



UNIVERSITY OF THESSALY
SCHOOL OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Consulting mobile chat app

Diploma Thesis

Dimitrios Tozakidis

Supervisor: Eleni Tousidou

September 2023



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ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ

ΠΟΛΥΤΕΧΝΙΚΗ ΣΧΟΛΗ

ΤΜΗΜΑ ΗΛΕΚΤΡΟΛΟΓΩΝ ΜΗΧΑΝΙΚΩΝ ΚΑΙ ΜΗΧΑΝΙΚΩΝ ΥΠΟΛΟΓΙΣΤΩΝ

**Συμβουλευτική εφαρμογή συνομιλίας μέσω κινητού
τηλεφώνου**

Διπλωματική Εργασία

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Abstract

This thesis focuses on the development of a mobile application to address various challenges individuals face by leveraging personal life experiences. The scientific area of this study lies at the intersection of technology, human interaction, and problem-solving. The purpose is to create a platform that allows users to seek help, receive guidance, and find solutions to their specific problems. The thesis examines existing solutions. A comprehensive analysis of the strengths and limitations of these approaches is conducted. Then, related work in the field is presented, exploring similar applications and their effectiveness. It delves into the tools utilized to develop the proposed mobile application. The logical structure of the application is carefully analyzed, highlighting key components that facilitate problem-solving and effective communication. Then it focuses on the practical usage of the application. The core functionality is described, featuring a feed of topics submitted by users seeking assistance. Users with relevant experience and willingness to help can engage in one-to-one conversations. The implementation details and user interface considerations are discussed to ensure a seamless user experience. The main results of this thesis include the development of a mobile application that promotes effective problem-solving by leveraging personal life experiences. By enabling one-to-one interactions, users can receive personalized guidance tailored to their unique challenges. The application fosters a sense of community, connecting individuals with shared experiences. Finally, the thesis concludes by summarizing the findings and discussing the implications of the developed mobile application. It emphasizes the importance of incorporating personal experiences to enhance problem-solving processes and highlights the potential for further improvements and future updates. Overall, this research presents a mobile application that provides a platform to seek help and find solutions to their problems. It showcases the potential for technology to foster collaboration and enhance the quality of life for individuals.

Διπλωματική Εργασία

Συμβουλευτική εφαρμογή συνομιλίας μέσω κινητού τηλεφώνου

Δημήτριος Τοζακίδης

Περίληψη

Αυτή η διατριβή επικεντρώνεται στην ανάπτυξη μιας κινητής εφαρμογής για την αντιμετώπιση διαφόρων προκλήσεων που αντιμετωπίζουν οι άνθρωποι, εκμεταλλευόμενοι τις προσωπικές τους εμπειρίες. Ο επιστημονικός τομέας αυτής της μελέτης βρίσκεται στο σημείο τομής της τεχνολογίας, της ανθρώπινης αλληλεπίδρασης και της επίλυσης προβλημάτων. Ο σκοπός είναι να δημιουργηθεί μια πλατφόρμα που επιτρέπει στους χρήστες να ζητήσουν βοήθεια, να λάβουν καθοδήγηση και να βρουν λύσεις στα συγκεκριμένα προβλήματά τους. Η διατριβή ξεκινά με την εξέταση των υπαρχόντων λύσεων. Διενεργείται μια περιεκτική ανάλυση των δυνατοτήτων και περιορισμών αυτών των προσεγγίσεων. Στην συνέχεια, παρουσιάζεται σχετικό έργο στον τομέα, εξερευνώντας παρόμοιες εφαρμογές και την αποτελεσματικότητά τους. Εξετάζονται τα εργαλεία που χρησιμοποιούνται για την ανάπτυξη της προτεινόμενης κινητής εφαρμογής. Η λογική δομή της εφαρμογής αναλύεται προσεκτικά, τονίζοντας τα βασικά στοιχεία που διευκολύνουν την επίλυση προβλημάτων και την αποτελεσματική επικοινωνία. Στη συνέχεια επικεντρώνεται στην πρακτική χρήση της εφαρμογής. Περιγράφεται η κύρια λειτουργικότητα, παρουσιάζοντας μια ροή θεμάτων που υποβάλλονται από χρήστες που αναζητούν βοήθεια. Οι χρήστες με σχετική εμπειρία και προθυμία να βοηθήσουν μπορούν να συμμετέχουν σε μονομερείς συνομιλίες. Συζητούνται οι λεπτομέρειες υλοποίησης και οι σκέψεις σχετικά με τη διεπαφή χρήστη, προκειμένου να διασφαλιστεί μια ομαλή εμπειρία χρήστη. Τα κύρια αποτελέσματα αυτής της διατριβής περιλαμβάνουν την ανάπτυξη μιας εφαρμογής που προωθεί την αποτελεσματική επίλυση προβλημάτων με τη χρήση προσωπικών εμπειριών. Με τη δυνατότητα μονομερών αλληλεπιδράσεων, οι χρήστες μπορούν να λάβουν προσωποποιημένη καθοδήγηση προσαρμοσμένη στα μοναδικά τους προβλήματα. Η εφαρμογή προάγει το αίσθημα κοινωνικότητας, συνδέοντας ανθρώπους με κοινές εμπειρίες. Στο τέλος, η διατριβή ολοκληρώνεται με τη σύνοψη των ευρημάτων και τη συζήτηση των προβλημάτων της ανάπτυξης της εφαρμογής. Τονίζεται η σημασία της ενσωμάτωσης προσωπικών εμπειριών για την ενίσχυση των διαδικασιών επίλυσης προβλημάτων και επισημαίνεται η δυνατότητα για περαιτέρω βελτιώσεις και μελλοντικές ενημερώσεις.

Συνολικά, αυτή η έρευνα παρουσιάζει μια εφαρμογή που παρέχει μια πλατφόρμα για την αναζήτηση βοήθειας και την εύρεση λύσεων σε προβλήματα. Αποδεικνύει την δυνατότητα της τεχνολογίας να προωθεί τη συνεργασία και να ενισχύει την ποιότητα ζωής των ατόμων.

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Chapter 1

Introduction

The existence of technology is driven by a multitude of reasons, stemming from human needs, aspirations, and the desire to improve various aspects of life. One of the main reasons of its existence is to improve the quality of life. Technology plays a significant role in enhancing the quality of life for individuals and communities. It provides access to better healthcare, education, transportation, entertainment, and communication. From medical advancements to the Internet, technology has transformed and improved numerous aspects of daily life. Enhancing communication and connectivity while advancing knowledge and research can improve spectacularly human well-being. Technology enables people to connect and communicate across vast distances. From telephones and email to social media and video conferencing, technology has revolutionized the way we interact and share information, fostering global connectivity and collaboration. Moreover it facilitates scientific research, exploration, and discovery. Powerful computing systems, data analysis tools, and sophisticated instruments enable researchers to collect, analyze, and interpret vast amounts of data, leading to new insights and advancements in various fields. The goal of this thesis is intertwined with this ideology.

1.1 Subject of the thesis

The subject of this thesis is to help people with any problems or challenges that they may face. There are many ways to solve our problems. Some times we just don't have enough experience on a topic or we just lack expertise. We may had a bad day, needed help with cooking or just don't know how to use our computer. Of course there are many videos on

Youtube with tutorials of how to use a feature of our computer, how to cook and how to exercise to regain confidence. Moreover there are many subreddits (famous social media) where people can share their thoughts and give their own advise to someone's issue. Finally with the new app Wysa people can enjoy mental health support and emotional well-being assistance by a chatbot that combines artificial intelligence (AI) and empathetic techniques. All these apps are great but each one of them lacks something important. Youtube provides little to no interaction between the helper and the person that in need. Subreddit has a forum format so there is limited one to one communication. Finally with Wysa, despite being a great technological achievement, is just a chatbot without any personal life experience.

To solve these imperfections the application presented in this thesis relies on exactly this, personal life experience. Mobile phones nowadays are the extend of our hands. So the idea is to make a mobile application where people can find answers and seek help on any issues they face. The core functionality of the application is a feed of many topics that have specific tags. The topics can be created by users who face a problem and need some help to deal with that problem. All the users can view all posted topics, and regarding their experience on a specific issue and the good will to help, can give answers to the editor of the topic. Finally a one to one conversation between the two users that can hold until the problem is solved.

1.2 Organization of the thesis

Related work about the subject of the thesis is presented in the second chapter. In the fourth chapter we are looking into the tools of the thesis. Then we analyze the logic behind of the application and afterwards more specifically it's usage, in chapter five. Finally, in the last chapter, we conclude the thesis and we quote some of ideas for potential future updates.

Chapter 2

Related work

2.1 Subreddits

Subreddits are a core part of the Reddit social media platform, playing a pivotal role to a ecosystem of online communities that focus on specific interests, topics, and conversations. Reddit is one of the largest online platforms, with millions of active users. Subreddits, in turn, play a central role to provide a great social media experience.

Essentially, Reddit works as a user driven platform where users are the main creators for the content, they can communicate in discussions and share links that are get checked by the platform. Subreddits, as we can see in Figure 2.1, are a small universes inside a larger ecosystem, that provides centralized forums for users to connect with people who share their ideas, passions and the same areas of interest. By subscribing to a specific subreddits, users can choose their own Reddit journey, by selecting the content that match better on their interests.

Each subreddit works autonomously, by his own set of rules that are set by moderators, who are volunteers that have to maintain a specific subreddit and provide a positive experience for all the subreddit users. Moderators play a central role not only to select the content but also to monitor any dispute on discussions inside their communities. They have the right to remove spam, report and ban users in order to create a safe and non toxic environment for users.

