

Dhyaa

IT 497: Graduation Project Report Product Release-2

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Dhyaa

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Abstract:

Many students struggle to find the right tutor for their needs, while tutors face challenges in managing their availability and reaching potential students. The purpose of developing Dhyaa is to provide a platform that helps them find each other, address these challenges, and provide a more convenient and effective tutoring service. The software was developed using an iterative approach that broke down the large problem into smaller, manageable tasks. Each task was solved individually, and the solutions were then integrated to address the overall problem and build the final product incrementally. After conducting the UAT, it was found that the main purpose of the software was clear and easy to use. Additionally, the evaluation showed that Dhyaa has strong performance, usability, error handling, and availability while also providing robust security measures. In conclusion, we are optimistic that Dhyaa will help connect both tutors and students, making the process of private tutoring more accessible and convenient.



Abstract (Arabic):

كثيراً ما يواجه الطلاب صعوبة في إيجاد المدرس المناسب لاحتياجاتهم، بينما يواجه المدرسوون تحديات في إدارة أوقات الدروس والوصول إلى الطلاب المحتملين. يهدف تطوير تطبيق "ضياء" إلى توفير منصة تساعدهم على العثور على بعضهم البعض ومعالجة هذه التحديات وتقديم خدمة تعليمية أكثر ملاءمة وفعالية.

تم تطوير التطبيق باستخدام منهجية التطوير التدريجي يقسم المشكلة الكبيرة إلى مهام صغيرة يمكن إدارتها. تم حل كل مهمة بشكل فردي، ثم تم دمج الحلول لبناء المنتج النهائي تدريجياً.

بعد إجراء اختبار التطبيق النهائي، تبين أن الهدف الرئيسي للبرنامج واضح كما أن التطبيق سهل الاستخدام. بالإضافة إلى ذلك، أظهر التقييم أن "ضياء" يتمتع بأداء قوي وسهولة الاستخدام مع توفير تدابير أمان قوية.

تطبيق "ضياء" يساعد في ربط المدرسين والطلاب معًا، مما يجعل عملية التدريس الخصوصي أكثر إمكانية وملاءمة.

Keywords:

1. **Cosine similarity:** It measures the similarity between two vectors of an inner product space.
2. **Manage Availability:** regulating the schedule of tutors by allowing them to set/cancel/edit their availability and ensuring that tutoring sessions are scheduled at their convenience.
3. **Recommender System:** A type of information filtering system known as a subclass aims to anticipate the rating or preference that a user would assign to a particular item.
4. **Session Type:** The format of the session, which can either be online or in person.
5. **Student:** person who is seeking academic support or private tutoring services.
6. **Suspend user account:** disable the user's account in the system.
7. **Tutor:** A person who offers lessons.
8. **Unsuspend user account:** unhang the user account in the system.



1 Introduction

In recent years the need for private tutors has grown significantly, such growth is attributed to a rising number of students seeking support outside the classroom [1]. Furthermore, whether it is in person or online, private tutoring allows students to take as much time as they require to study and comprehend their coursework. Additionally, tutoring offers students a safe environment where they can ask questions, they are too hesitant or embarrassed to ask in class. Students who face difficulty in learning are in desperate need of tutors; however, due to the lack of communication platforms, students struggle to find tutors, and tutors also have difficulty reaching students who need them, despite their best efforts.

1.1 Problem

Students may face problems in understanding their subjects, and having a teacher at school is not always enough. Also, not all parents can follow up and teach their children, which increases the need for a tutor, and here lies the problem. Finding a tutor to help is not an easy task due to a lack of communication platforms that serve both students and tutors and meet their needs. On the other hand, tutors also struggle to reach students who need them, and their attempts to spread can be seen through recommendations and street posters. Developing an application that connects students and tutors will make it easier for students to find a qualified tutor to help in understanding difficult subjects leading to a rise in their grades, and it will also help tutors to reach the largest possible number of students in need.

1.2 Project Goals and Objectives

1.2.1 Goal

The overall goal of Dhyaa is to connect anyone who wants to learn (student) to people who can teach them (tutors) in real-time.

1.2.2 Objectives

- Provide students with a system that helps search for tutors and filter the search results.
- Provide students with a system that recommends relevant tutors.
- Provide students with a system that allows them to chat with a potential tutor for inquiries.



- Provide students with a system that allows online payment for the lessons.
- Provide students with a system that helps in rating tutors and giving them a review.
- Provide tutors with a system that helps in managing their availability.
- Provide tutors with a system that allows them to chat with potential students to answer their inquiries.
- Provide tutors with a system that helps in rating their students and giving them comments.

1.2.3 Project vision statement

Project vision:

For students and tutors.

Who struggle in finding each other.

The Dhyaa is a mobile application.

That connects students and qualified tutors.

Unlike Hassati application.

Our product focuses on assisting students in finding suitable tutors and giving tutors the opportunity to reach out to more students.

1.3 Brief Description of The Approach

Dhyaa system was developed using Agile approach, which is an iterative and incremental software development methodology that emphasizes flexibility. We used Dart language and Flutter framework to create an Android mobile application, as well as JavaScript, HTML, and CSS to create the website for the admin. Firebase was used as a real-time NoSQL database for managing user data.

Before starting the design phase, we conducted a requirement elicitation process by interviewing private tutors and students to understand their needs. This helped us to identify the features and functionalities required for the system.



After gathering requirements, we planned the development phase and started working on the incremental agile approach. The agile approach allowed us to make changes and adapt to any challenges that occur during development. At the end of each sprint, we performed acceptance testing and integration testing to measure both team and application performance.

We used several tools during development, including Android Studio IDE for coding, GitHub for version control, and Jira software for project management. Additionally, Dhyaa application was integrated with the Moyasar API to facilitate payment for lessons.

1.4 The main contribution and solution

Dhyaa is an Android mobile application that addresses the challenge of connecting private tutors and students effectively. It offers a user-friendly platform where students can search for tutors and book lesson appointments. Tutors can manage their availability and receive appointment requests. Dhyaa facilitates flexible working hours for tutors and enhances their work experience. It streamlines the process of private tutoring, making it more accessible and convenient for both students and tutors. Users can rate and review each other and communicate through messaging. This solution has a significant impact, especially in Saudi Arabia, where private tutoring is prevalent. Dhyaa has the potential to expand globally and make private tutoring accessible to more people worldwide.

Dhyaa differentiates itself by focusing specifically on private tutoring and providing suggestions of similar tutors to students. It also integrates with Moyasar API for easy and secure payment processing. The website administration panel allows efficient user management. Dhyaa fills a market gap by offering a unique platform that seamlessly connects private tutors and students, providing convenience and accessibility.

1.5 Scope

Dhyaa is an Android-based mobile application that supports Arabic language. It's an application that makes it easy for students who struggle to connect with expert tutors for in-person or online lessons. It permits students to search based on a wide variety of subjects, different hourly rates, ratings, session types (in-person or online), and any location of their choosing. Dhyaa recommends different tutors to assist students in finding the ideal tutor. Also, it can be easy for students to compare different tutors by looking at their ratings, reviews, and experience and by chatting with a potential tutor for inquiries. It also allows students to add a



review after the lesson and pay them easily through the application. On the other hand, it helps tutors as well to reach the largest number of students to share their experience as an expert and earn money based on their availability, they can also answer students about their inquiries, as well as rate their experience with the student and give them comments.

1.6 Report Structure

The report is organized into 10 sections.

1-Introduction: An overview of the general problem and domain area that Dhyaa addresses.

2-Background: An explanation of the topics encountered during the development of Dhyaa.

3-Literature Review: A comparative analysis of Dhyaa and its competitors.

4-System Design and Development: This section includes the methodology, system requirements, system design, data design, interface design, and implementation sections.

5-System Evaluation: This section includes user acceptance testing, quality attributes, and a discussion of the evaluation results.

6-Conclusion and Future Work: A summary of the software development process, the importance of the developed technology, the implications on the world, the challenges encountered, the limitations of the system, the main contribution of Dhyaa, and future work.

7-Acknowledgments: A section to acknowledge the people or organizations that contributed to the development of Dhyaa.

8-References: A section where sources cited in the report are listed.

9-Appendix: Additional information that supports the report but is not essential to its understanding.



2 Background

2.1 Private Tutor

The term "private tuition" first appeared in the nineteenth century, but it was not until the twentieth century that it began to emerge, thanks to widespread economic growth. Private tutoring is defined as "tutoring services provided by tutors accredited or certified." [2]

There are two types of private tutoring, face-to-face tuition, which means will tend to find that sessions take place in their home with their tutor, but lessons can be arranged at a different location, such as a local library, and online tuition is a way of teaching a student one-on-one, using an online communication platform (such as zoom), Just like in-person lessons, very little is needed for online tuition, only a stable internet connection and a device that has a microphone and video software.

The current tutoring platforms have limitations that prevent them from fully serving the needs of both students and tutors, we aim to be a strong competitor in the tutoring market by offering an improved platform. Our focus is on providing easy booking, secure payment, convenient availability management for tutors, and personalized tutor recommendations for students.

2.2 Recommender System

Recommender systems are software tools and algorithms that analyze user data and make recommendations to users [3]. These systems are used in a wide range of applications, such as e-commerce websites and music streaming services, to help users discover new products or items they might be interested in.

2.3 Types of Recommendation Systems

There are three types of recommendation systems, Collaborative-Based, Content-Based, and hybrid.

The Collaborative-Based method is based on gathering and analyzing data on user behavior. This includes the user's online activities and predicting what they will like based on their similarity with other users. For example, if user A likes Apple, Banana, and Mango while user B likes Apple, Banana, and kiwi, they have similar interests. So, it is highly likely that A would like kiwi and B would enjoy Mango. This is how collaborative filtering takes place [4].



On the other hand, Content-based recommendation system methods are based on the description of a product and a profile of the user's preferred choices. In this recommendation system, products are described using keywords, and a user profile is built to express the kind of item this user likes. For instance, if a user likes to watch movies such as Iron Man, the recommender system recommends movies of superhero films. The central assumption of content-based filtering is that you will also like a similar item if you like a particular item [5].

In Hybrid recommendation systems, products are recommended using both content-based and collaborative-based simultaneously to suggest a broader range of products to customers. This recommendation system is up-and-coming and is said to provide more accurate recommendations than other recommender systems [6].

Dhyaa application will have a content-based recommendation system for the following reasons:

- No data from other users is required to start making recommendations: Unlike collaborative-based method, content-based method doesn't need data from other users to create recommendations. Once a user has searched on and browsed a few items or completed some purchases, a content-based filtering system can begin making relevant recommendations [7].
- Improved relevance: A content-based system can recommend tutors based on relevant attributes such as subject matter expertise, location, session type. This can help to ensure that the recommended tutors are a good match for the specific needs and preferences of the students [8].
- Reduced reliance on user data: A content-based system can make recommendations based on the attributes of the tutors rather than relying solely on user data such as previous ratings or feedback. This can make the system more robust and less susceptible to biases or fluctuations in user behavior [9].

2.3.1 Content-based algorithms

There are several algorithms that can be used to implement content-based recommender systems. Here are some common approaches:



- **Product Similarity (Item-Item Filtering):** Product similarity is a recommendation system technique that recommends products to a user based on similarities between previous products with which they have interacted. It works by locating and recommending products that are like those with which the user has interacted [10].

There are several similarity measures that can be used to calculate the similarity between products. Some of the commonly used measures are:

1. **Minkowski Distance:** Minkowski distance is a generalized distance measure that calculates the distance between two points based on the p-norm of the differences between their coordinates. It can be used for clustering and classification tasks. A real-world example of using Minkowski distance is in image processing, where it can be used to compare the similarity of two images [11].
2. **Manhattan Distance:** Manhattan distance is a distance measure that calculates the distance between two points by summing the absolute differences between their coordinates along each dimension. It is commonly used in machine learning for clustering, classification, and regression tasks. Manhattan distance is commonly used in urban planning, where it can be used to calculate the distance between two points in a city grid [12].
3. **Euclidean Distance:** Euclidean distance is a distance measure that calculates the distance between two points in a straight line. It is commonly used in machine learning for clustering, classification, and regression tasks. An example of using Euclidean distance is in geographical applications, where it can be used to calculate the distance between two points on a map. [13].
4. **Cosine similarity:** is a measure of similarity that can be used to compare documents or, say, give a ranking of documents with respect to a given vector of query words. Let x and y be two vectors for comparison. Using the cosine measure as a sim (x, y)
$$= \frac{x \cdot y}{\|x\| \|y\|}$$
 [14].

We choose Cosine similarity as our similarity measure as Cosine similarity can be a useful similarity measure to use in a recommender system for the following reasons:



- It can measure the similarity between the interests of tutors based on their attributes, such as subject, session type, and location. This information can be used to match students with tutors who are a good fit.
- It is a well-established similarity measure that has been widely used in recommender systems and has demonstrated good performance in many applications.
- It is computationally efficient, making it a practical choice for a tutoring application that may need to make real-time recommendations to users.

2.4 Payment gateway

Dhyaa offers online payments, which are “payments that are initiated over the internet for goods or services purchased either online or offline.” [15].

