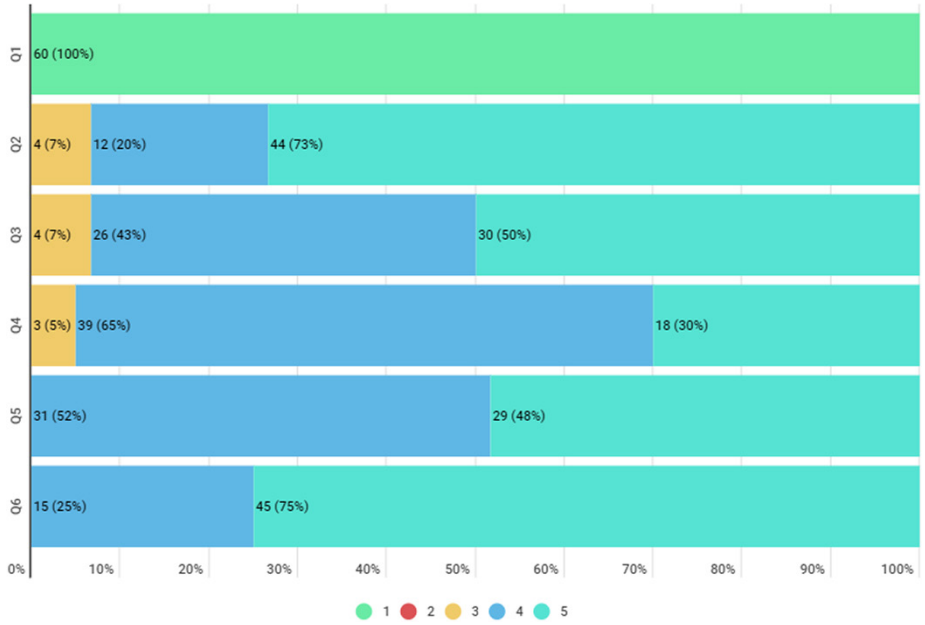


Fig. 10. People survey result

5.3 Validation by expert judgment

This section presents the results of the evaluation of the quality of the mobile application prototype, validated by ten experts in the design and construction of health-oriented mobile applications. The evaluation criteria are the following: efficiency, usability and security. The questions to validate the quality of the prototype were based on a Likert scale, with the following response options: 1 (very low), 2 (low), 3 (regular), 4 (high) and 5 (very high); Table 5 shows the result of the validation by the experts, as well as the evaluation questions used for each criterion; likewise, the level of quality, achieved from the calculations obtained by the mean and standard deviation (S. D.) of each question; From the results of the validation by the experts, the quality level was calculated as follows: 1 (very low), 2 (low), 3 (regular), 4 (high) and 5 (very high); Table 4 shows the result of the validation by the experts, as well as the evaluation questions used for each criterion of each question; according to the average, the quality level of the prototype of the mobile application was rated, with a scale ranging from 0.00 to 2.00 (Low), 2.01 to 4.00 (Medium), and 4.01 to 5.00 (High). According to the results, a total mean of 4.66 with a standard deviation of 0.465 was obtained, which means that the level of quality that includes the criteria of efficiency, usability and security of the mobile application is high.

Table 5. Validation results by experts

Criterion	Questions	Mean	S. D	Quality
Efficiency	The app is compatible with older and newer versions of Android.	5.00	.000	High
	The app is compatible with old and new versions of Android.	4.60	.516	High
	Video call quality without interruptions.	4.60	.516	High
	Improved access to mental and emotional health services.	4.80	.422	High
Usability	The app is easy to use.	4.80	.422	High
	The app's interfaces are user-friendly and intuitive.	4.80	.422	High
	The app interfaces are of excellent quality.	4.40	.516	High
	The app has settings to change theme, font type and font size in case of visual impairment of the patient.	4.50	.527	High
Security	It has authentication mechanism and user session control.	4.80	.422	High
	The video call and chat are end-to-end encrypted.	4.40	.526	High
	The app keeps stored data safe and secure	4.70	.483	High
	Stored user data is manipulated only by the user owner.	4.80	.422	High
Average and total standard deviation of quality level		**4.66**	**.465**	**High**

6 Discussions

The methodology used in the research to develop the telemedicine mobile application prototype is the RUP methodology. However, the methodology used in the authors' research [10] is different from ours, since they used the waterfall methodology to develop their prototypes. Regarding the evaluation of the prototype, in our research it was performed through validation by expert judgment who evaluated the prototype according to their knowledge in the design and development of the mobile application, which was then rated the level of quality with a scale: low, medium and high according to the average obtained after the calculation of each question that composes the evaluation criteria. Meanwhile, the authors [19] conducted the evaluation of the prototype with 15 patients and their therapists, who rated whether the prototype met their expectations according to the function tests of the app. Regarding the prototype, the authors [15] developed a mobile app for online psychological assessment and monitoring the mental health of college students. Meanwhile, our prototype of the mobile application is focused for all people, which, at the same time, facilitates mental health specialists to provide care via video call to people who require help for the welfare of their mental and emotional health.

Although it is true, the research carried out is at the technical level of the prototype. However, from a general point of view, psychological factors such as lack of affection can directly affect mental health. In addition, the biological factor represents a significant aspect of mental health, since bad life experiences, inadequate lifestyle, and family history of mental health problems, among others, can negatively affect mental health, harming the person's health.

7 Conclusion and future work

In conclusion, this research has succeeded in developing a prototype of a mobile telemedicine application to provide mental services; for the emotional, psychological and social well-being of people. A prototype of quality, efficient, easy to use and safe; to provide care to people who require help. For the benefit of their mental health and well-being. The development of the prototype has contributed to the mental health of people in Peruvian society, facilitating remote access to services without leaving home and no matter where you are in difficult times such as the COVID-19 pandemic. This forced them to maintain social distancing, which made it difficult to travel to mental health care centers. To achieve the purpose, the RUP methodology; was of Vital importance as it allowed to efficiently document and develop the prototype of the mobile application.

One of the limitations encountered during the development of the prototype are the risks related to the use of data and the security of information, privacy and confidentiality of users. Similarly, the hardware imposes restrictions, since the design of the mobile application must be compatible with a wide range of high-end, mid-range and low-end mobile devices.

In future work, it is suggested to complement this project with emerging technologies, such as artificial intelligence, to support the diagnosis of the patient's mental state. Similarly, to develop the proposed mobile application for mobile devices with the IOS operating system.

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