A subreddit's popularity depends on user activity and the quality of content that users share. The most liked posts will be promoted and moved to the subreddit feed, while posts that get the most reports and downvotes will be at the bottom of the feed. This voting system

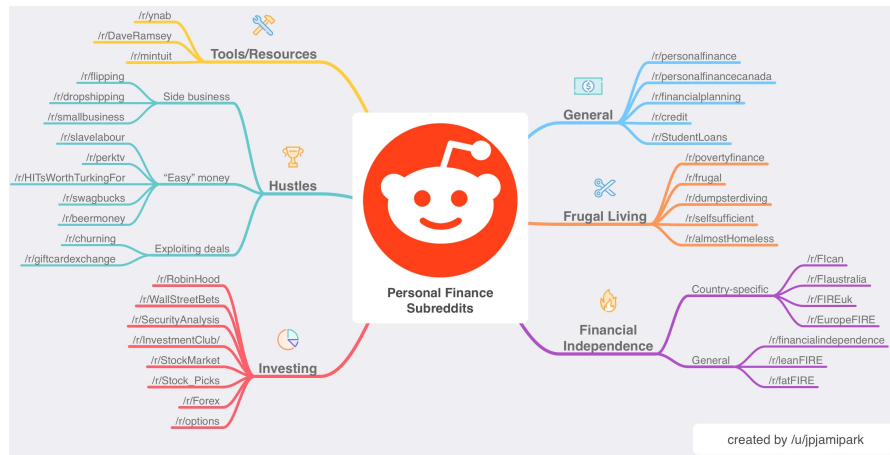


Figure 2.1: Famous subreddits in different categories

and also the comments option, upgrade the experience making it more friendly for the users.

Subreddits also works perfectly as a platform to search for information and read the news. Many subreddits has to with current events, providing users with the opportunity to debate and communicate by exchanging personal views on specific topics. The amount of different opinions and backgrounds inside these communities can provide a more correct and good understanding of complex issues.

In addition to discussions, the subreddits sometimes host “Ask Me Anything” (AMA) sessions, celebrities and experts get questioned from users anything and then respond to the community. This format enhance the interaction between users and “experts”, fostering a sense of friendly environment and accessibility that we rarely see on other social media platforms.

In short, subreddits are the fundamental building blocks of Reddit, providing a centralized and dynamic space for individuals to connect, share, and weigh in on topics of interest. By applying the principles of hierarchy and user-driven content, subreddits have enabled millions of users to create communities focused on their passions. They facilitate meaningful interactions, provide access to multiple perspectives, and provide a platform for sharing information and cultural phenomena. Whether the search is for knowledge, entertainment, or a sense of belonging, the vast world of subreddits offers something for everyone.[1], [2]

2.2 Youtube videos

YouTube has changed completely the way we learn, educate and upgrade our skills by the usage of a dynamic and friendly platform for users who want acquire knowledge and new skills , like is shown in the image 2.2. Here are some key reasons why YouTube contribution in these areas stand out:

1) Visual and interactive learning: YouTube's video format provides a visual and interactive learning experience. Many people find it much easier to understand something difficult when they can see visual tutorials that show step by step the process. With YouTube people can find the exact tutor or content creator that helps them the most to understand the instructions and at the end to greatly improve their ability to understand and not forget information.

2) Learn at your own pace: One of YouTube's most favourite features is how flexible is that you can study at your own whenever you want. Unlike the traditional way of study in classrooms YouTube is saving time to users who want to learn at their home and progress at their own pace. Learners can pause, rewind, and rewatch videos as many times as they want to secure that they understood everything.

3) Develop practical skills: YouTube is a very valuable resource for learning practical skills. Even if somebody wishes to learn how to play the guitar, how to learn any language even the dead ones, learn how to code, take advices on cooking, or literally anything you can thing of YouTube offers countless tutorials and instructional guides . The platform helps users to acquire practical and theoritical skills in a convenient and free way through your personal device.

4) Algorithm-based recommendations: Algorithm based recommendations that are set by user's previous activity, YouTube playlists will be very effective tool for the users. Based on a user's viewing history and preferences, YouTube recommends relevant videos and creator's channels that match their own unique interests. This helps learners discover new content and create their own way to complete their goal.

5) YouTube's comments section: YouTube's comments section provide interaction, that is very important for the learners, with content creators. Users can ask any question, seek help, and share their thoughts so as a result a sense of community thrives. This interactive atmosphere encourages users to discuss and exchange their knowledge on a specific subject while they are safe behind their device.

In short, YouTube has a wealth of educational content, rich visual and interactive learn-

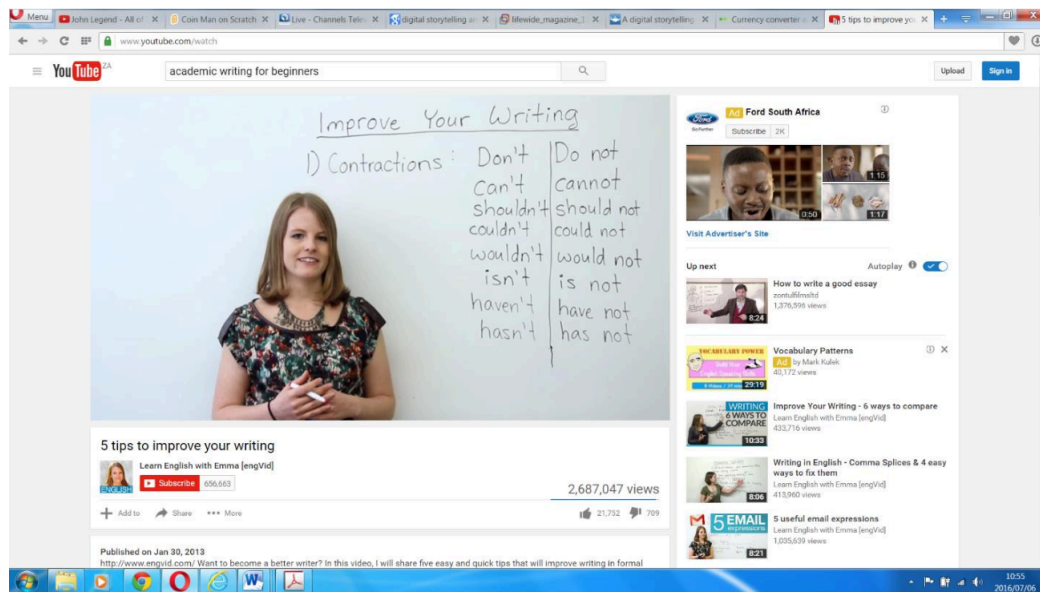


Figure 1: Illustration of one of the videos used to facilitate academic writing group

Figure 2.2: A youtube tutorial to improve your writing

ing experiences, self-paced learning flexibility, global reach, practical skill development resources, Personalized learning recommendations, comprehensive features, and community-focused collaboration make YouTube an indispensable tool. learning, educational and skill development tools. It enables individuals to expand their knowledge horizons, learn new skills, and engage in a diverse range of educational content to advance their personal and professional growth.[3]

2.3 Wysa chatbot

Wysa presents itself as an artificial intelligence (AI) powered conversational chatbot, cleverly designed in order to help people that are in need of mental health support. Developed by Touchkin, Wysa uses AI with empathetic methods, by creating a safe place where users can freely express their thoughts, feelings, and concerns.

Wysa's focus to enhance people's mental health with tools that provide comfort to them. This chatbot combines with skill techniques that they come from many therapy models, including cognitive behavioral therapy (CBT), dialectical behavioral therapy (DBT), and mindfulness practices. Wysa's AI-powered algorithms takes into account the user input in order to send empathetic with no judgment responses.

The user friendly chat interface makes Wysa easy to access anytime and anywhere. Most

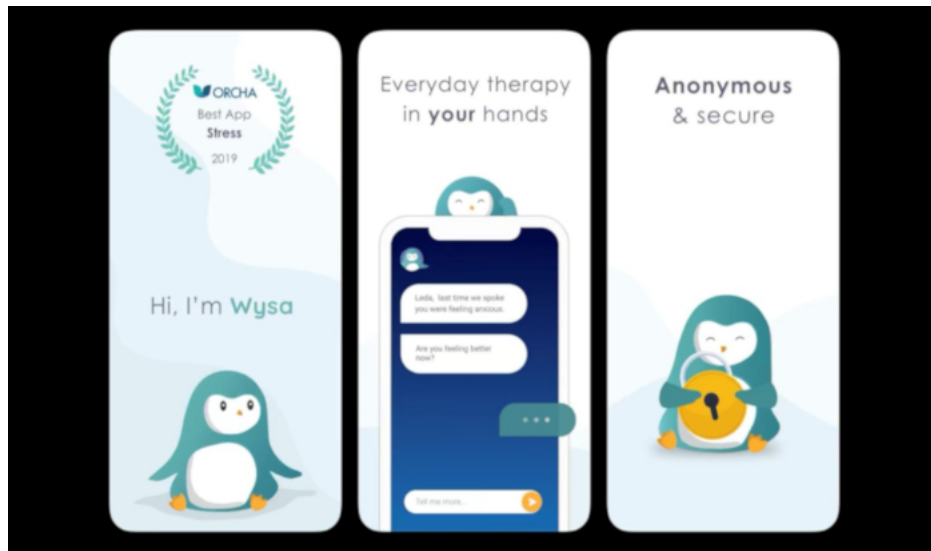


Figure 2.3: The Wysa opening screen

importantly there is an a mobile application (figure 2.3), to give to users the opportunity to speak with the chatbot easy and with safety. A friendly penguin avatar is the “face” of Wysa, creating a friendly and approachable atmosphere.