A third-party payment gateway opens a door for services for both iOS and Android apps; even though it has nothing to do with the digital purchases itself, these services must be integrated into the application. This integration is made through several steps and involves the several components that are listed below:

- **Client SDKs:** “Client-side SDKs are designed to be used in applications that your users run directly on their own devices, such as mobile, desktop, and web applications.” [16]
- **Server SDKs:** “Server-side SDKs are designed to be used in server-side applications such as web servers and backend services that you run on your own servers.” [17].
- **APIs:** “The gateway API keys help configure SDKs and libraries as an important part of building your payment gateway integration in mobile applications. That is, organized around REST, if sellers are eager to exercise more control over the checkout experience, they have to go for APIs.” [18].
- **Third-party apps:** “Third-party payment processors (sometimes referred to as payment aggregators) are entities that allow merchants to take online or credit card payments without the need to set up their own merchant accounts” [19].

2.4.1 Payment service providers

- **PayPal:** A widely used payment gateway that allows businesses and individuals to accept payments online. It offers a range of payment solutions, including credit card payments, bank transfers, and mobile payments, and supports multiple currencies [20].



- **Stripe:** Stripe is another popular payment gateway that offers a range of payment solutions, including credit card payments, bank transfers, and mobile payments. It also supports multiple currencies and offers fraud detection and prevention features [21].
- **Moyasar:** is an online payment gateway that allows businesses and individuals to accept online payments in Saudi Arabia. It was founded in 2014 and is based in Riyadh, Saudi Arabia. Moyasar offers a range of payment solutions, including credit card payments, bank transfers, and mobile payments, and supports multiple currencies, including Saudi Arabian Riyal (SAR), US Dollar (USD), and Euro (EUR) [22].

Choosing a payment gateway for an application depends on several factors, such as the target market, the payment methods we want to support our users, and the fees and features the payment gateway offers. For Dhyaa we choose Moyasar as our payment service provider. Here are some reasons why we choose Moyasar as our payment gateway:

1. **Multiple payment methods:** Moyasar supports a range of payment methods, including credit cards, bank transfers, and mobile payments. This can help to increase the convenience and accessibility of your application for our customers [23].
2. **User-friendly dashboard:** Moyasar offers a user-friendly dashboard that allows us to manage our payments, view transaction history, and generate reports.
3. **Compliance with international security standards**
4. **Competitive pricing:** Moyasar offers competitive pricing for its payment solutions, with no setup fees and low transaction fees [24].



3 Literature Review

The traditional method of finding a private tutor is time and effort-consuming. It is a difficult process for both the tutor and the student. Modernly, it has become easier and more suitable with the help of mobile applications. We will discuss similar projects related to our project to build an application capable of providing the best services and user experience to both students and tutors. We will evaluate these apps based on their features, visual and interaction design.

Modarby:

<https://www.modarby.com/en/our-app> [25]. Modarby is a mobile application that is considered the number one tutoring platform in the Middle East. Modarby aims to provide the best services for students and tutors for personal or online sessions.

Student features:

- **Register:** It allows students to sign up by filling in their (name, place of residence, and phone number). It allows students to sign in with their phone number and a four-digit passcode.
- **Search for suitable tutors:** Searching for suitable tutors can be done through a menu where students can select a topic from the displayed menu; the menu only displays tutors based on the subjects they teach.
- **Chat with potential tutors before booking a lesson:** A message will be sent by clicking on the tutor profile and then clicking on the send message button.
- **Booking a lesson:** Booking a lesson is done by clicking the booking button on the tutor profile, the lessons are categorized as less than 4 hours (single lessons) or more (package lessons) the lesson is not considered booked unless paid for the lessons can be sat online or in person.

Tutor Features:

- **Register:** A tutor can register by filling in necessary information (degree, university, time available) Modarby gives the tutor the chance to choose whether a student can immediately book them, or the tutor must agree first.



- **Verify identity:** Verifying the tutor's identity is done through a video call with the admin of the system (passport, identity document) must be shown and verified by the admin.
- **Advantages:** Modarby provides gifts for new joiners like free lessons, there is a clear refund policy to avoid confusion or any conflict with students, and it provides a payment history to keep track and avoid repudiation, overall, the application was easy to navigate through, and having the contact support icon in the middle of the footer provided a sense of trust to the application.
- **Disadvantages:** Students could only sign up with their phone number. There aren't alternatives like emails, and the verification is via WhatsApp, which makes it impossible for students who don't have WhatsApp to sign up, and it can make users hesitant and make the application seem untrustworthy. The homepage seemed crowded, and the font sizing seemed to be small, on the other hand, the error messages were vague and unclear.

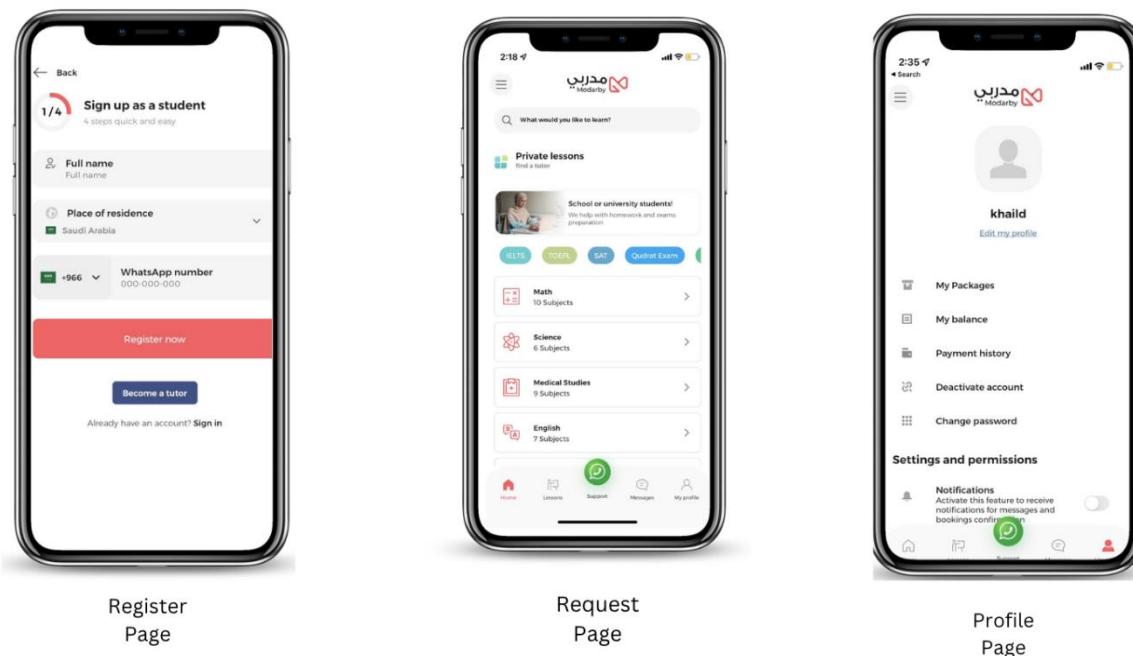


Figure. 1 Modarby Application



Hessati:

<https://hessati.com/> [26]. Hessati is a mobile application that allows students to order a tutor for a personal or online session for all educational levels, it provides an accessible way to find different tutors.

Student features:

- **Register:** It allows students to register by filling in the necessary info (phone number, email, name).
- **Search for a suitable tutor:** It doesn't give the student a chance to search for a specific tutor, but the student can choose the gender or course, and based on that, it will display the available tutors at the time.
- **Chat with potential tutor:** It does not allow the student to chat with a tutor.
- **Booking a lesson:** You can book a lesson by approving the tutor. The lesson is considered booked even if it hasn't been paid for, and the student can cancel at any given time.

Tutor features:

- **Register:** A tutor fills in the name, email, location, phone number, major, degree, and bank information to create a profile.
- **Verify identity:** A copy of (the identification document, and degree) must be uploaded into the app to verify the account.
- **Advantages:** It allows students to suggest a subject that isn't on the menu; it also allows the user to pay later considering it as a debut, which can be an advantage to the student but a disadvantage to the tutor.
- **Disadvantages:** It doesn't allow students to choose a suitable tutor, it displays them by who is available at the current moment in addition the navigation through the application is hard, when logging out you cannot sign up again you can only sign in limiting the number of accounts created for a single mobile.

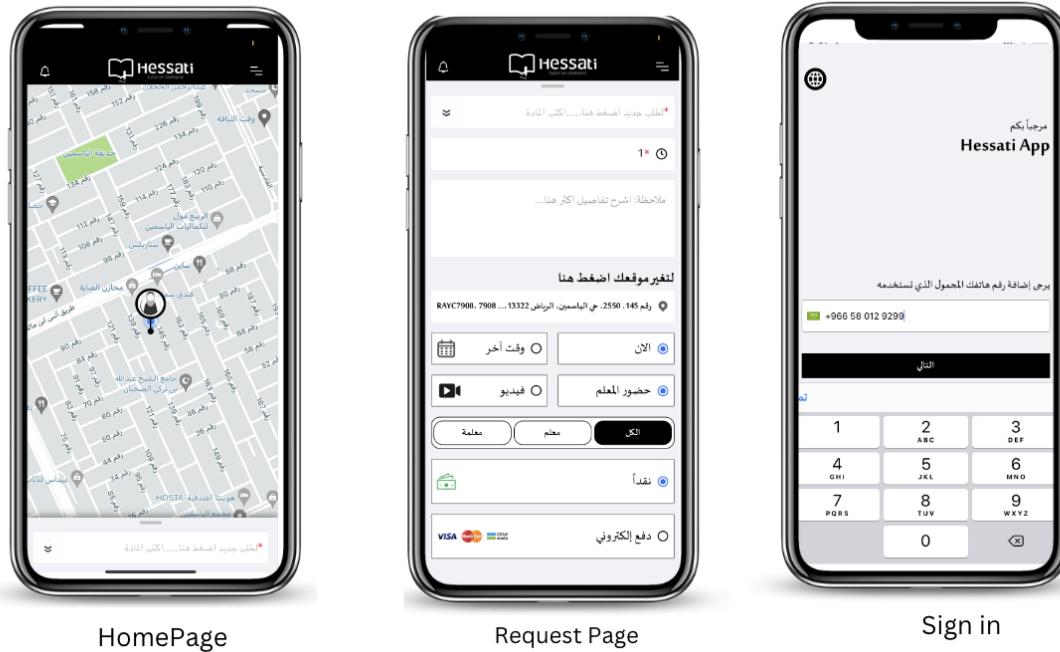


Figure. 2 Hessati Application

Fahame:

<https://www.faheemapp.com/> [27] .Fahame is a mobile application that provides highly qualified tutors for students from all levels.

Student features:

- **Register:** It allows students to register by verifying their account with their phone number. You can register as a student or a parent of a student and then choose the level of education.
- **Search for suitable tutors:** A student applies a request on what the student wants (subject, number of hours, study group or individual session), and based on that the student will be contacted by a suitable tutor.
- **Booking a lesson:** The lesson is not considered booked unless paid for, paying for the lesson is online.

Tutor features:

- **Register:** A tutor registers by filling in (phone number, name, age, degree, and online or personal tutoring).



- **Verify identity:** The process of verification is done by uploading the necessary documents (a copy of the degree, a copy of id) to their website which will be kept confidential and won't be displayed on their profile.
- **Advantages:** It allows the student to request a subject that is not displayed in the menu, also there are two types of users: students and parents of students, the interface is easy and simple, and students can request a tutor for a study group rather than a single student Faheem provides gifts and coupons for students.
- **Disadvantages:** You must sign up each time you try to access the application, Faheem does not allow its users to sign in, which is a huge disadvantage.