Through friendly dialogues, Wysa gently prompts users to express without fear their thoughts and emotions, offer guidance during difficult times, and provides them strategies to face their problems. It helps users to recognize counterproductive thinking patterns and to fight their pessimistic thinking. Additionally, Wysa offers a plenty activities and exercises in order to help users relax and relieve their stress.

In addition to its core features, Wysa has many different features in its catalog to include a wealth of self help tools. It provides guided meditation sessions, relaxation exercises and techniques that can upgrade sleep quality. Users can set their very own goals, track their progress, and often receive some motivational messages.

In short, Wysa appears to be an AI-driven chatbot that provides emotional support and introspection support, by helping users to upgrade their mental health. Its strategy is user centered and an real commitment to user privacy, Wysa provides a secure and flexible platform for users to explore their emotions, face their problems and bad thoughts and learn healthier coping mechanisms.[4]

Chapter 3

The theory behind the app idea

3.1 The problem to be solved

There are many ways to utilize technology. For example, communication using technology to stay connected with others through email, instant messaging, video calls, or social media platforms. Then comes education to take advantage of online courses, educational apps, and digital libraries to enhance your learning experience. Health and Fitness is something important as well to monitor your health and fitness goals with wearable devices such as smartwatches or fitness trackers, as well use health apps to track your diet, exercise routines, sleep patterns, and overall well-being. So my reasoning was to find a way to provide all these to common people. So, I had to think of a way to have access to all this information. Then I got some inspiration from some of the main providers of any kind of help. Some of them are the applications I mentioned in the second chapter. All of them do a great job providing some help to the users. But analyzing them I came to the understanding that there is no perfect application, based on the flows that I found on them that I describe in second chapter. What would happen though, if I would create an application, that isn't as impersonal as Youtube is, that can provide completed guidance that is not just an inconvenient forum like Subreddit and finally that provides a human advisor unlike the one of Wysa?

3.2 The solution

While I had already found the issue, I wanted to try to fix it, but I wasn't sure how. I got again an inspiration, for one last time, from Subreddit. The way this application works

relies almost entirely on the users. So, one day while I was reading a forum conversation, I came into the conclusion that people keen on to help their fellow man. This help comes with no reward, so I couldn't be not surprised by this phenomenon. Living in a world, that sometimes is so cruel, this is something really hopeful. The other point that I realized with my life experience, is that someone who lived a specific situation from the beginning to the end, in other words has experience with this, can be a great advisor to someone who face this situation now. Not only that but I observed that if that person got away of that situation and is happy about it, he knows how difficult is to be in such a place, so he commiserates as well. As a result he is very likely to want to help someone that now faces the same issue. So, to conclude that thoughts on an idea I decided to create an application where people can ask questions and get answers from someone with experience with the problem they want to solve. The users can create an anonymous account and then create an article to ask for help for something. The other users, if they want, can provide some advice on a one-to-one chat that can end only if the problem is solved. More explanation about the app functionality in chapter five. Of course, it had to be a mobile application. The reason behind that is quite simple. Think about it. What is the device that everybody has? What is the device that you can carry with you even when you're away from home? It must be the modern smartphone. [5], [6]

3.3 The target group

The target group for my application would likely be individuals who are seeking personalized guidance and support in various aspects of their lives. This group would include people who value human interaction and a sense of connection, as well as those who have specific problems or challenges they need assistance with.

1) Individuals in need of emotional support: Our application wants to provide an approach that is more personal in compare with existing platforms. So our target group will include people who want to find emotional support and guidance from others who already experienced something similar. This will help people to face many mental health issues.

2) Those seeking practical advice and solutions: Our application is trying to offer solutions and guidance based on experience of other people. This may be appealing to other people who seek answers for their problems and advice on topics like relationships, work, education,

health, fitness, and other.

3) People who prefer one to one interaction: The one to one communication feature inside our application would be very useful to users who direct communication and a more personal experience. They may prefer to have a private communication with someone who already deal with similar challenges

4) Individuals who value anonymity: Our application allows users to create accounts anonymously, something that help people who want to seek help without revealing their identity. This can provide a safe and friendly environment for people to open up about their issues and ask for assistance.

5) Tech maniac mobile users: Since our application made as a mobile application, the target group are people who are comfortable using mobile phones and are may have access to them throughout the day. This may include people from any age groups, as smartphone nowadays is a device that anyone can use.

In summary, the target group is people who seek a supportive and friendly platform to seek advice, guidance, and any possible solutions to their problems, while we emphasise on human connection and shared experiences. Our vision for our application is to bridge the gap between technology and human support, creating an application with people who are ready to assist each other on their respective journeys.

3.4 The importance of social media

The usage of social media in our application is paramount. Social media has changed the way we speak share and search information, making it a useful tool to upgrade the user experience and the effectiveness of our platform. Social media can be used to provide a sense of community to all the users who share commons. By enabling social media features like ads and discussions, our application can create a place where everyone can find easily people with common experiences and create supportive communities.

By using social media elements like rating makes users to participate actively and also engage with the application. Users can like to other posts, make a comment, and offer support, creating a friendly and interactive environment. Social media platforms are known for how easy is to share your content. Our application can allow users to share articles, experiences, and advice with the people that are chatting. This sharing capability can enhance the reach of

valuable information and encourage people to share knowledge.

Social media algorithms, a future implementation, can be used to provide a more personal recommendation on articles, to users based on their interests and preferences. This can help users discover relevant articles, and others who can provide some assistance to their needs. Another key factor is user authentication. Social media profiles can be a mean to verify the authenticity of the users. While our application allows anonymity, users can link their social media profiles so that they build trust and authenticity inside the community. This can be really important in case of any vulnerable situations.

In summary, using social media options into our application can massively upgrade its utility by creating a friendly and supportive community. It enables users to connect, share, and search for advice in a familiar and user-friendly environment. Social media not only are inside the main features of our application but also helps in building a friendly and helping user community.

Chapter 4

The tools

This application could not be carried out, without the usage of the following valuable tools.

4.1 Android Studio

Android Studio is a powerful integrated development environment (IDE) exclusively made for the creation of Android and only but not only Android applications. Developed from Google, it has a massive amount of tools and other functionalities made to simplify the app development process. Here, we will provide an overview of Android Studio, specializing to its main attributes and capabilities.

Android Studio is a user-friendly interface as shown in figure 4.1. helping not only experienced developers but new ones as well. It offers a very helpful toolkit that makes simple app development, including a simple editor who has a very smart code completion, syntax highlighting, and the feature of debugging. These capabilities help developers to write code with efficiency, reducing the possibilities of errors and also increase productivity.

A notable feature of Android Studio is the advanced emulator. This emulator helps developers to test their apps on virtual devices, by simulating any screen size they want to test, hardware settings, and Android versions. This feature make sure that the app works smoothly to any device, so the issues will be close to zero.

Another important ability of Android Studio is that can be used for many programming languages. While Java is the most important language on Android app development, Android Studio also supports Kotlin and Dart. Developers are free to choose whatever language based

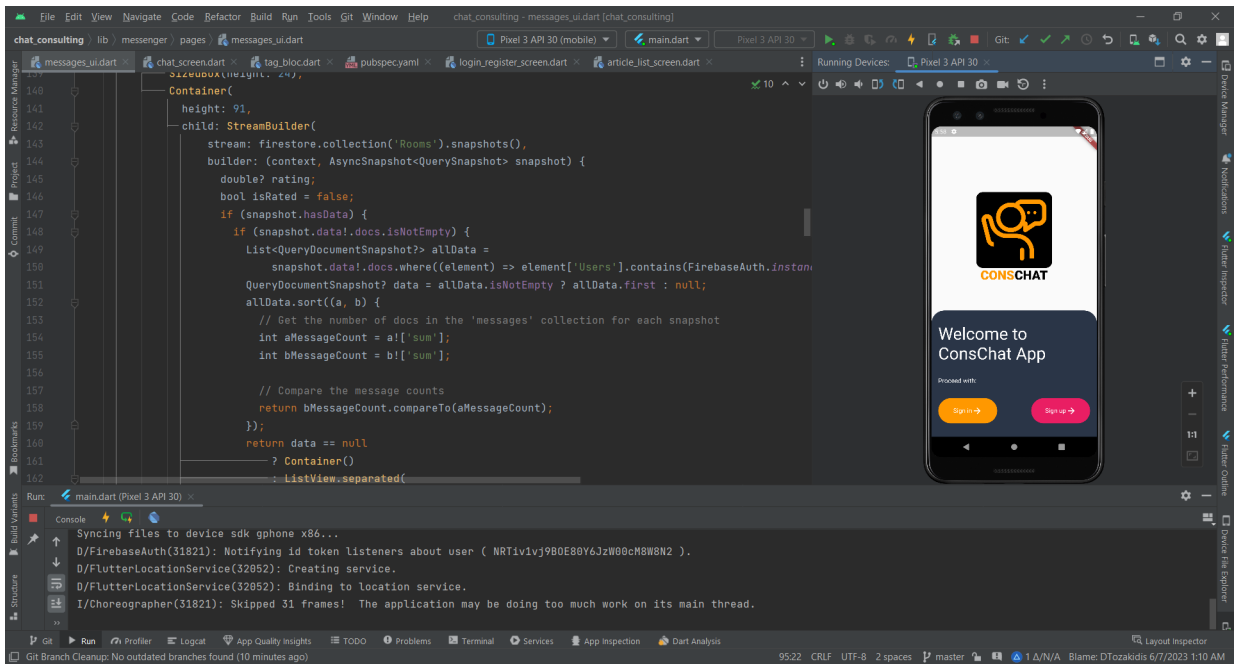


Figure 4.1: The android studio environment while developing the application

on what they want to make and any other potential project requirements.