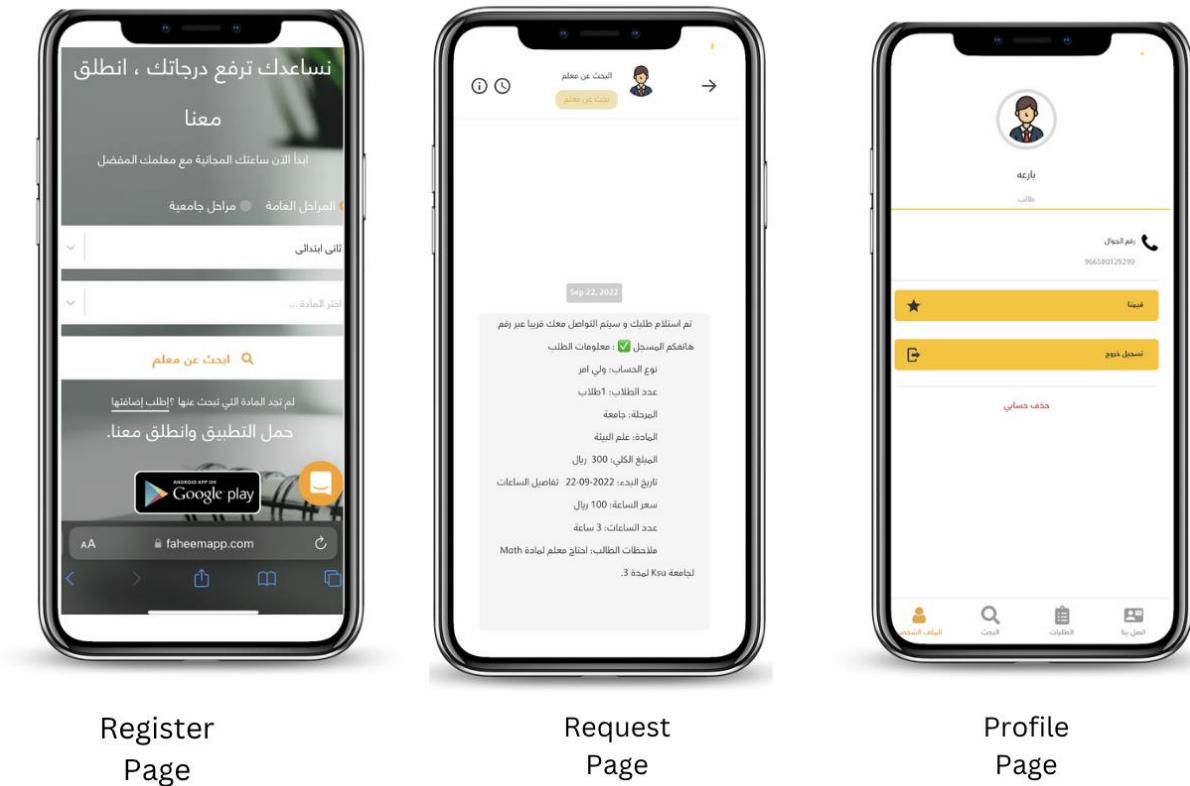


Figure. 3 Faheem Application



QuickTutor:

<https://quicktutor.com/> [28]. is a mobile application that provides everyone who is interested in learning the ability to book a session online or live, with more than 9,000 subjects and topics.

Student features:

- **Register:** It allows students to register with their phone number. Or sign in with google.
- **Search for suitable tutors:** By going to the search bar and entering the name of the topic or tutor, QuickTutor will display all suitable tutors.
- **Booking a lesson:** The student must connect with the tutor first by messaging them and after the session can be booked.

Tutor features:

- **Register:** A tutor fills in required information (phone number, hourly rate, email, topic) a tutor can add up to 20 topics.
- **Verify identity:** The process of verification is done by uploading the necessary documents and having a video chat with the admin of the system.
- **Advantages:** It provides many topics academic and non-academic such as skills and hobbies like makeup, food supplements, auto repairs, and many more. It displays newly joined tutors which allows new joiners to be recognized. QuickTutor also rewards any user who finds bugs or technical issues with the platform with \$10.00, and \$25.00.
- **Disadvantages:** To book a session the users must contact the tutor first, the messaging feature only allows the user with limited sentences such as “Hello, I want to connect with you” and afterwards tutor can accept or decline, this limits the student and can be a waste of time especially if the student is in a hurry.

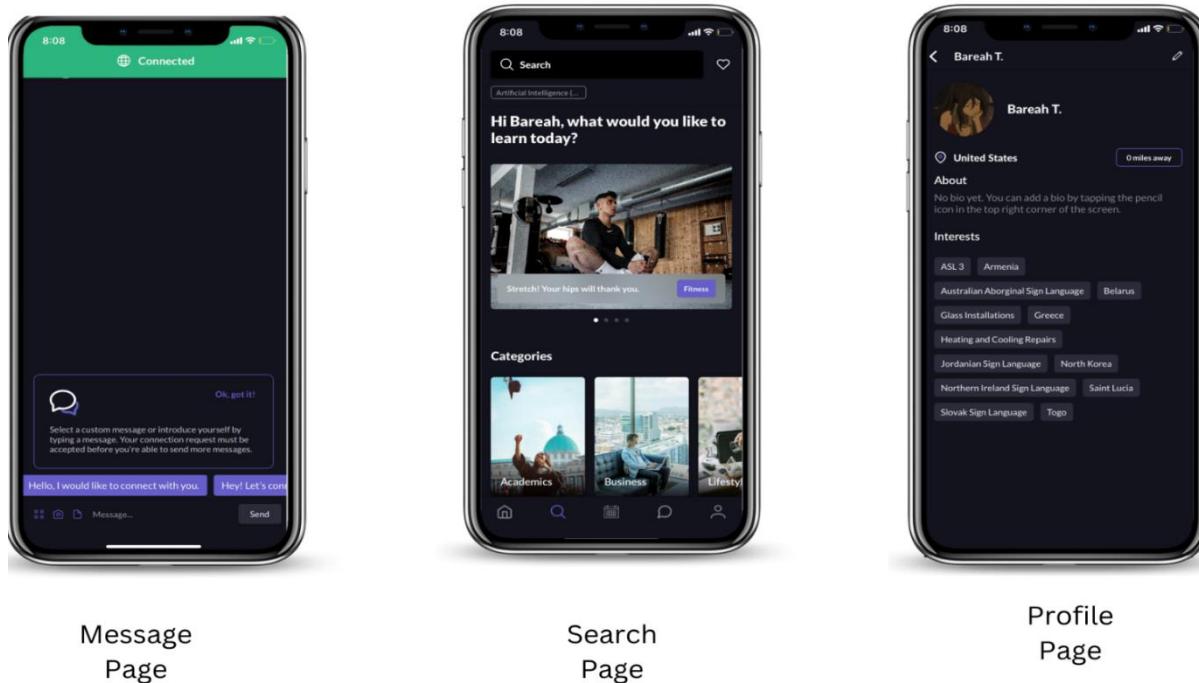


Figure. 4 QuickTutor Application

Kadama:

<https://www.kadama.com/index.html> [29] .is a mobile application that provides homework and helps with exams and tutoring sessions.

Student features:

- Register:** It allows students to register with their phone number, Email and password.
- Search for suitable tutors:** By going to the search page and clicking on the subject from the displayed subject. It will connect the students with suitable tutors.
- Booking a lesson:** The student must connect with the tutor first by messaging/calling them and afterwards the session can be booked.

Tutor features:

- Register:** A tutor fills in the required information (phone number, email, topic).
- verification:** There is no verification process.



- **Advantages:** It provides many topics such as music, Tech, and science. It provides students with gifts; students can earn dollars by opening the app daily. 100% money-back guarantee if the student is not satisfied.
- **disadvantages:** The interface is crowded; the colors are dark and there is no light mode. The application was very hard to navigate through, it does not display all suitable tutors, it only displays online tutors which is a huge disadvantage.

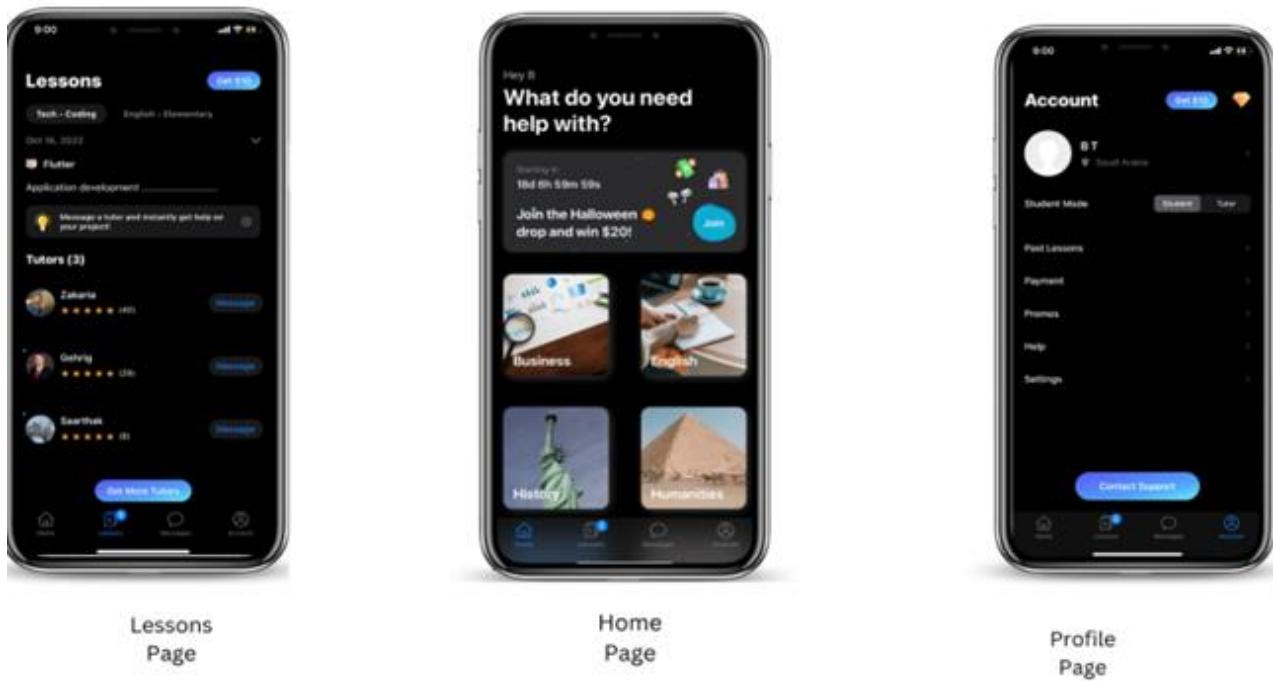


Figure. 5 Kadama Application



3.1 Competitive Product Analysis

Table 1 Competitive Product Analysis

Features	Applications					
	Modarby	Hessati	Fahame	QuickTutor	Kadama	Our App (Dhyaa)
Search for tutors by filtering	✓		✓	✓		✓
Send and receive direct messages (DM)	✓			✓	✓	✓
Rate tutors and add review	✓			✓	✓	✓
Rate Students	✓			✓	✓	✓
Contact the admin of the system	✓	✓	✓	✓	✓	✓
Recommend suitable tutors for students				✓		✓
Support Arabic Language	✓	✓	✓			✓
Support IOS	✓	✓	✓	✓	✓	
Support Android	✓	✓	✓	✓	✓	✓

To Sum up, we analyzed and compared systems in the market that are like our system to provide a vision of possible features. This could also benefit us in applying similar technologies that similar systems have already done to see what distinguishes and make our application stand out. Allowing users to search for tutors, contact system administrators, and rate tutors, send direct messages, are common features in many tutoring applications, such as (Modarby, QuickTutor). However, providing tutors with the opportunity to rate students and manage their availability, as well as recommending suitable tutors for students, is not as common as the other features, these features will make our system stand out among competitors.



4 System Design and Development

4.1 Methodology

4.1.1 Agile Approach

Dhyaa was developed using the agile software development process, which allows developers to deliver value to customers faster and with fewer issues through continuous evaluation of requirements, plans, learning, and results. The development process is divided into small iterative phases called sprints, and Dhyaa was produced in five sprints [30].

4.1.2 Scrum Framework

We adopted the Scrum framework that emphasizes teamwork, accountability, and iterative progress where everyone plays a role toward a well-defined goal.

Software development Scrum roles include the 3 following roles:

- **Product owner:** This person serves as the liaison between the development team and its customers. The product owner is responsible for ensuring that expectations for the completed product are communicated and agreed upon.
- **Scrum Master:** The Scrum Master is referred to as the project facilitator. They ensure Scrum best practices are followed. They must be good leaders and project managers, skilled at collaboration, conflict resolution, and process improvement.
- **Development team:** Members of the Scrum development team work together to create and test incremental releases of the final product. Developers must know Scrum and Agile development practices [31].

The Scrum process encourages practitioners to work with what they have and continually evaluate what is or is not working. Good communication is essential and is carried out through meetings, called "events." Scrum events include the following 5 events:

- **Daily Scrum:** This event is a short, stand-up daily meeting that takes place in the same place and time each day. In these meetings, the team reviews work accomplished the previous day and plans what will be done in the next 24 hours. This is the time when team members discuss problems that might prevent project completion.



- **Sprint:** A Sprint is the time frame in which work must be completed, often 30 days. New Sprints start right after the end of the previous one.
- **Sprint Planning Meeting:** In these meetings, everyone participates in setting goals. Finally, at least one increment -- a usable piece of software -- should be produced.
- **Sprint Review:** This is the time to show off the increment.
- **Sprint Retrospective:** A Sprint retrospective is a meeting held after a Sprint ends. During this meeting, everyone reflects on the process. A team-building exercise may also be offered. An important goal of this event is continuous improvement. [32]

In Scrum product development, 3 artifacts are used to see what has been done and what is still in the queue. It is useful to look at Scrum artifacts in Sprint Planning Meetings. Scrum artifacts include the following:

- **Product backlog:** This refers to what remains to be done. During a product backlog grooming session, the development team works with the business owner to prioritize work that has been backlogged. The product backlog may be fine-tuned during a process called backlog refinement.
- **Sprint backlog:** This is a list of tasks that must be completed before selected product backlog items can be delivered. These are divided into time-based user stories.
- **Product increment:** This refers to what has been accomplished during a sprint, all the product backlog items as well as what's been created during all previous sprints. The product increment reflects how much progress has been made. [32]

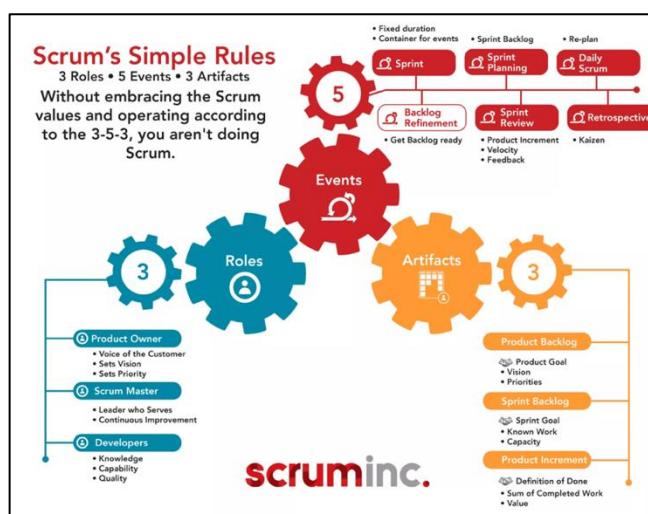


Figure. 6 Scrum Simple Rules



4.1.3 Agile and Scrum in Software Development

During the sprint, the team gathers for a brief stand-up meeting to review progress weekly, talk about any obstacles, and decide whether any changes to the plan are necessary. The team gathers for a sprint review meeting at the end of the sprint to present the finished product and gather feedback. To review the sprint and find areas for improvement, the team also holds a sprint review meeting. The team places a strong emphasis on cooperation and open communication throughout the Scrum process, frequently working together to complete tasks and giving feedback to one another. This makes it more likely that the team will stay on task and be able to complete the sprint's work in a high-quality manner. Overall, the Scrum framework and Agile principles support an adaptable, cooperative, and iterative approach to software development that enabled us as a team to respond quickly and effectively to changing requirements.

4.1.4 Jira and GitHub

Tools we have used:

- **Jira:** is a powerful work management tool that provided us with scrum boards, which allowed us to manage the distribution tasks between the team members, organize and track our project, store the product backlog, document all the meetings with the supervisor, sprint reviews, and any submitted documents.¹
- **GitHub:** is an open-source repository hosting service. It helps the team to push, pull the changes on their code to collaborate on it together. It also keeps track of the various changes made by other team members. ²

¹ Jira is accessible through: <https://graduationproject-2022.atlassian.net/jira/software/projects/PJ2022/boards/1>

² Dhyaa system GitHub repository: <https://github.com/Halalmohareb/2022-GP1-16>



4.2 System Requirements

4.2.1 System Users

There are different types of users interacting with Dhyaan application.

Administrator: The person responsible for managing users' accounts.

Student: The person who needs a tutor and is interested in a particular subject.

Student parent: The person who needs a tutor for their children.

Tutor: The person who has sufficient knowledge and experience in the teaching field.

Table 2 System users

Characteristic/User	Administrator	Student	Student Parent	Tutor
Age	Above 18	Above 16	Above 18	Above 18
Language	Arabic language			
Educational level	Bachelor's degree or equivalent	Nothing specific	Nothing specific	Associate degree or equivalent
Technical expert	Medium	Basic		Medium
Platform	Website	Android application		

4.2.2 Requirements Elicitation and Analysis

For requirements elicitation, we have decided to use both interviews and a questionnaire as our requirements elicitation methods since questionnaires are fast, inexpensive means and can help us to cover a big slice of audiences (students and tutors) in a short time. As for the interviews, we will be able to collect more information and there is less chance of misinterpretation since confusion can be clarified instantly by asking questions further on. This will allow us to understand our users' knowledge and needs better. More details of the interviews and questionnaire will be provided in Appendix B. For student questionnaires, we constructed a survey by using Google Forms. Our survey consists of 5 questions and was distributed through the internet so users can answer it easily from that survey, we received 72 responses. To indicate the difficulties users face, we asked them if they struggled with understanding a certain subject or found any difficulties with homework, and if they find it difficult to find a suitable tutor. We found that 98.6% have difficulties with understanding a certain subject or with homework and 55.6% struggle to find a suitable tutor and 2.8 % do not suffer at all.



To develop a solution that could help students with these difficulties, we asked them if they would be interested in an app that recommends a list of tutors depending on their needs. And we found that 91.7% were interested in an application that displayed a list of tutors. We also asked them if they found other students' feedback useful when looking for a private tutor. And 80.6% find this feature very useful. Additionally, we also distributed another survey using google forms, which targets tutors. Our survey consists of 5 questions and was sent through different social platforms so it can reach many of our targeted users easily, we received 35 responses. Firstly, we asked the tutors if they would be interested in giving private lessons in the first place 62.9% were interested in becoming private tutors, 22.9% responded with maybe and 14.3% were not interested. Then if we asked if they struggle with finding new students and 71.4% seemed to have this struggle which is most tutors. Then we asked if they struggle with last-minute cancellations to whether it was a problem that we need to solve, we found out that 60% of tutors struggle with it 22.9% are sometimes struggling with it, and 17.1% do not struggle with it at all. However, we asked about payments, and if they have trouble with receiving payments from students, 62.9% answered with yes, 25.7% answered sometimes, and 11.4% answered no, therefore, we considered the online payment feature as one of the important features of the Dhyaa application would provide. Lastly, we asked whether they are interested in an application that links them with students based on their availability and takes care of lesson payments. We figured that 80% of tutors were interested, which is huge. For student interviews, we found that students watched educational YouTube channels whenever they struggled with their studies, sought private tutors, or asked friends for help. And they have different methods of finding a private tutor, including asking relatives, friends, and neighbors. We can consider some of these methods as similar systems, such as educational platforms and applications. And they must know about the tutor's previous experience and knowledge of his specialty, gender, and commitment. Most of them have difficulty finding a private tutor with a good price, a nearby location, and a high level of efficiency. Additionally, some of them want more than one payment option. To take advantage of the advantages and disadvantages of our competitors, we asked the interviewees if they had experience with similar applications. We found that 2 of the interviewees had used tutoring applications. They liked the fact that they could have online lessons and the layout was simple and clear. However, what they disliked was that these applications required annual or monthly subscriptions, and the high price. finally, the Interviewees were strongly interested in our application since it would help them



find tutors more easily and achieve their academic goals. Moreover, we also interviewed some private tutors. We figured out the private tutors' struggles with lesson cancellation and the distance between the student house and their locations. Some find it hard to manage their availability with students. We also figured that private tutors would love to have a profile containing their students' feedback to honor what they are giving. Most of the private tutors were excited about the idea of having a platform only concerned with the service they provide.

4.2.3 User Interactions



Figure. 7 User Interactions



4.2.4 Roadmap and Product Backlog

4.2.4.1 Roadmap:

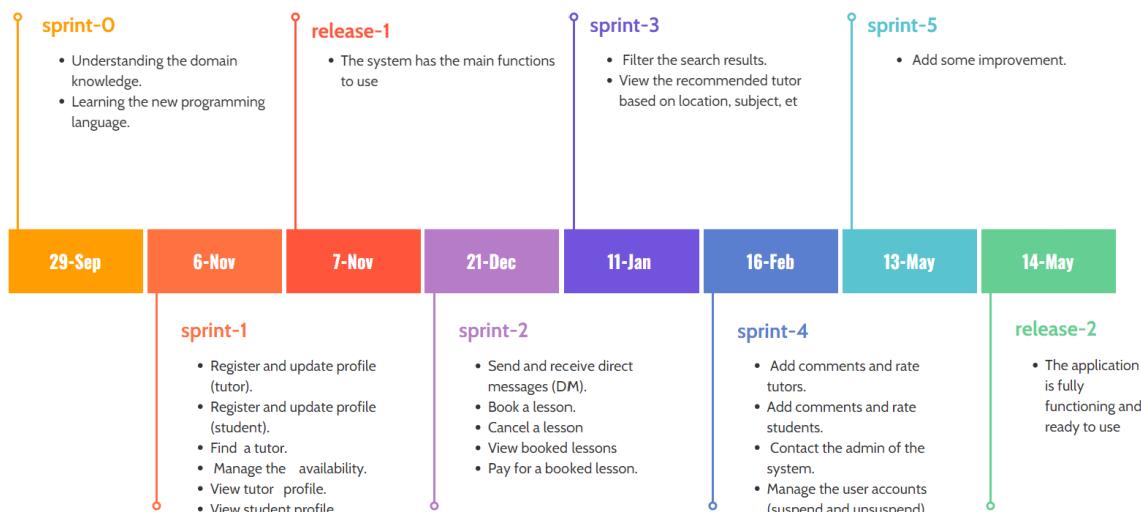


Figure. 8 Roadmap

4.2.4.2 Product Backlog:

Table 3 Product Backlog

ID	PBIs (User Stories)	Size	Type	Status	Acceptance Criteria
1	As a tutor, I want to be able to sign-up for the system so that I can have an account in the Dhyaa application and use its features.	2	feature	Done	<p>As a tutor if I go to the sign-up page and enter my username, email, password, phone number, one or more subjects, major, and city, address, session type and price then click on register button, then I should have an account in Dhyaa application, and a confirmation message should appear.</p> <p>If I did not enter one or all the following</p>



					<p>username, email, password, phone number, one or more subject, major, and city, address, session type and price and click then an error message should appear.</p> <p>If I enter an already used email, then an error message should appear.</p> <p>If I enter an invalid email format, then an error message should appear.</p> <p>If I enter a password that's less than 8 characters and/or has not at least one letter and/or has no numbers, then an error message should appear.</p>
2	<p>As a student, I want to be able to sign-up for the system so that I can have an account in Dhyaa application and use its features.</p>	2	Feature	Done	<p>As a student if I go to sign up page and enter my username, email, password, phone number and city/address and click on sign-up button, then I should have an account in Dhyaa application, and a confirmation message should appear.</p> <p>If I did not enter one or all the following username, email, password, phone number and city/address and click on sign-up</p>



					<p>button then an error message should appear.</p> <p>If I enter an invalid email format or an already used email, then an error message should appear.</p> <p>If I enter an already used username, then an error message should appear.</p> <p>If I enter a password that's less than 8 characters and/or has not least one letter and/or has no numbers, then an error message should appear.</p>
3	<p>As a registered user in Dhyaa application, I want to be able to sign-in to my account so that I can use the application's features.</p>	2	Feature	Done	<p>As a registered user</p> <p>If I go to sign-in page and click on sign-in button, select my role, and enter my Email, and password correctly then I should be signed into my account in Dhyaa application.</p> <p>If I go to the sign-in page, click on sign-in button, select different role or enter an Email or/and password wrong, then I won't be able to log in and an error message should appear.</p>
4	<p>As a registered tutor in Dhyaa application, I want to be able to update my profile information so that I can</p>	2	Feature	Done	<p>As a registered tutor</p> <p>if I go to the account page and</p>



	provide the latest update on my information to my students.				click on update my information and change phone number, major, subject and city, address, type of session and price, bio and click on update button, then my information should be updated, and a confirmation message should appear.
5	As a registered student in Dhyaa application, I want to be able to update my profile information so that tutors have the latest update on my information	2	Feature	Done	As a registered student If I go to profile page and click on edit profile and change phone number or city/address, bio, picture, and click on update button, then my information should be updated, and a confirmation message should appear.
6	As a registered student in Dhyaa application, I want to be able to view my profile information so that I can check if my information is correct.	1	Feature	Done	As a registered student If I go to the profile page and click on view my profile, then my profile should be displayed.
7	As a registered tutor in Dhyaa application, I want to be able to view my profile information so that I can check if my information is correct.	1	Feature	Done	As a registered tutor If I go to the profile page and click on view my profile, then my profile should be displayed.