Android Studio comes equipped with a variety of tools for debugging that assist in error identification. This includes a debugger that helps developers to see inside their code and its variables, specific breakpoints, and the way the memory is used. Also, Android Studio offers performance tools to update app performance and find potential issues.

The IDE works seamlessly with the Android Software Development Kit (SDK), including libraries, frameworks, and APIs, providing developers many interesting features for their applications. Android Studio make simple SDK management with an interface to install, change, and manage these important components

To speed up app deployment, Android Studio provides a simple process for generating APKs (Android application packages) or app useful bundles. These packaged apps can be easily uploaded on the Google Play Store or shared to any other users.

Android Studio plays a central role in the app development process as it is a very important tool at our app development journey. Android Studio importance in Android app development made it the obvious choice for our project. Android Studio's code editor was very useful for the development process. Some of the features was a smart code completion and syntax help, not only increased how easier was the process but also ensured our code quality. Developers can write and save their code with no issues, with almost no errors. The Android Studio emulator is the is the main testing device for our app. This allowed us to try many different

Android devices with different capabilities and screen sizes. This feature make sure that our apps are compatible across any different device, saving our time and our resources.

The debugging tools that Android Studio has, are very precious to identify and fix problems in the application. The debugger allows us to see inside the code, extract variables, and look for any memory leak. Additionally, performance tools helped to optimize the application and identify potential issues, providing a great user experience. Android Studio has made managing the SDK much easier. With an valuable interface to install, and manage SDK, our development can be precise on coding without having to do complex management tasks. Its massive plugin possibilities allows us to extend its capabilities based on our own requirements for the project. We can add design methods, write code, and add third party libraries, improving the application and its user experience.

In short, Android Studio is not just a development tool but also a key helper for the success of our applications. Specialized features, powerful testing capabilities, debugging tools, and connection with the Android system to simplify the development process. Android Studio provides to all of us the tools and and capabilities needed to create successful Android apps.

4.2 Flutter

Flutter figure 4.2 stands out as an open source ui framework, made with care by Google, that provides all the developers the opportunity to build interesting native apps on many different of platforms, all from one single code project. Its popularity is constantly arises among developers because of its adaptability, performance, and the user friendly interface.

The notable advantage of Flutter is its cross-platform flexibility. Developers have the ability to code a script once and distribute it across multiple platforms, spanning iOS, Android, web, and desktop, saving valuable time and effort. This is achieved through Flutter's clever use of a rendering engine that interfaces directly with each of the platform's components, having high performance that comes close to the native one.

Flutter's hot reload capability is another really important feature. All the developers can change the code and automatically see the changes happen in the app with recompilation or application restart. This very useful process significantly help productivity, make easier the testing and the constant debugging.

Flutter also opens the door to multiple libraries and native packages through its compo-



Figure 4.2: The flutter logo

nents. All this huge amount of packages includes multiple features, including networking, database connection, state and cubit management, and more, helping developers to find any possible solutions and make development faster.

Additionally, Flutter follows all the Android's Material principles and iOS's Cupertino Design principles, to make sure that all the apps designed by Flutter has the native look of Android and iOS. This feature enhance the user experience for every device type.

In terms of performance, Flutter does the compilation of applications into native machine code, well done to reduce any performance problems that are often associated with cross-platform frameworks. The result is perfect animations and snappy user interface.

In short, Flutter comes as a flexible and powerful framework for developing cross-platform applications. Equipped with a host of widgets, hot reload capabilities, performance improvements, and important community support, Flutter has become the preferred choice for developers looking to build top-notch apps quickly. effectively. Its knack for delivering native-like experiences across multiple platforms has solidified its position as a great choice for businesses and developers looking to reach a diverse user base.[7]

4.3 Dart

Dart is a programming language (figure 4.3) designed by Google, designed to enhance the speed and the efficiency. Dart is an object oriented programming language, having the style syntax of the C language that you can write and read it. Also it provides a toolbox that has many features and utilities that can help a developer into his journey.

A notable attribute of Dart is its ability to compile to native code that can be used for many platforms. This means that developers can create code once and run it for all the platforms that

are supported, such as web browsers, mobile phones, and desktops. This important flexibility makes Dart the number one language in cross platform development, by reducing the time and effort you need to spend.

Dart demonstrates the strength of this kind of system, where the variables are checked when the system compiles. This type of settings are a way to find error, by making code more reliable and maintainable. However, Dart also has feature for the variable type, so developer don't have to declare immutable values.

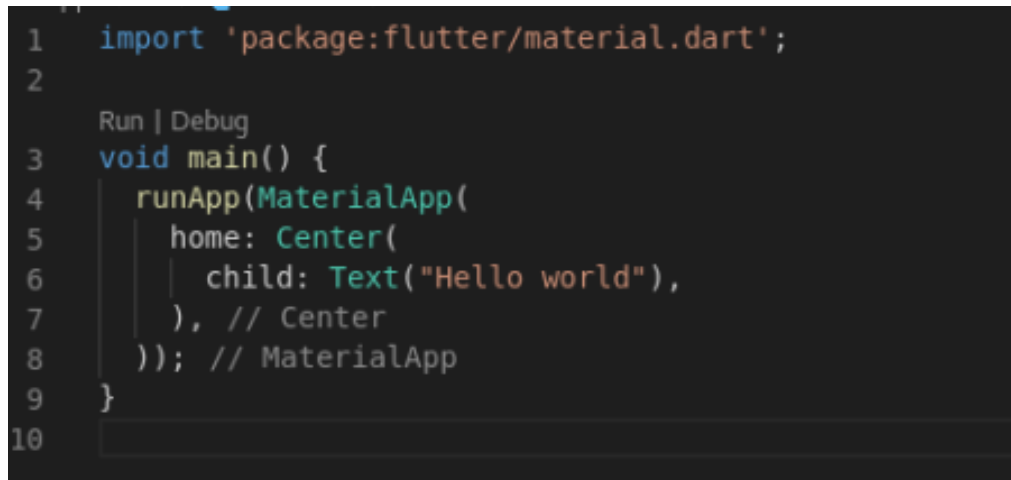
Also another feature of Dart is the asynchronous capability. Dart uses the concept of futures, `async` and `wait` syntax to handle any asynchronous need, by sending network requests or by reading files. This framework allows developers to create well executed code that is no burden for the execution of the tasks.

Dart is the language that everyone would choose to build applications using Flutter framework. The Dart and Flutter is a pair that got great reviews because it is user friendly, its fast reload functionality, and fast development process.

Dart has been very valuable for our application due to how unique and flexible his features are. Dart's capability to compile the code and transform it to native for many different platforms made really fast the cross platform development. Also Dart has a powerful system and support for detect any issues that are valuable to make the code more reliable. Furthermore by detect any potential errors throughout the compilation, Dart makes it easy to find any kind of problems early while we develop the application, to make sure that has no issues and that is stable.

Finally, Dart's connection with Flutter framework, that can fast reload and be easy to handle made even more faster the development cycle and upgraded the efficiency of our application development program.

In short, Dart is a very powerful and easy to learn programming language with plenty of features and tools to make a well performance application. It is cross platform language, with powerful platform system, with asynchronous programming feature, and a rich library that still gets bigger providing any developer a platform to develop efficient application for any device type.[8]



```
1  import 'package:flutter/material.dart';
2
3  void main() {
4    runApp(MaterialApp(
5      home: Center(
6        child: Text("Hello world"),
7      ), // Center
8    )); // MaterialApp
9  }
10
```

Figure 4.3: Simple Dart code that prints “Hello world” at the center of the screen

4.4 Firebase

Firebase presents itself as a powerful platform designed by Google, designed with the addition of tools and services that made for developers who want to build any kind of application. It provides the infrastructure that can handle all the tasks we need to make, like storage for data, authentication, and synchronize the data in less than a second giving developers the opportunity to only have to work on the functionality of their application. In this chapter, we’ll analyze all the key features and benefits of Firebase.

Inside the Firebase is the real time database that we can see in Figure 4.4, it is a cloud NoSQL database that allows developers to store data in real time for every type of application. It uses a JSON type to store the data, making organizing and to find data a simple task. By using real time databases, we can design applications that transfer without problems data between different devices, providing a user experience that everyone would be satisfied.

Firebase authentication is another valuable feature that makes apps a secure and user friendly authentication system. It supports many ways to authenticate such as email and password authentication, facebook login, and even any other authentication method that someone can create. If a developer use the Firebase authentication, he can stop thinking about authentication, authorization, and how to manage user accounts without having to build all this from scratch.