8	<p>As a registered tutor in Dhyaa application, I want to be able to add my availability, so that my student can book a suitable appointment.</p>	3	Feature	Done	<p>As a registered tutor If I go to manage my availability page and click on a date and press add availability button and choose to start, end time and the repetition then a new available time should be added and available to student.</p> <p>If I enter a start time that is equal to or bigger than the end time, then an error message should appear.</p> <p>If I enter an availability time already scheduled, then an error message should appear.</p>
9	<p>As a registered tutor in Dhyaa application, I want to be able to edit my availability, so that my student can book a suitable appointment.</p>	3	Feature	Done	<p>As a registered tutor If I go to the home page and click on the manage availability button and choose a scheduled time and click on Edit Button and confirmed my edit, then the date should be edited.</p> <p>If I go to the home page and click on the manage availability button and choose a scheduled time and click on Edit Button and do not confirm my Edit, then the date should not be edited.</p>



					<p>If I enter an availability time already scheduled, then an error message should appear.</p> <p>If I enter a start time that is equal to or time that exceeds the end time, then an error message should appear.</p>
10	As a registered tutor in Dhyaa application, I want to be able to delete my availability, so that I can be unavailable to student	3	Feature	Done	<p>As a registered tutor</p> <p>If I go to the home page and click on the manage availability button and choose a scheduled time and click the delete Button and confirmed my delete, then the date should be deleted from my Schedule.</p> <p>If I go to the home page and click on the manage availability button and choose a scheduled time and click the delete Button and do not confirm my delete, then the date should not be deleted from my Schedule.</p>
11	As a registered student in Dhyaa application, I want to be able to search for tutors, so that I can find a suitable one for me.	8	Feature	Done	<p>As a registered student</p> <p>If I go to the search bar on the home page and search for a subject and click on the search icon, then a list of tutors should appear.</p>



12	<p>As a registered student in Dhyaa application, I want to be able to view the tutor's profile, so that I can decide if it fits my requirements.</p>	1	Feature	Done	<p>As a registered student, If I click on the tutors account of a specific tutor, then the tutor's information, availability time and reviews should appear.</p>
13	<p>As a registered tutor in Dhyaa application, I want to be able to view students' profiles, so that I can decide if that student will benefit from my education well</p>	1	Feature	Done	<p>As a registered student If I click on view my profile then I will be able to see my profile</p>
14	<p>As a registered student in Dhyaa application, I want to be able to book a lesson so that I can overcome any struggle.</p>	13	Feature	Done	<p>As a registered student in Dhyaa application if I click on a tutor and click on the book lesson button and fill in the required information (Subject, session type, session date and time) and pay then the lesson should be booked and added to the booked lesson page.</p> <p>If I click on a tutor and click on the book lesson button and didn't fill in all or some of the required information, then an error message should appear.</p> <p>If I click on a tutor and click on the book lessons button and fill in the required information and choose an upcoming date and did not pay then the lesson won't be booked, and an error message should appear.</p>



15	<p>As a registered student in Dhyaa application, I want to be able to view a list of my booked lessons so that I can view completed lessons and my upcoming ones.</p>	5	Feature	Done	<p>As a registered student in Dhyaa application if go to booked lessons page then a list of my booked lessons (completed and upcoming) will display.</p>
16	<p>As an administrator In Dhyaa application, I want to be able to sign-in into my administrator dashboard so that I can manage users' accounts.</p>	2	Feature	Done	<p>As an administrator</p> <p>If I enter my ID and password correctly then I should be signed in into my account</p> <p>If I enter a wrong ID and password, then an error message should appear</p>
17	<p>As an administrator In Dhyaa application, I want to be able to manage users' accounts So that I can suspend and unsuspend users.</p>	8	Feature	Done	<p>As an administrator</p> <p>If I choose a suspension reason then the user account should be suspended, user cannot sign-in , and the tutor account doesn't appear in tutors' lists.</p> <p>If I click on unsuspend button then the user can sign-in into his account, and tutor account will appear in tutors lists again.</p>
18	<p>As a registered student in Dhyaa application, I want to be able to send and receive direct messages to/from tutor so that I can inquire about any unclear points and receive tutor message</p>	13	feature	Done	<p>As a registered student in Dhyaa application</p> <p>- If I go to tutor's profile and click on chat with tutor button then chat page will be displayed.</p>



					<p>If I write a message in the text field and click on the send button, then the message should be sent.</p> <p>If I do not write anything, then the send button should be disabled.</p>
19	As a registered tutor in Dhyaa application, I want to be able to send and receive direct messages to/from students so that I can answer their inquiries and receive their messages.	13	feature	Done	<p>As a registered tutor in Dhyaa application</p> <p>If I click on the messages page, then I should be able to see the received messages.</p> <p>If I replied to a message and click send, then the message should be sent to the student.</p> <p>If I did not write anything, then the send button should be disabled.</p>
20	As a registered student in Dhyaa application, I want to be able to Filter the search results so that I can look up different tutors based on my preferences.	13	feature	Done	<p>As a registered student in Dhyaa application</p> <p>If I go to the home page and click on filter icon and filter price/city/address/session type/rate, then click on filter icon a list of tutors will appear based on my selection.</p>
21	As a registered student in Dhyaa application, I want to be able to cancel a booked lesson so that I can remove the lesson from booked lessons page in case an incident occurs.	3	Feature	Done	<p>As a registered student in Dhyaa application</p> <p>If I go to booked lessons page and clicked on cancel button and confirmed my cancelation, then the lesson should be removed from booked lesson</p>



					<p>page and a refund should be sent and notification should be sent to the student and tutor.</p> <p>If I go to booked lessons page and clicked on cancel button and confirmed my cancelation before the 24 hours, then the lesson should be removed from booked lesson page but not refundable.</p> <p>If I go to booked lessons page and click on cancel button and do not confirm then nothing will change, and the lesson will still be booked.</p>
22	As a registered tutor in Dhyaa application, I want to be able to cancel a booked lesson so that I can remove the lesson from booked lessons page in case an incident occurs.	3	Done		<p>As a registered tutor in Dhyaa application</p> <p>If I go to booked lessons page and clicked on cancel button and confirmed my cancelation, then the lesson should be removed from booked lesson page and a notification should be sent to the student and tutor.</p> <p>If I go to booked lessons page and click on the cancel button and do not confirm then nothing will change, and the lesson will still be booked.</p>
23	As a registered student in Dhyaa application, I want to be able to pay	13	Feature	Done	<p>As a registered student in Dhyaa application</p>



	for a booked lesson so that I confirm my booked lesson.				<p>If I click on the complete purchase button and enter valid card information, then an informative feedback confirmation message should appear.</p> <p>If I click on the complete purchase button and enter invalid card information, then informative feedback payment failed message should appear.</p>
24	As a registered student in Dhyaa application, I want to be able to view the recommended tutors So that I can find the most suitable tutors.	21	Feature	Done	<p>As a registered student in Dhyaa application if I click on a specific tutor then a recommendation list of similar tutors should be displayed.</p>
25	As a registered student in Dhyaa application, I want to be able to add reviews and rate tutors So that I can share my experience with other students.	5	Feature	Done	<p>As a registered student in Dhyaa application If I go to booked lessons page and click on rate lesson from completed lessons list, then a field text and rating stars should appear.</p> <p>If I click on star icon and write my review then the color of the star changes, and the review should be posted in the tutor's profile and a conformation message should appear.</p> <p>If I click on submit review without writing a comment or choosing a</p>



					number of stars, then an error message should appear.
26	As a registered tutor in Dhyaa application, I want to be able to add reviews and rate students So that I can share my experience with other tutors.	5	Feature	Done	<p>As a registered tutor in Dhyaa application if I go to booked lessons page and click on rate lesson from completed lessons list then a field text and rating stars should appear.</p> <p>If I click on star icon and write my review, then the color of the star changes and the review should be posted in the student's profile and a confirmation message appears.</p> <p>If I click on submit review without writing a comment or choosing a number of stars, then an error message should appear.</p>
27	As a user of Dhyaa application, I want to be able to contact the system administrator So that I can report spam users.	8	Feature	Done	<p>As a registered tutor in Dhyaa application</p> <p>if I click on contact support, then Dhyaa application should display contact information.</p>
28	As an administrator In Dhyaa application, I want to be able to manage users' accounts So that I can suspend and unsuspend users.	8	Feature	Done	<p>As an administrator</p> <p>If I choose to suspend an account, then all features will not be available to that account.</p>



					If I choose to unsuspend a suspended account, then all features will be available again to that account.
--	--	--	--	--	---

4.3 System Design

4.3.1 Architectural Diagram

Many architectural models can be used to specify the organization of the system. As for Android mobile applications, we found that it is commonly represented as: presentation layer, business layer, and data layer.

For the presentation layer, the main concern would be how the user feels and sees when using the application. The presentation layer contains the user interface which is concerned with overall design such as color, fonts, and placement along with the presentation logic (the user experience).

Then comes the business layer that is concerned with the logic and rules for data exchange, operations, and workflow. Generally, the business layer can exist on a server or the user device but for our application, it will be on an external server.

Lastly comes the data layer which will include all the data utilities, service agents, and data access components to support data transactions. It will be divided into two parts: Persistence which is concerned with data access with data sources via API and Network which is concerned with network communication, routing, and error reporting, in our application we used Moyasar API and EmailJs API then added them to the data layer as they are an external service.

The data layer will also contain the validation and maintenance of the data [33].



Dhyaa system Architecture

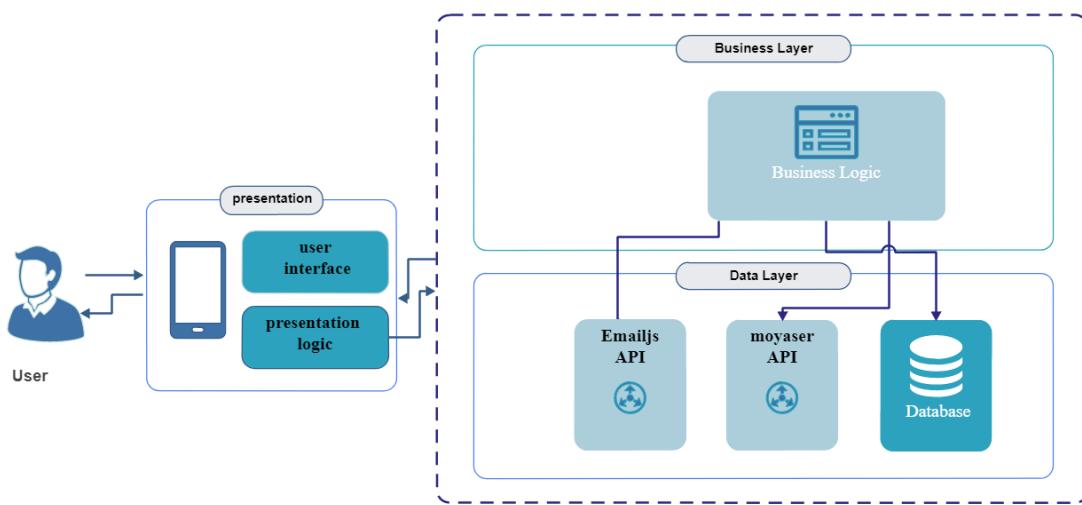


Figure. 9 Dhyaa System Architecture



4.3.2 Class Diagram

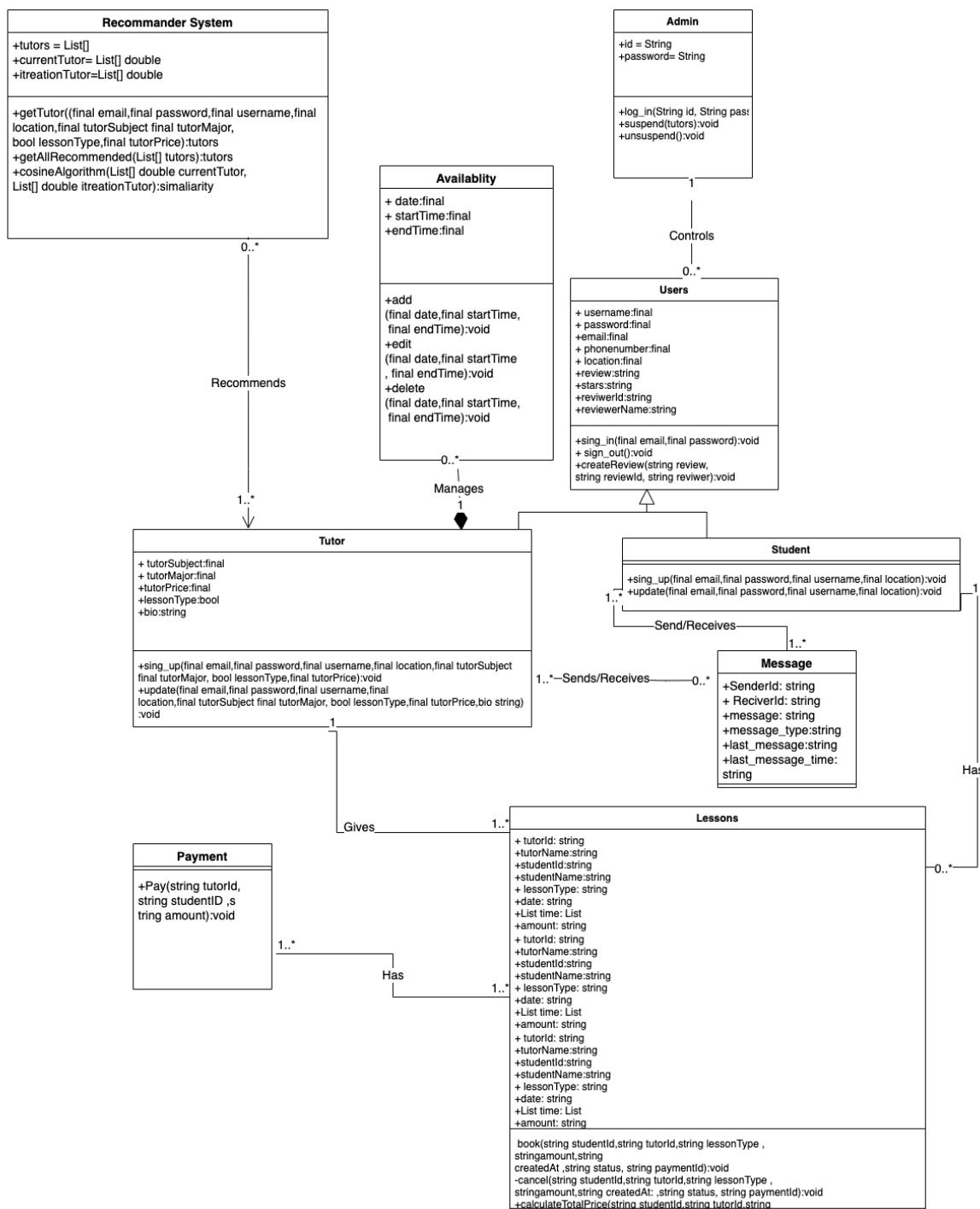


Figure. 10 Class Diagram



4.3.3 Component Level Design

ID	PBIs (User Stories)
14	As a registered student in Dhyaa application, I want to be able to book a lesson so that I can overcome any struggle.

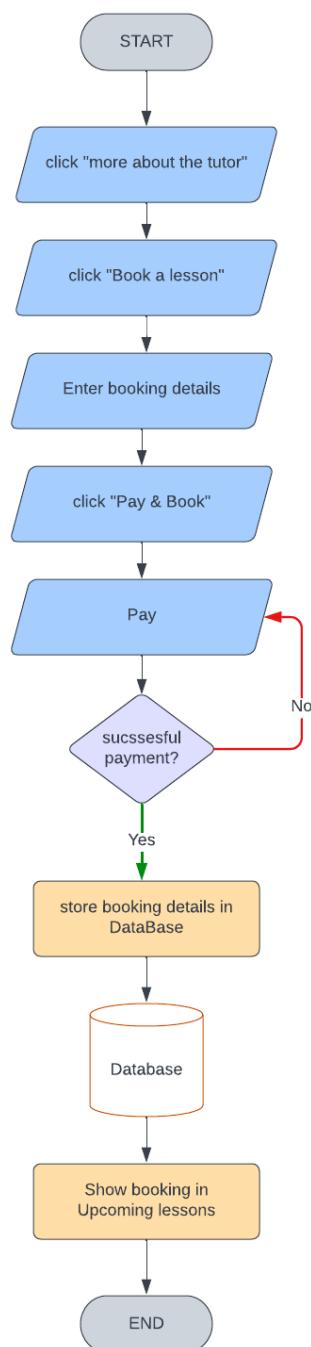


Figure. 11 Booking lesson Flowchart.



ID	PBIs (User Stories)
18	As a registered student in Dhyaa application, I want to be able to send and receive direct messages to/from tutor so that I can inquire about any unclear points and receive tutor message

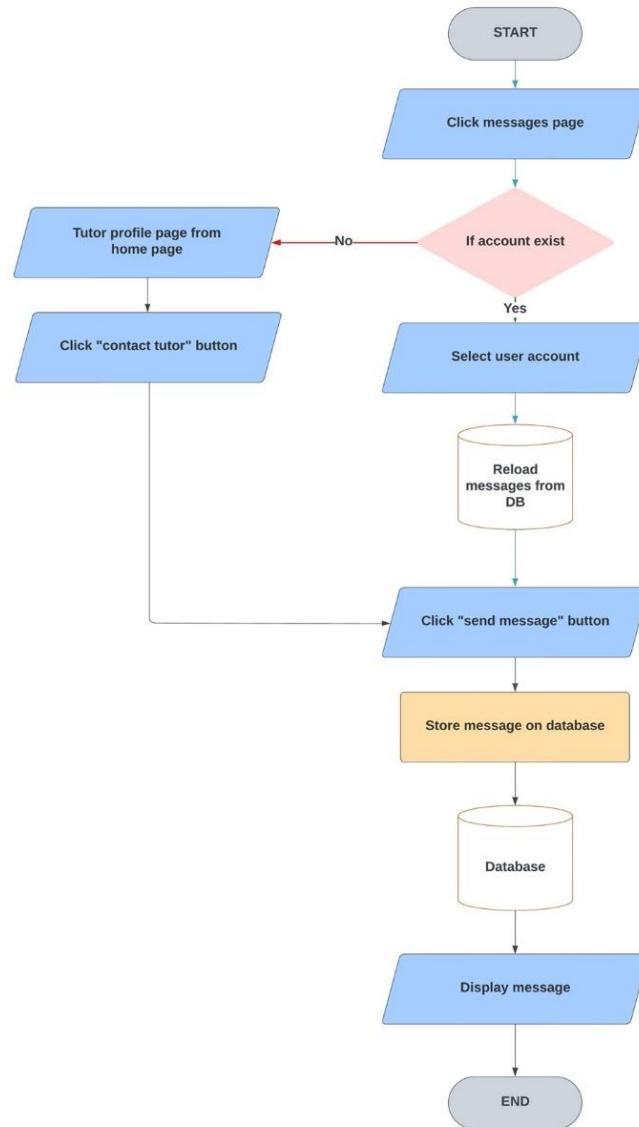


Figure. 12 Direct Message Flowchart



ID	PBIs (User Stories)
8	As a registered tutor in Dhyaa application, I want to be able to add my availability, so that my student can book a suitable appointment.

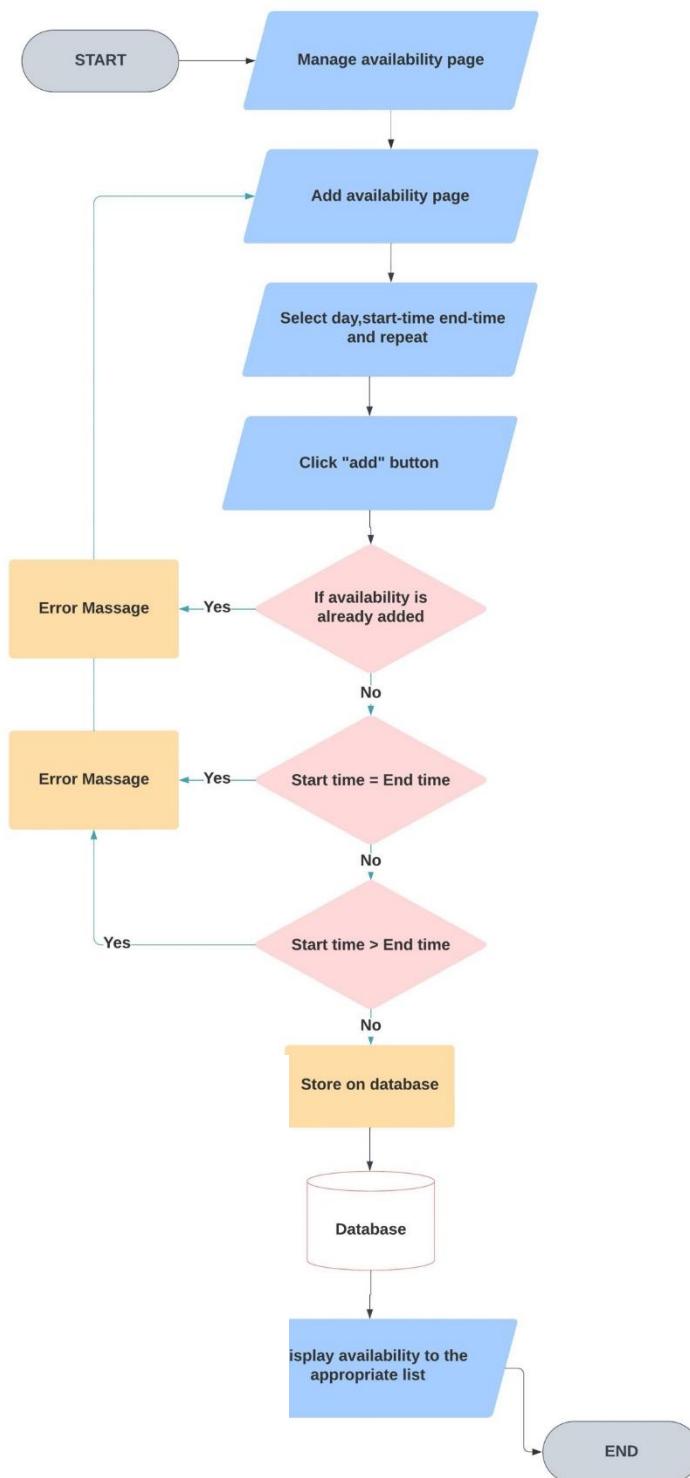


Figure. 13 Add availability Flowchart



ID	PBIs (User Stories)
25	As a registered student in Dhyaa application, I want to be able to add reviews and rate tutors So that I can share my experience with other students.

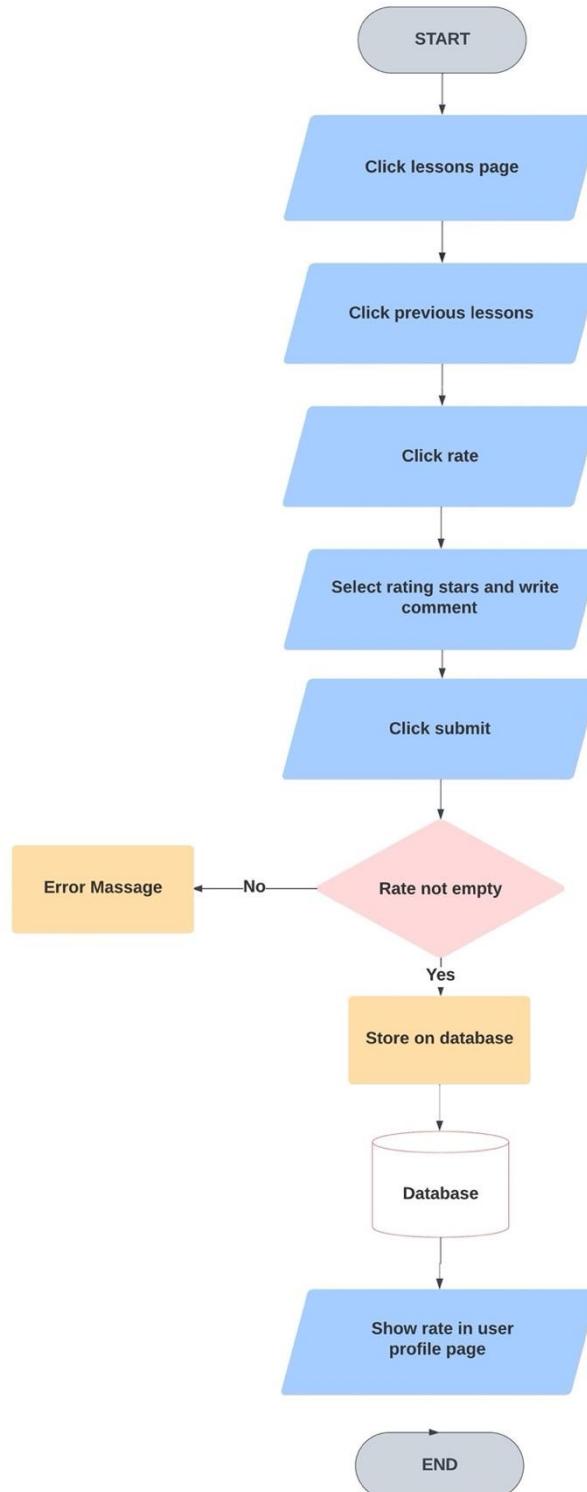


Figure. 14 Review and Rate Flowchart



ID	PBIs (User Stories)
24	As a registered student in Dhyaa application, I want to be able to view the recommended tutors So that I can find the most suitable tutors.