Firebase also has a great set of tools to test, and improve the application performance. For example, Firebase Test Labs gives to developers the tools to test their apps on real mobile phones or computers that are based in the cloud, to be sure that is compatible for all

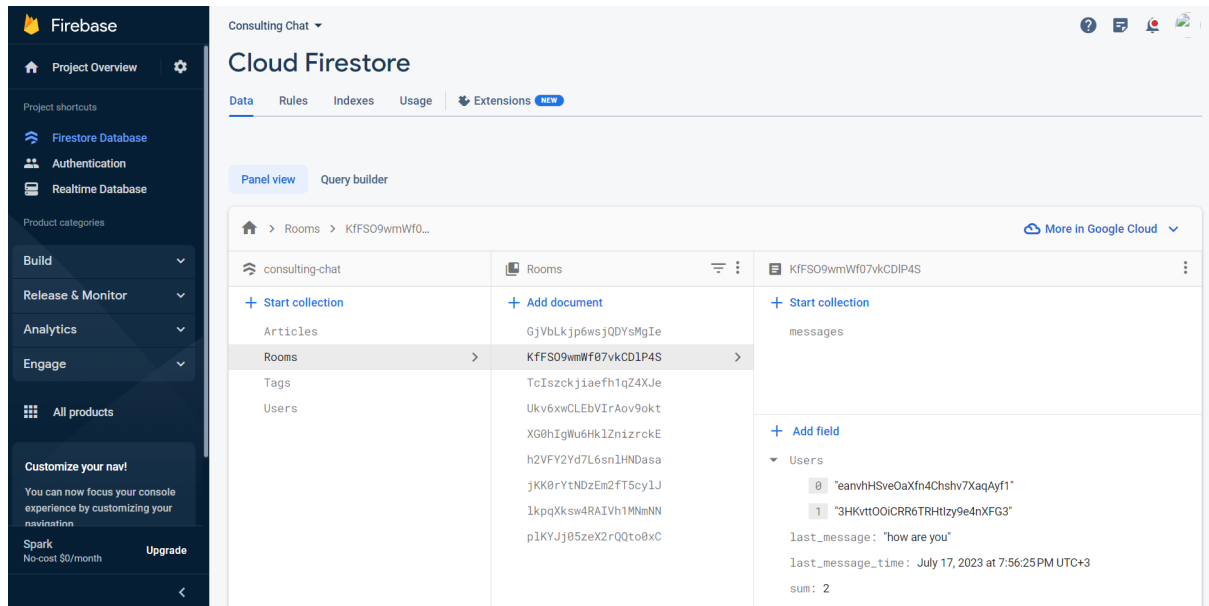


Figure 4.4: The Firestore Database of the application

the platforms. Firebase performance monitoring gives information about the application performance, making it easier to find any potential issues. Additionally, Firebase Crashlytics extends real time crash reporting, to make sure that all issues will be resolved shortly by the developers.

Summarizing, Firebase is a comprehensive platform with a many useful tools and services designed to make the development of web and mobile applications a piece of cake. It has powerful features for real time data synchronization, authentication, database storage, testing, and archiving data. By using Firebase we can focus our energy on designing our app's features, while relying on firebase to handle all the infrastructure. Firebase's usability and synergy with every other development platform and especially Flutter made it very popular among any kind of developer with a purpose to upgrade their application development and provide the best experience.[9] [10]

4.4.1 Firestore

Firestore is an excellent tool provided by Firebase for my application needs. Firestore is a NoSQL document database that is a feature created by Google that has the capability to store data to many different devices and platforms. This makes it the best choice for building our real time synchronized application.

Firestore has an organizational structure that is based on collections, just like the tables in

any plain relational databases. Inside every collection it saves multiple files that each of them has some key values like the JSON objects. Firestore uses a simple and very user friendly data model, making easy to store complex data structures and objects inside other of the same kind within documents.

Additionally, Firestore makes sure that the data are consistent. That make the data changes to happen atomically without problems. That means that if we change some documents all of them will be done or none. This upgrade data consistency and avoids any potential errors.

Firestore works well with other Google services, firstly with Firebase authentication and then with the cloud storage. This makes it easier to build solutions with the use of other compatible services like authenticate users and storage the files.

Firestore scales expertly and automatically manage the main backend work that needs to be done for the application's operation. It handles with ease high read and write loads, to make sure that the application performance remains always the same.

Firestore was the foundation in our application development, by providing a powerful data storage that was perfect for our project. We used the Firestore's NoSQL document database to store all the data that are used inside the application, to be sure that the app is synchronized. Firestore's structure is based on collections and documents that help us set our data accordingly. Inside every document, we store the key values that we mentioned before, containing complex data structures, which are very important for our application to work as intended. The Firestore's most known feature the real time synchronization, plays an important role for the function of our application. By using the listener feature of flutter, we enabled real time updates to be sure that changes that a user made are shown real time to the users by using the same dataset. This feature plays an important role in order to create a responsive environment in our application.

We utilized four collections in our database. Firstly, the "Users" collection contains comprehensive user information, including their usernames, IDs, and rating data. Secondly, the "Tags" collection stores details about seven tags available for users to select when creating ads. The "Articles" collection has information about each ad, including its set tags, title, description, and details about the writer. Lastly, the most interesting collection is "Rooms," which stores documents having information about the two users who chatting in a chat inside a specific room. It also has inside details about the last message send and its timestamp. Finally, within the "Rooms" collection, there is a sub collection named "Messages," which

stores information about every message sent.

In summary, Firestore comes as a majestic and adaptable NoSQL document database, known for its real time synchronization, great querying capabilities, and easy integration with other Google services. It enables developers to create applications that are responsive, while also providing strong scalability and security properties. Overall, Firestore plays a central role in our application development, providing a reliable, rich data storage that fills completely the functionality of our platform.

Chapter 5

The application's logic

5.1 The devices we used for application testing

The development and testing of the application by making use of two devices. We used it on a physical device and on an emulator. The emulator is a feature of the Android Studio that provides real time testing without requiring the physical device. However it is not as stabilized as a physical device is. Therefore at the final stage of the application was also run on a physical device to be sure that everything works as intended.

5.1.1 Google Pixel 3

First we used the Google Pixel 3 device (figure 5.1) inside our android studio simulator. Google Pixel 3 is a smartphone created by Google in October 2018. When we were running the Google Pixel 3 emulator, it was replicating the software of the physical device on our computer. Now we can describe the main features of the Google Pixel 3 device. The Pixel 3 runs on Android and precisely on the Android version that developed by Google. The emulator we used replicated the first version of Pixel 3 the one that got released. The emulator aims to replicate this specific hardware to provide an almost exact experience. Pixel 3 offers many software features. These features are Google Assistant, Pixel Launcher, and access to many different Google services. The emulator will work accordingly with these features, allowing users to interact with the Google Assistant. It's important to note that the emulator provides a simulated environment and it is not always providing the best user experience like the one of using a real Pixel 3 device. However, it allows as and other users to test with Pixel 3 without the need of the physical device.



Figure 5.1: The google pixel 3 device

5.1.2 Redmi Note 9 Pro

The physical device we used was the Redmi Note 9 Pro (figure 5.2) a smartphone created by Xiaomi that was the personal phone of one of our developers. The release was in March 2020. It is small budget smartphone that provides many features that are more than enough for its affordable price. There comes the description of Redmi Note 9 Pro based on the features we need for our app. Redmi Note 9 Pro has a modern and beautiful design with a glass to both sides, protected by Gorilla Glass 5. It has a large 6.7 inch screen with a resolution of 2400 x 1080 pixels. The phone has 4 cameras and a central placed selfie camera at the front of the phone. The back of the device not only has the four cameras but also a fingerprint sensor.

Redmi Note 9 Pro runs on MIUI, Xiaomi's custom Android operating system. MIUI offers a many different customization features and options to choose from, like a mode that makes darker the screen and other installed from release apps. The device also includes headphones and lastly a microSD card slot where somebody can insert a microSD card for extra space.

Overall, the Redmi Note 9 Pro offers a combination of design and performance, making it a great choice for any user who is looking for a cheap smartphone with all the main features. As we mentioned, this app is made with Flutter, so with only one project it is available for Android and iOS apps. Although we don't have access to an iOS device for testing. That's



Figure 5.2: The Redmi note 9 pro device

why the app version is only for Android devices.

5.2 Application's Architecture

5.2.1 Firebase Auth

The architecture of this application is based on a very important tool. At the home screen a user can authenticate with the help of Firebase Auth. Firebase Auth is a strong and secure authentication system for Flutter apps. It allows users to log in and register by the use of many different authentication methods like email and password, Google and Facebook login, and others. Provides a backend environment for authentication for Flutter apps, with a simple way to implement authentication features. The Firebase Auth in Flutter can be helpful with many APIs that makes authentication a piece of cake. Also, it provides a very safe encryption and security means in order to keep the data of the users safe. It make sure that the user's credentials are encrypted throughout all the processes and safely stored in the Firebase database.

It offers many different options to customize your application, helping developers to change the authentication method and the requirements of their application. Also every user can select his own interface, and management features, having more flexibility and control over the process. Finally user authentication management gets simpler in Flutter apps. It provides built-in methods and callbacks to handle user login, logout, and state changes, making it easier to manage different application scenarios and user experiences. Overall, Firebase Auth is great pair with Flutter that provides a great authentication tool, helping developers to efficiently solve the problem of creating a secure user authentication for their Flutter apps.[11]

5.2.2 Bloc

A fundamental role in our application development is the design pattern bloc (short for Business Logic Component) used to manage state and manage any user selection. It separate the principles and helps to organize a clean code architecture. The most important feature is the bloc that separates the logic of the application and the state management from the ui. A bloc receives events or any action from the user interface and saves them to then produce the state. Events are the user interactions or any other trigger, and states are the result of the state of the application. Blocs often use streams to send events to the state. The bloc emits new states when the application state changes and the user interface is updated as well.[12], [13]

In our application development, the Bloc design plays a central role to manage the state and the user interactions. This model is a part of the principle of separation of ui and logic, to be sure that our code architecture remains well organized. In our project, we used the states with the help of immutable data classes. Every time a state change happens, a new instance of the state class is created and it got send to update the application state. BlocBuilder and BlocListener are essential tools in our application. BlocBuilder makes it easy to dynamically update the user interface when the application state changes. With this option we make sure that our app is always responsive to only see the latest values of the data, giving users a engaging experience. On the other hand, BlocListener help us to react to state changes by setting some specific actions or side effects,for example displaying a snack bar, navigating to another screen, or updating data.

Chapter 6

The apps usage

6.1 Welcome page

First of all, the user must own an android device. With this device he is able to install the application. With the completion of the installation, he can now use the application. The first time he opens the application, he faces the welcome screen of “ConsChat” as we can see in figure 6.1, that is the name of the app. The app welcomes him and offers two choices. The user can either create a new account or login with an existing account, figure 6.2. If he select the first option, he must provide a username, his personal email and a password. The password must have at least 6 characters and the email address must be in the correct form and cannot already used by another another user. By selecting the second option, he must provide his credentials in order to login successfully, his email and password. After completing any of this actions, he can press the enter button to navigate inside the application. If there is an issue with his credentials, an appchip will inform him that something went wrong with the specified error message.

6.2 The option of chatting

6.2.1 Messages screen

After connecting successfully, the user gets navigated to the messages screen that is in the figure 6.3. There he can view any messages that have been exchanged with other users. If it is the first time he enters the application, he will see a message that informs him that he

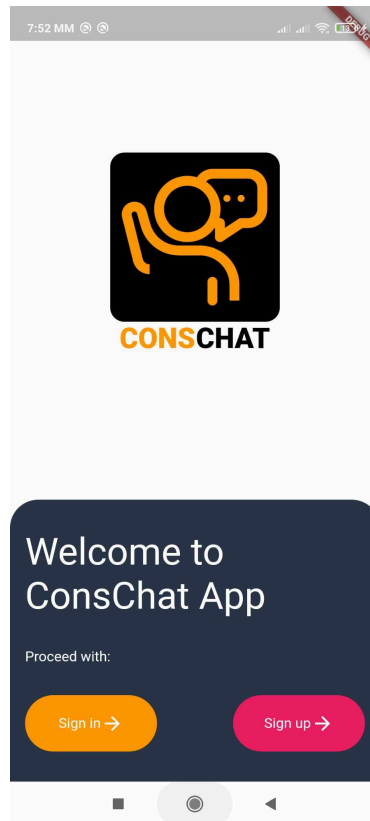


Figure 6.1: The welcome page

hasn't exchanged any messages yet. The chat screen consists of the 'favorite users' and the latest messages. On the row of the favorite users, he will see them in descending order on the number of the exchanged messages. Every user on the favorite list has a rounded avatar with the first letter of the user's name inside. Has under the avatar there is his full name. On the list of the latest messages every user button consists of four items. First there is the same avatar with the first letter inside, followed by the user's name. Under the user's name he can read the last message that had been exchanged inside that chat room. Finally at the top of each message he can see the exact time that the last message was sent.

6.2.2 Chat screen

The user can now press any button either from the favorite or the last messages list. This will navigate him inside a chat room. Every chat room consists of two users. On the top of the screen the current user can preview the name of the other user of the room. Under the name the user can see the rating of this user in stars. The rating range is one to five and is the average of the ratings other users gave to this one, figure 6.4. If the current user hasn't

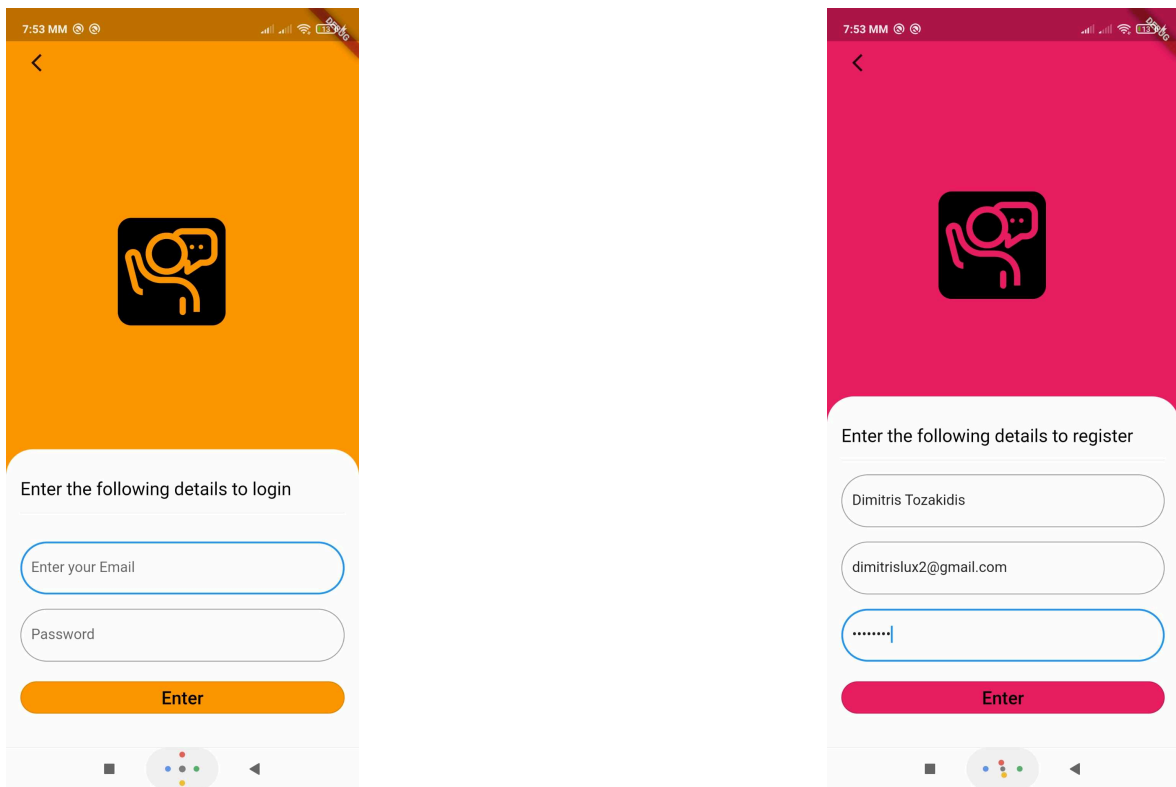


Figure 6.2: Login and register page

rated this user yet, then the stars will have yellow color and he is able to rate him between one to five stars. After rating him the stars become blue and the rating gets locked. The next time he will enter the room the rating and changed with the new average rating. Under the rating bar, the current user can preview the messages of this chat room. On the left are the other user messages and, on the right, his own messages. Over every message, there is the time that the specific message was sent. In the case of two or more messages that have the same sending time, the sending time is only visible on the first message. On the bottom of the screen, there is a text field where the user can type a new message. On the right is the send button, which he can press to send the message. The messages are updated live by the use of a stream provided by firestore. All the information for the specific room is stored inside a document of the collection Rooms. It consists of the two users id, the last message, the last message time, the amount of messages and a collection called messages. Inside this collection is a document for each message. This document has the message, the time that got sent and the sender id.

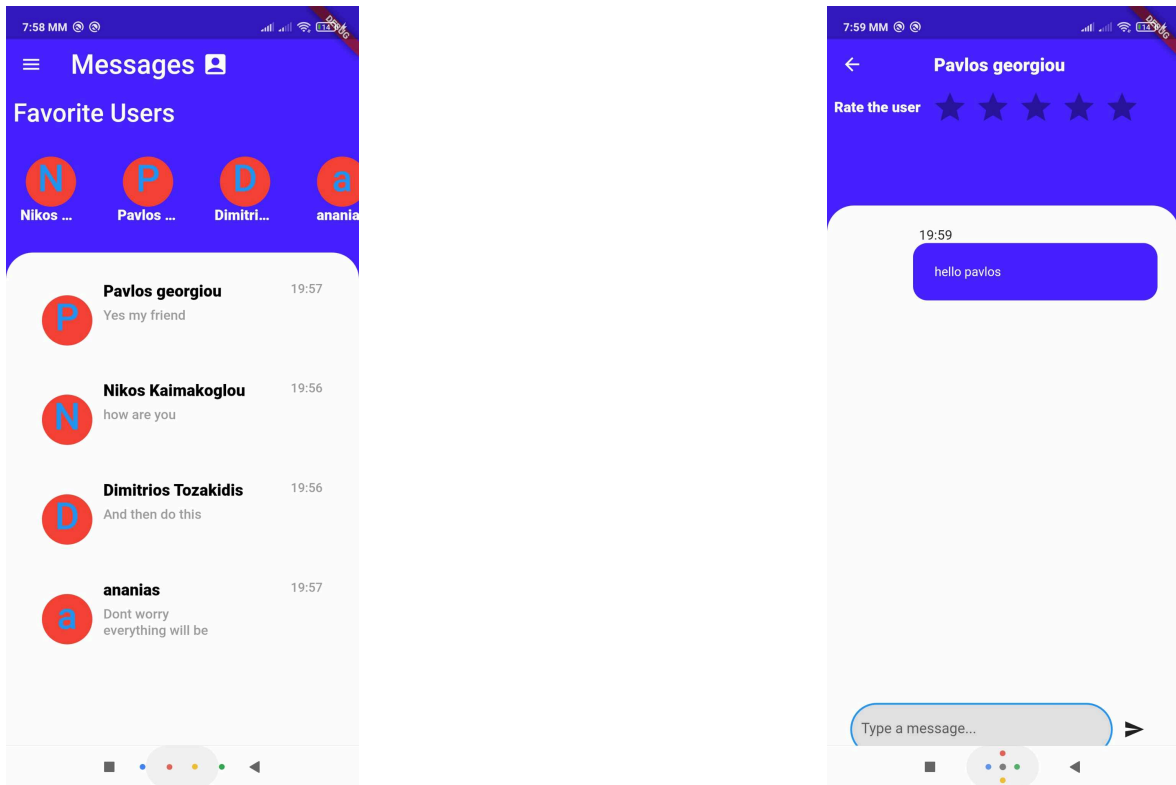


Figure 6.3: The messages screen and a chat room with user that has no ratings

6.3 Profile and log out

On the top left of the messages screen is the menu button. By pressing this button, the user can preview the options he has inside the application. After the messages option comes the profile option, figure 6.5. Inside this screen the user can see his personal name so that he knows how other people see him. Another option inside this screen is to sign out or delete his account permanently. The last option for the user is the Logout button. By pressing this button the user navigates to the opening screen of the application. Now he can again Sign in or create a new account. But before the sign out option there is the most important option, the ads.