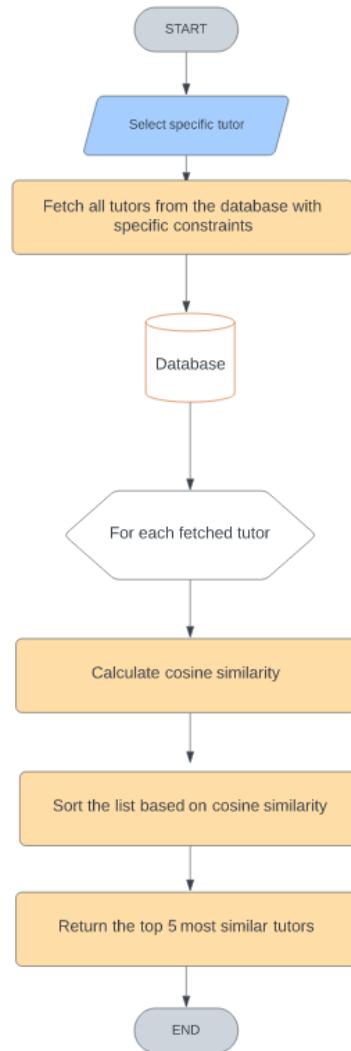


Figure. 15 Recommender Flowchart



4.4 Data Design

4.4.1 ER Diagram

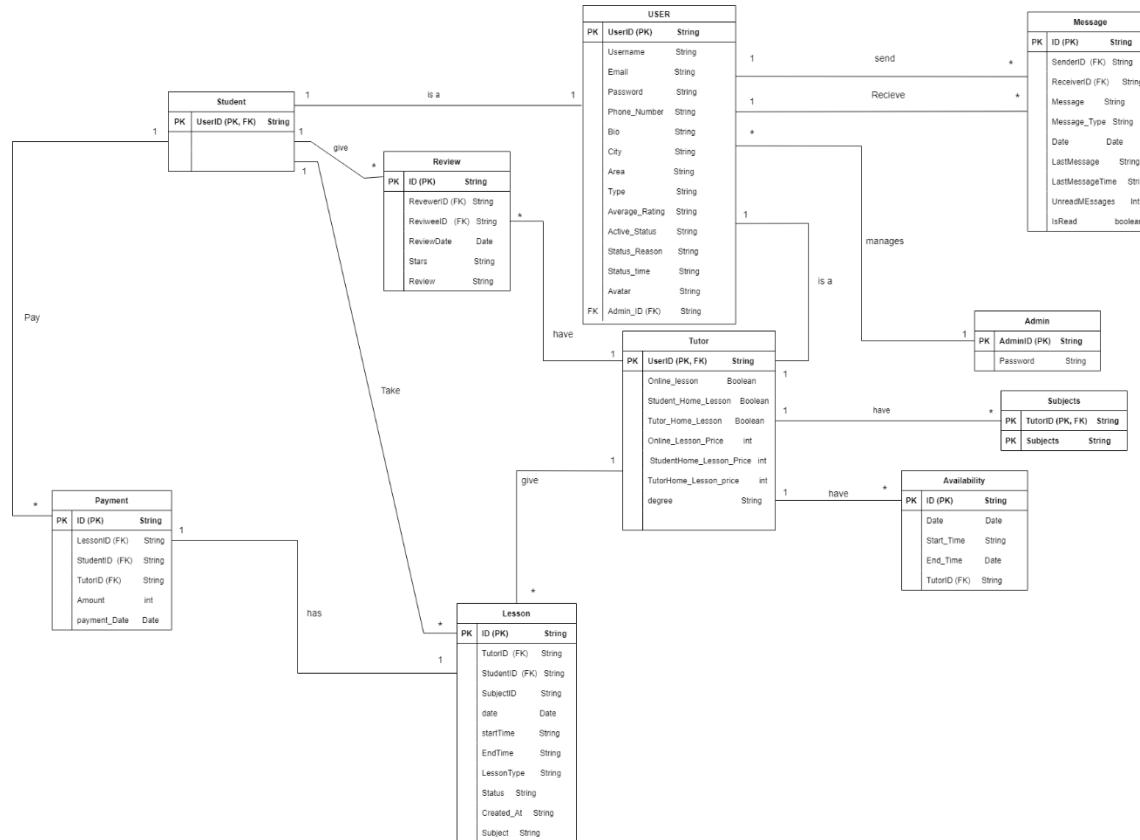


Figure. 16 ER diagram



4.4.2 the non-relational schema

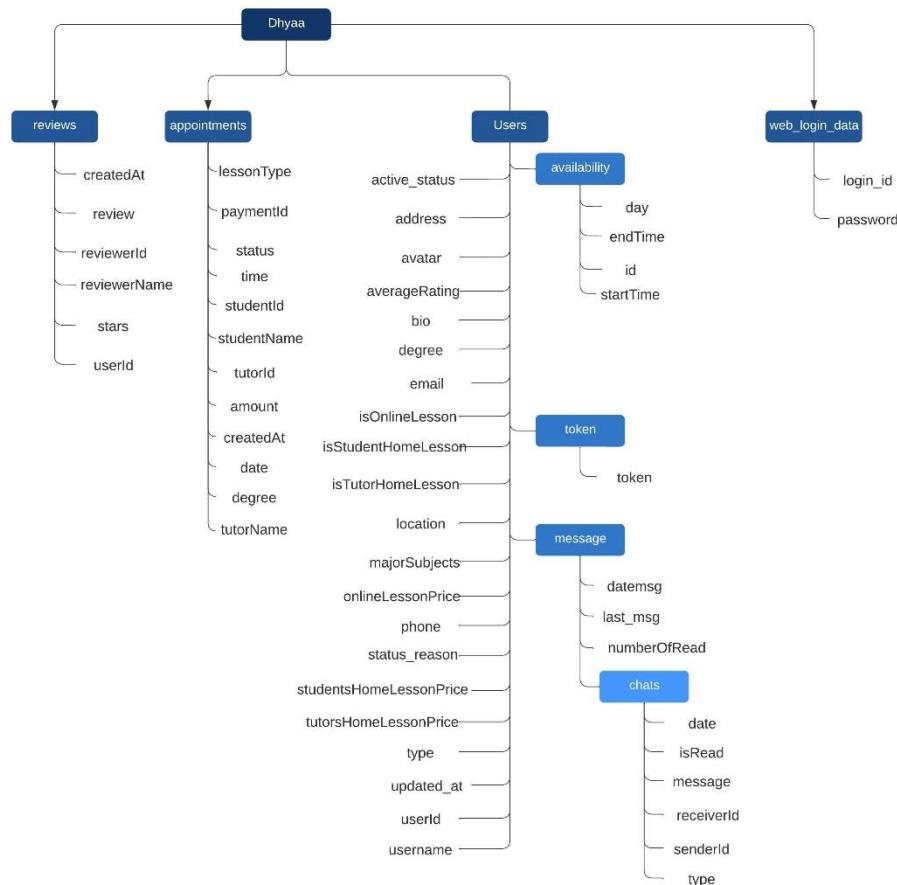


Figure. 17 None-relational schema

4.4.3 Data dictionary

Table 4 Data dictionary

Collection	Attribute	Description	Data type
Users	userId	The Id of the user which is unique for each user.	String
	Username	The username of the user	string
	type	The type of the user (student or tutor)	String
	tutorsHomeLessonPrice	The lesson price in the tutor place	string
	Email	The email of the user	string
	Password	The password of the user	String



	Phone_number	The phone number of the user	String
	location	The location of the user	string
	address	The address of the user	String
	bio	The bio of the user	string
	degree	The degree of the user	Array of string
	isOnlineLesson	Indicate if the tutor can have an Online Lesson	Boolean
	isStudentHomeLesson	Indicate if the tutor can have the lesson in the student place.	Boolean
	isTutorHomeLesson	Indicate if the tutor can have the lesson in his/her place.	Boolean
	majorSubjects	The subject of the user	string
	onlineLessonPrice	The online lessons price.	string
	averageRating	The average rate of the user	string
	updated_at	The date of the last update	string
	studentsHomeLessonPrice	The lesson price in the student place	string
	avatar	The path of the user profile photo	string
availability	day	The day of the availability	string



	Start_Time	The start time of the availability	string
	End_Time	The end time of the availability	string
chats	senderId	The ID of the sender	string
	receiverId	The ID of the receiver	string
	message	The sender message	string
	isRead	Indicate whether the receiver have read the message or no	bool
	type	The type of the message	string
	date	The date of the message	string
Message	last_msg	The last message has been sent.	string
	numberOfUnRead	Number of unread messages by the receiver	int
	time	The time of the last message	string
token	token	The user token.	string
Appointment	date	The date of the lesson	String
	degree	The degree of the lesson	string
	lessonType	The type of the lesson	string
	paymentId	The Id of the payment	String
	status	The status of the lesson	String
	studentId	The Id of the student	string
	studentName	The name of the student	string



	time	The time of the lesson	array
	tutorId	The Id of the tutor	String
	tutorName	The name of the tutor	string
	createdAt	The date and time the lesson has been created in	String
	amount	The appointment price of the lesson	string
reviews	createdAt	The date and time of the created review	string
	review	The review statements.	string
	reviewerId	The id of the reviewer	string
	reviewerName	The name of the reviewer	string
	stars	Number of stars by the reviewer	string
	userId	The user id	string
Web-login-data	login_id	The admin id	string
	password	The admin password	string



4.5 Interface Design

4.5.1 Site Map

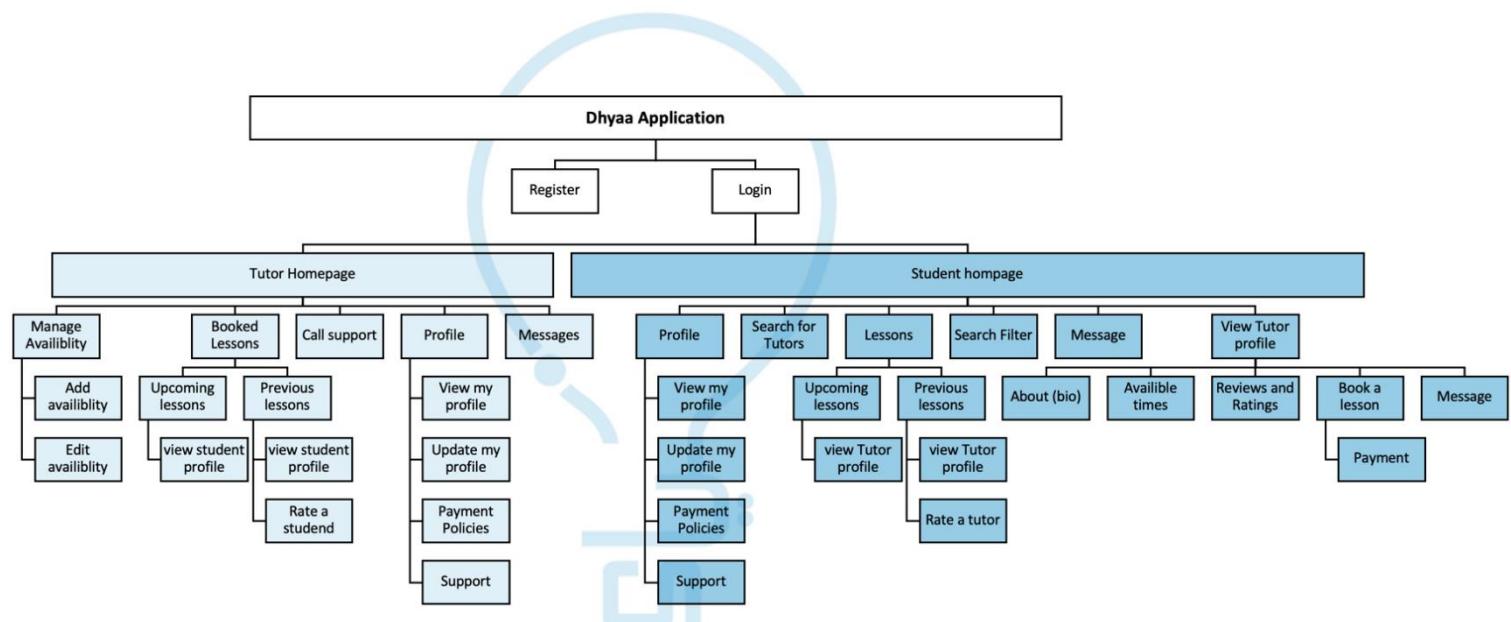


Figure. 19 Application Site Map

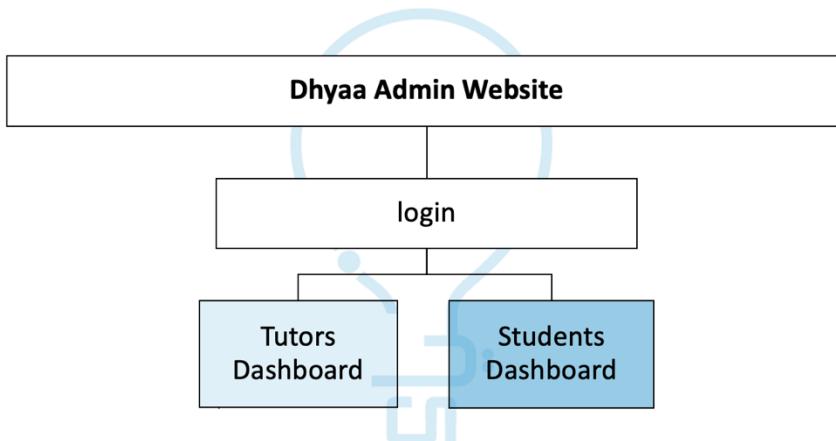


Figure. 18 Website Site Map

4.5.2 User experience guidelines

We applied these rules and guidelines based on the user experience design course.



- Offer Consistent interfaces that have similar style such as the background color is always white (#F0F0F0) in all pages, and the primary color is blue (#2d99cd) and its shades.
- Use colors and signs that are familiar to the average user and attract his attention, such as red color (#d97775) and exclamation marks for warnings.
- Consistency: Use the Font “Cairo” on all pages and messages.
- Offer informative feedback, such as mentioning the empty primary field when registering or that email or password is incorrect when logging in.
- Maximize user’s ability to go back to any previous point by always providing a button that navigates the user to the previous page.

4.6 Implementation

In this section, we provide an overview of the code's major and challenging parts, implementation steps, and procedures. Dhyaa was implemented using flutter framework and dart language, the back-end development was developed using firebase. Firebase is a Backend-as-a-Service (BaaS) platform provided by google; it offered us a suite of backend services to build our application without managing the underlying infrastructure. It provided us with real-time database, authentication, cloud storage, cloud functions, and hosting services.

4.6.1 Moyasar API Integration

In Dhyaa application, we used the Moyasar payment gateway, which was one of the biggest challenges since it required us careful planning, attention to details, and testing environment to ensure a smooth and secure payment experience.

The Integration involved several steps:

- 1- Sign up for a Moyasar account: The first step is to create an account on the Moyasar website and obtain API keys and use them in our application to access the dashboard and collect the money. Appendix C
- 2- Install the Moyasar Dart package: The next step is to install the Moyasar Dart package, which is a library for the Moyasar API. We installed it by adding to **pubspec.yaml** file.