6.4 The ads

6.4.1 Ads screen

Ads is the main feature of this application. By selecting this option, the user navigates to the screen with all the ads that can be seen in figure 6.6. On the top of the screen, there is

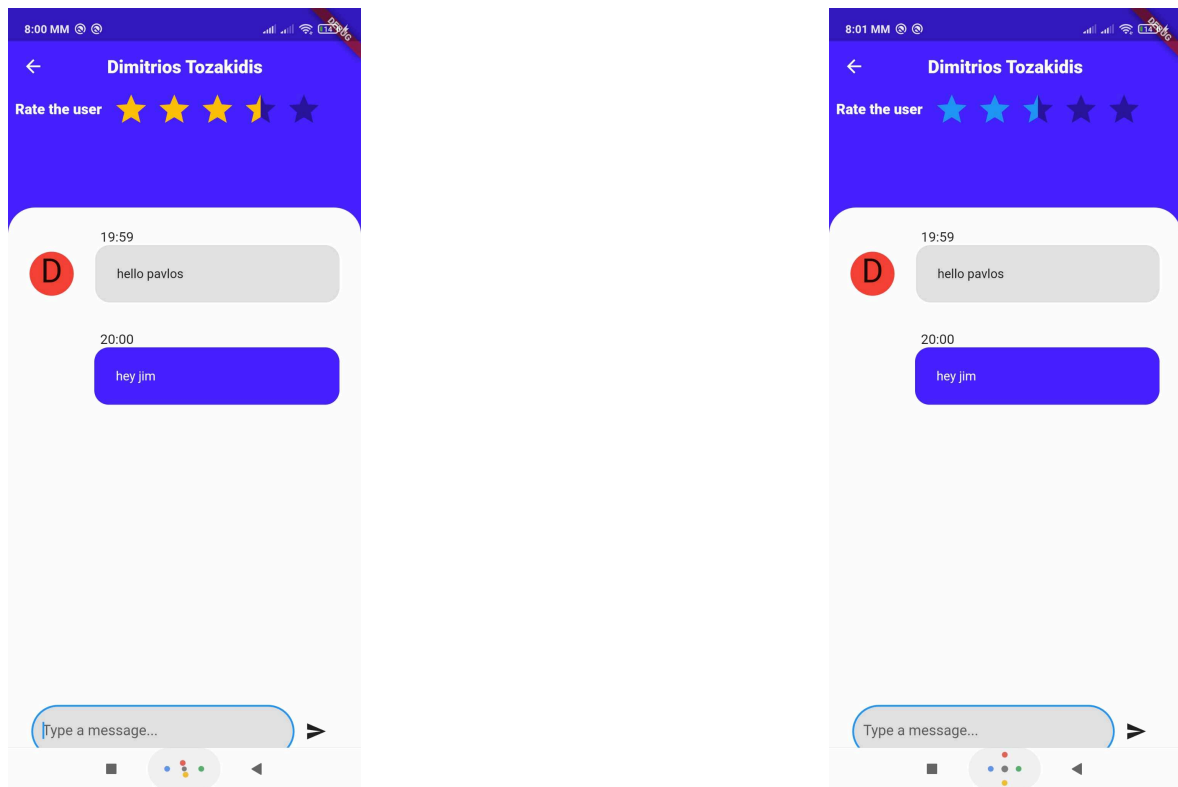


Figure 6.4: On left a chat room with user that has 3.5 rating on the right the current user just rated him with 2.5 stars

a text field. There the user can search to find any ad inside the application. The key factor of the search is the title of every ad. Following the search bar, come the tags. The tags are specific sections that any user can set to his ad. Some examples are sports, anxiety, cooking, technology etc. Every user who creates an ad can set any number of tags inside that ad so other users can understand what this ad is related to. All the existing tags are inside a horizontal list. There a user can select any amount of them in order to preview only ads with the selected tags. The search bar and the filter tags feature, work alongside. Under the tags comes another list but this time vertical. Inside that list there are all the existing ads, in alphabetic order. Every ad consists of a rounded container. This container is dark orange if nobody read this ad and is light orange otherwise. On the top left of the container, is a picture that describes the first tag selected by the author of this ad. Next to this picture is the title of the ad and under that just a part of the text inside this ad that describes the author's issue. On the top right of the container, there is a icon of a trashcan. If the ad doesn't belong to the current user this button is disabled. Otherwise by pressing this button, it opens a dialogue that asks the user if he wants to delete this article, figure 6.7. By selecting the "yes" button the article gets

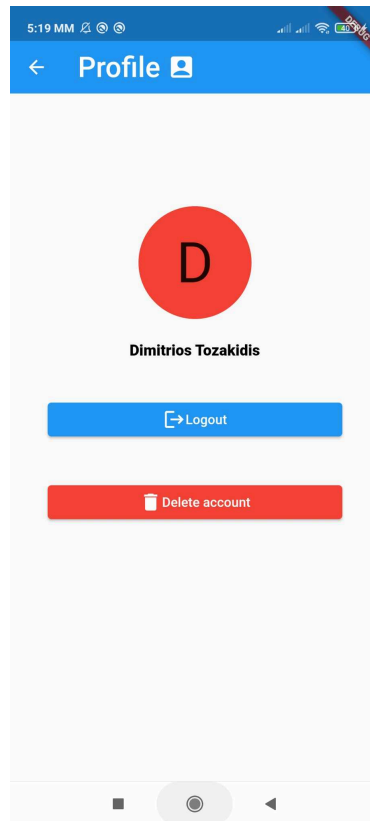


Figure 6.5: The profile screen

deleted. Lastly on the bottom left, there is a text button that offers the author to edit this ad. The author by pressing it can change the title, the description and the selected tags of this article. Finally on the bottom right of the screen, there is the elevated button with the plus icon. There the user can add a new article by entering a title, a description and select the tags of this ad. The ad must have a title and at least one tag, the description is optional.

6.4.2 Opened ad

Every ad container is tappable, despite the author. By pressing a container, the user gets navigated to a screen with the ad in full screen, as we can see in figure 6.8. Inside this screen a user can preview all the information of the ad. If the user is the author of the ad he opened, he can press the menu button on the top right. This opens menu that provides the option add new add, edit this add and delete this ad. The top half of the screen consist of the image that describes the first and most important tag of this ad. Over this image, on the left is the avatar of the author. Under the avatar the user can see the current date. Then comes the title of the ad, with a big font. Finally, the last object that is above the image is the name of the author.

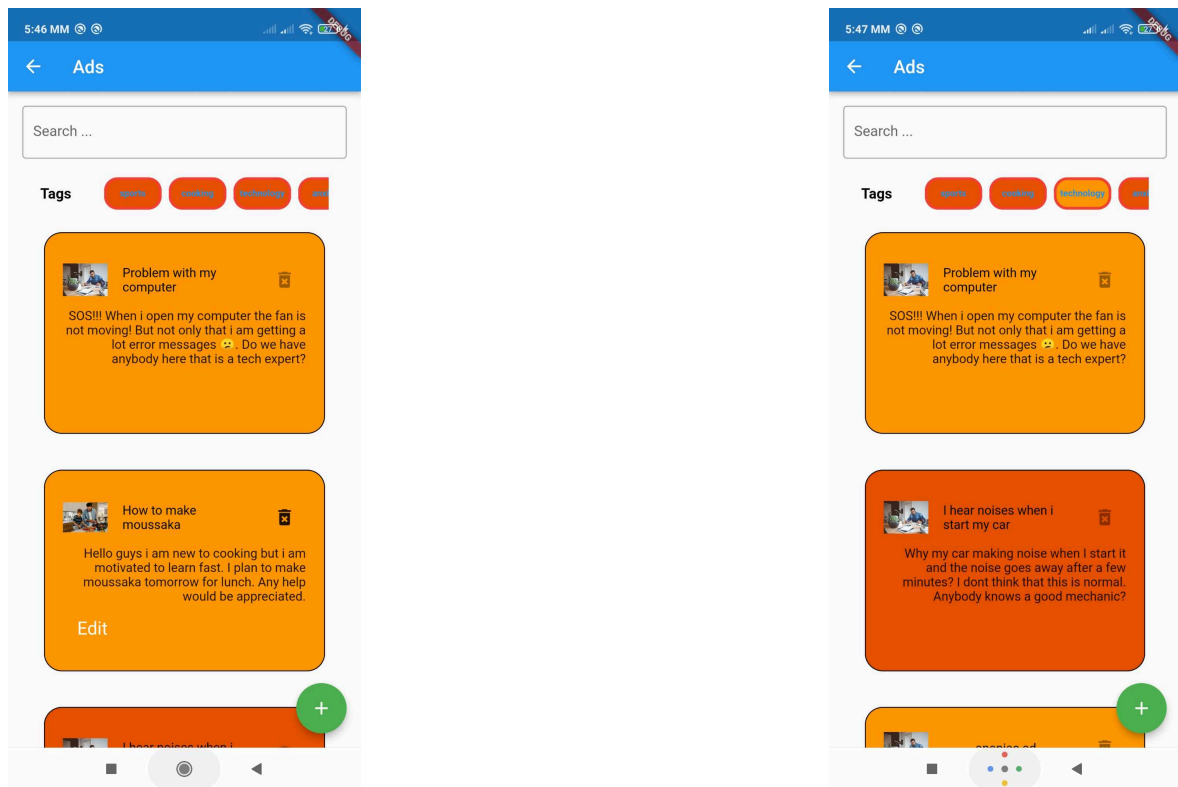


Figure 6.6: The ads screen. On the right the filter technology selected

Under the image now, there are the tags of this ad. The tags again are tappable and if the user press it get navigated to the previous screen with the selected tag already selected as a filter. The most important content is under the tags, that is the description. The user can read the ad carefully and only if he wants to help the author, can press the answer button on the bottom right. This button navigates him to a chat room with the author of the specific ad, and there the conversation begins. Every ad document consists of the title, the description, the isRead Boolean, the list with the tags, the writer's name and finally the writer id.[14], [15]

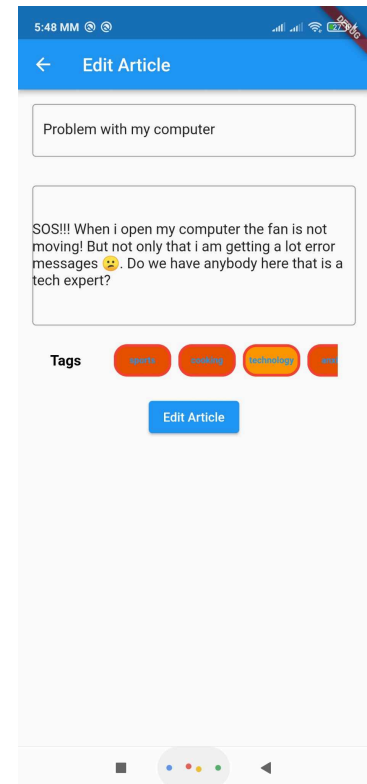
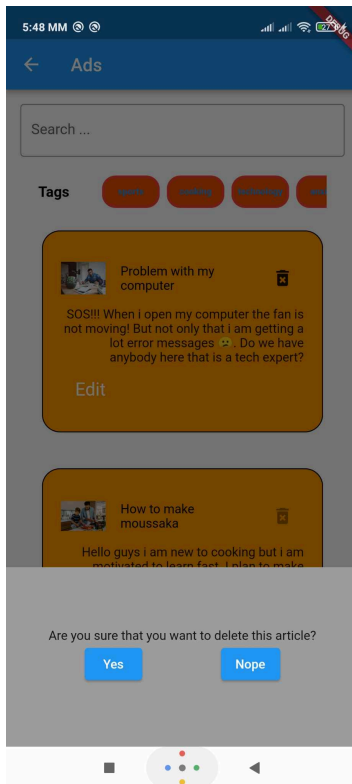


Figure 6.7: On left the delete action dialog. On the right the edit screen

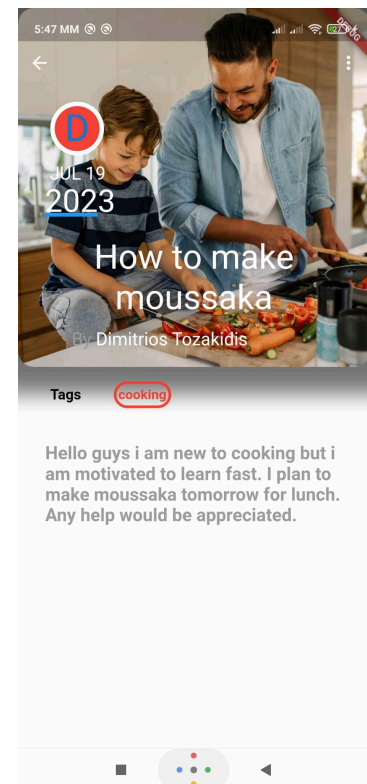
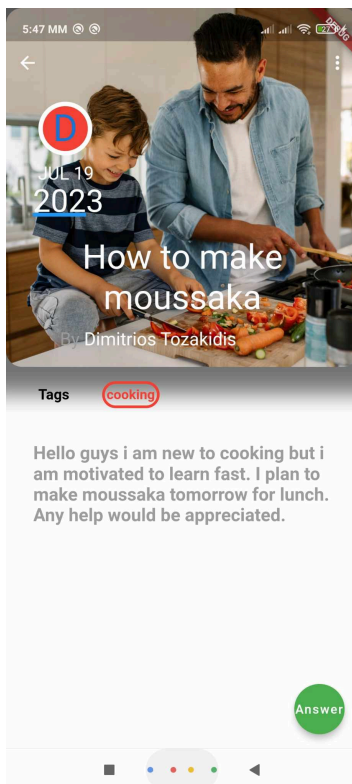


Figure 6.8: On left the preview of an opened ad. The right picture is the preview i see, if the ad is mine

Chapter 7

Conclusion

7.1 Summary and conclusion

Summarizing, the study focused on the development of a mobile application called "ConsChat," which aimed to provide a platform for anonymous chatting and ad posting. The application utilized various tools and technologies, including Android Studio, Flutter, Dart, Firebase, and Firestore, to create a robust and user-friendly application.

Throughout the development process, several key features and functionalities were implemented. These included authentication using Firebase Auth, state management using the Bloc pattern, real-time chat functionality using Firestore, and a comprehensive ad system. The application's logic was designed to provide a seamless and intuitive user experience, with different screens and options for chatting, viewing ads, and managing profiles.

The testing phase involved using physical devices and emulators to ensure the application's compatibility and functionality across various platforms. The Google Pixel 3 emulator and the Redmi Note 9 Pro physical device were used for testing, providing insights into the application's performance and user experience on different devices.

Based on the development and testing process, several conclusions can be drawn. The application successfully implemented the desired features, allowing users to create accounts, chat anonymously, post ads, and manage profiles. The utilization of Firebase and Firestore facilitated real-time data synchronization and secure authentication, ensuring a reliable and efficient application.

Positive conclusions can be drawn regarding the usability and functionality of the application. The user interface was designed to be intuitive and user-friendly, allowing users

to navigate through different screens and access various features easily. The integration of different technologies and tools, such as Flutter and Firestore, contributed to the seamless performance of the application.

However, some challenges and limitations were also encountered throughout the study. The lack of access to an iOS device limited the application's availability to Android users only. Additionally, the emulator used for testing, while helpful, may not perfectly replicate the user experience of a physical device. These limitations could be addressed in future iterations of the application.

In conclusion, the thesis made a significant contribution to addressing the problems outlined in the introduction. The development of the ConsChat application provided a platform for anonymous chatting and ad posting, offering users a secure and user-friendly experience. The utilization of various technologies and tools showcased the potential of Android Studio, Flutter, Dart, Firebase, and Firestore in developing robust and efficient mobile applications. The study's positive outcomes and insights lay the foundation for further improvements and advancements in anonymous chatting and ad systems.

7.2 Future extensions

During the development process we found some ideas for further extension of this application. One way to extend the diploma project is to develop compatibility for iOS devices. Currently, the application is only available for Android devices. By expanding its compatibility to iOS, you can reach a wider user base and provide a seamless experience for iOS users. This would involve adapting the application code and ensuring compatibility with the iOS platform.

Another extension idea is to allow users to add a profile picture or avatar to their accounts. This would enhance personalization and user identification within the application. Users could upload a picture from their device or choose from a selection of pre-defined avatars. Implementing this feature would involve integrating image uploading functionality and updating the user interface to display avatars alongside user profiles and chat rooms.

Currently, the application supports text-based messaging. To enhance the user experience and offer more communication options, adding voice chat functionality could be a valuable extension. Voice chat would allow users to have real-time conversations using audio instead

of solely relying on text messages. This would require integrating voice recording and playback capabilities, as well as incorporating user interface elements for initiating and managing voice chat sessions.

To improve the ad posting and browsing experience, implementing a recommendation system based on user activity and preferences could be an effective extension. The recommendation system would analyze user behavior, such as the ads they view, the tags they interact with, and their messaging history. Based on this data, the system could suggest relevant ads to users, increasing the likelihood of finding relevant content. Developing a recommendation system would involve data analysis, machine learning algorithms, and integrating the recommendation engine into the application's backend.

These extension ideas would enhance the functionality, user experience, and reach of the application. By expanding compatibility to iOS devices, allowing avatar pictures, incorporating voice chat, and implementing a recommendation system, the diploma project could offer a more comprehensive and personalized platform for anonymous chatting and ad posting.

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