- 3- Implement the payment flow and handle the response: When the user submits the payment form, the **byCard()** function is called, which initiates the payment process by sending a payment request to the Moyasar payment gateway. The payment request includes the payment amount, card details, and a callback URL. If the payment is successful, the user is directed to the payment verification page using the transaction URL provided by the Moyasar payment gateway. If the payment fails, an error message is displayed to the user. On the payment verification page, the user can confirm the payment details and complete the payment process.

```
// Functions
// initiates the payment process with a credit card.
// It uses the MoyasarPayment class to make a payment request and waits for the response.
// The payment request includes various parameters.
byCard() async {
    PayModel res = await MoyasarPayment().creditCard(
        description: 'أقساط',
        amount: double.parse(widget.appointmentData.amount),
        publishableKey: moyasarAPIKey,
        cardHolderName: cardHolderName,
        cardNumber: cardNumber.replaceAll(' ', ''),
        cvv: int.parse(cvvCode),
        expiryMonth: int.parse(expiryDate.split('/')[0]),
        expiryYear: int.parse(expiryDate.split('/')[1]),
        callbackUrl: 'https://google.com',
    );
    // If the payment request is successful, the response will contain the payment details.
    // Otherwise, an error message will be returned.
    if (res.type != null) {
        print(res.message);
    } else {
        // If the payment is successful, extract the payment details and navigate to the next screen.
        CreditcardModel cardModel = CreditcardModel.fromJson(res.source);
        Navigator.push(
            context,
            MaterialPageRoute(
                builder: (BuildContext context) => VerifyPayment(
                    url: cardModel.transactionUrl, // URL for payment verification
                    appointmentData: widget.appointmentData, // appointment details
                    myUserData:widget.myUserData, // details of student
                    userData:widget.userData, // details of the the tutor
                ), // VerifyPayment
            ), // MaterialPageRoute
        );
    }
}
```

Figure. 20 Payment code

- 4- Testing: Without using actual funds, Moyasar offers a sandbox setting for testing credit card transactions. This gave us the chance to test the integration and make sure everything is operating as it should.



Type	Card Number	Status	Message
Visa	4111111111111111	Successful	Succeeded!
Visa	401288888881881	Failed	Unable to process the purchase transaction
Visa	4123450131000508	Failed	3-D Secure transaction attempt failed (Not Enrolled)
MasterCard	5457210001000092	Failed	Insufficient Funds
MasterCard	5204730000002514	Failed	Declined
MasterCard	5204730000001177	Failed	Invalid Card. Unable to store the card
MasterCard	555555555554444	Failed	Unable to process the purchase transaction
MasterCard	5105105105105100	Failed	Unable to process the purchase transaction

Figure. 21 Testing credit card transactions.

4.6.2 Recommender system

Despite the challenges we faced in implementing the chosen recommender system using Flutter, we translated the content of relevant references and fully understood the workings of the algorithm to make it compatible with our system.

The **getAllRecommendedTutors()** function is responsible for recommending similar tutors to a student based on their current view of a specific tutor's profile to determine the student interests. This ensures that the recommendations are personalized and relevant to the student's needs. The function starts with retrieving the tutors from the database and selects similar tutors based on the session type, price, subject, city, and area attributes. The reason for choosing these specific attributes is that they are crucial in determining the type of tutor a student is looking for. For example, a student might be interested in a tutor who specializes in a particular subject, lives in the same city, and has some sort of similarity regarding the price, area, and Session Type. This provides the student with a range of options that fit their preferences.



```
static Future<List<UserData>> getAllRecommendedTutors(UserData user) async {
    List<UserData> tutors = [];
    List temp = [];
    // First : Retreive The users who match the following
    await db
        .collection('Users')
        .where("type", isEqualTo: "Tutor")
        // removing the tutor its self from recommendation
        .where("userId", isNotEqualTo: user.userId)
        .where("active_status", isEqualTo: "unsuspended")
        .get()
        .then((value) {
    value.docs.forEach((element) {
        tutors.add(UserData.fromMap(element.data()));
    });
});
    tutors.shuffle(); // To make tutors list random so we get different recommendations
```

Figure. 22 Recommender function

To calculate the similarity score, we use the cosine similarity equation shown in the figure [24]. This equation measures the similarity between two vectors in a multi-dimensional space and the cosine of the angle between the two vectors, where values closer to 1 indicate that the vectors are more similar or closer together in the n-dimensional space, and values closer to 0 indicate that they are less similar. In our case, the vectors represent the attributes of the current tutor view and the other tutors in the system thus, whenever the other tutor matched the mentioned attribute, we would give it a numeric value, and that what enable us to calculate the similarity.

Our main priority is to provide accurate and useful recommendations that benefit both the student and the tutor. To achieve this, we display different recommendations each time a student views a tutor's profile, as the selection of similar tutors is randomized. The results are sorted based on the cosine similarity score we calculated, and the top 5 similar tutors are displayed from the most to the least similar. This ensures that the recommendations are diverse and provide the student with a range of options to choose from.



```
// Second : Giving the selected attributes numeric values to measure the similarity
for (var tutor in tutors) {
    dynamic cosineSimilarity = 0.0;
    double subjectCount = 0.0;
    double locationCount = 0.0;
    double addressCount = 0.0;
    double sessionTypeCount = 0.0;
    double priceCount = 0.0;

    // ===== Subject =====
    List userDegree = jsonDecode(user.degree); // active profile tutor
    List itemDegree = jsonDecode(tutor.degree); // compared tutor
    for (var ud in userDegree) {
        for (var it in itemDegree) {
            if (it.toString().toLowerCase() == ud.toString().toLowerCase()) {
                subjectCount = 0.3;
            }
        }
    }
    if (subjectCount != 0.0) {
        // at least one subject has to match
        // ===== Location/City, Address/Area =====
        if (tutor.location == user.location) {
            locationCount = 0.175;
        }

        if (tutor.address == user.address) {
            addressCount = 0.175;
        }

        // ===== Session type =====
        // we want to show the tutors in same city only
        if (locationCount == 0.175) {
            if ((tutor.isOnlineLesson == user.isOnlineLesson) &&
                tutor.isOnlineLesson) {
                sessionTypeCount += 0.058;
            }
            if ((tutor.isStudentHomeLesson == user.isStudentHomeLesson) &&
                tutor.isStudentHomeLesson) {
                sessionTypeCount += 0.058;
            }
            //if not they give online lessons
        } else {
            if ((tutor.isOnlineLesson == user.isOnlineLesson) &&
                tutor.isOnlineLesson) {
                sessionTypeCount = 0.058;
            }
        }

        // ===== Price =====
        // minimum price rates for the current tutor
        var userPriceList = [
            int.parse(
                user.onlineLessonPrice == '' ? '0' : user.onlineLessonPrice),
            int.parse(user.studentsHomeLessonPrice == ''
                ? '0'
                : user.studentsHomeLessonPrice),
            int.parse(user.tutorsHomeLessonPrice == ''
                ? '0'
                : user.tutorsHomeLessonPrice)
        ];
        // excluding (0)
        userPriceList.removeWhere((element) => element == 0);

        // minimum price rates of compared tutor
        var tutorPriceList = [
            int.parse(
                tutor.onlineLessonPrice == '' ? '0' : tutor.onlineLessonPrice),
            int.parse(tutor.studentsHomeLessonPrice == ''
                ? '0'
                : tutor.studentsHomeLessonPrice),
            int.parse(tutor.tutorsHomeLessonPrice == ''
                ? '0'
                : tutor.tutorsHomeLessonPrice)
        ];
        // excluding (0)
        tutorPriceList.removeWhere((element) => element == 0);

        // matching minimum price rates
        if (userPriceList.length > 0 && tutorPriceList.length > 0) {
            if (userPriceList.reduce(min) == tutorPriceList.reduce(min)) {
                priceCount = 0.175;
            }
        }
    }
}
```

Figure. 23 Recommender system



```
// ===== Cosine Similarity =====  
  
List<double> currentTutor = [0.3, 0.175, 0.175, 0.175, 0.175]; // Vector1 , values assigned to all attributes  
List<double> iterationTutor = [  
    subjectCount,  
    locationCount,  
    addressCount,  
    sessionTypeCount,  
    priceCount,  
]; // Vector2 , only has the numeric values of the matched attributes  
  
// Cosine Similarity algorithm  
cosineSimilarity = await cosineAlgorithm(  
    | currentTutor, iterationTutor); // sending cs param  
  
// unsorted array  
temp.add({  
    'cosineSimilarity': cosineSimilarity,  
    'tutor': tutor,  
});  
}  
} //loop ends  
// sorting based on Similarity Level  
//https://api.flutter.dev/flutter/dart-core>List/sort.html  
temp.sort((b, a) => a['cosineSimilarity'].compareTo(b[  
    'cosineSimilarity'])); // sorting is from most similar (max similarty (1)) to less similar (0)  
  
// Returning top 5 most similar tutors  
return temp.take(5);  
}
```

Figure. 24 Cosine similarity



4.6.3 Managing availability and notifications

Managing availability was a challenging feature, especially when dealing with preventing conflicts and ensuring that tutors do not add the same time twice on the exact date. This became even more complex with the addition of a repeat feature that allowed tutors to schedule the same available time on multiple days. To address this challenge, a few steps were taken.

First, we checked if the available time was valid and had not been added on the same date before. This was done by querying the database for any previous entries with the same date and time. If such an entry existed, the tutor would be notified that the time slot was already taken.

Next, we extended the check to include any repeated dates, ensuring that the tutor did not schedule the same time slot on any of the repeated dates. Regarding the notification we faced some challenges with receiving duplicate notifications thus we tried to solve that by adding to each notification an id which is the notification timespan(date), but it still did not work. Then eventually we figured it out by dividing the microseconds of the notification timespan by 1000000.

4.6.4 Email service provider integration

To implement the contactus feature in Dhyaa, we used EmailJS which is a third-party service that allows us to send emails directly using templates and predefined email services. to allow Dhyaa users (tutors and students) to send an email to the Dhyaa admin directly from the contact us page. We did the following steps to make it works:

1. Connect to an email service using EmailJS:
 - Fill out the service details.
 - Test the email service and making sure we receive the test email.
2. Create an email template using EmailJS:
 - Fill out the template properties.
 - Test the template via the Test dialog.
3. Integrate the email service in Flutter:
 - Add the http package.



- Choose “Account” then “API KEYS” in EmailJS.
- Get the API key (user_id which is the Public Key of the account).
- Construct the code for the API (include the API key).



5 System Evaluation

5.1 User Acceptance Testing

In this section, we are presenting the user acceptance testing, to verify That our software meets user needs, we followed the User Acceptance Testing: A step-by-step guide [34] we conducted user acceptance testing (UAT). We first defined the goals and scope of testing. We then selected appropriate students, tutors, and admin users as testers and set up a testing environment simulating real usage. We developed test cases covering key user tasks and features. The testers evaluated the app's performance on these cases. Finally, we analyzed the results, discussed any issues, and determined if the app is ready to release or needs further improvements.

5.2 Test Objectives

Objective: To verify that the software meets the user's requirements and specifications.

5.3 Testers

To Select user testers, we choose users who are representative of each user type of Dhyaa system we went back to our system users, which we specified in our system requirements we chose 20 students who are above 16, and have basic technical experts and 20 Tutors who are above 18 with medium technical skill and 20 admins who is above 18 with large technical skill and all users must know the Arabic language.

5.4 Environment

Questioners and interviews were distributed among all participants, and an android mobile was used for the testing; we observed and had them verbalize their thoughts using "think aloud" methods. While we looked for any points of confusion, friction, or difficulty and made notes, and encouraged them to ask questions whenever they felt like it and give us their honest opinion, we also collected both quantitative metrics (e.g., task completion times) and qualitative feedback (open-ended comments). Both types of data can inform improvements to the user experience; our goal was to provide a realistic environment and not influence how users use our system to get more accurate results.

5.5 Test Cases

We conducted scenarios and procedures used to verify that Dhyaa software meets the user requirements and specifications. Since there are multiple types of users in Dhyaa system,



which are students, tutors, and admin, we Identify the different user types, and Develop user scenarios based on the different user types and their respective tasks.

5.5.1 Student Test Cases

Table 5 Student Test cases

Case Number	Case	Input	Preconditions	Expected Output
#1	Creating an account	<ul style="list-style-type: none">Student navigates to the log-up page.Student enters a valid username, email, password, phone number, city, address.Student clicks on the register button	<ul style="list-style-type: none">The software is running and accessible by the student.The log-up page is displayed correctly.The student has a valid internet connection.	<ul style="list-style-type: none">The student should see a confirmation message that the account has been created successfully.The student should have an account.If the student does not fill/fills incorrectly in a field or all the field an error massage appears
#2	Log in	<ul style="list-style-type: none">Student navigates to the login page.Student enters correct email and password.Student clicks the 'Log In' button.	<ul style="list-style-type: none">The software is running and accessible by the student.The 'Log In' page is displayed correctly.The student has a valid account with the correct email and password.	<ul style="list-style-type: none">The student should be redirected to the home page.If the student enters an invalid email or password, an error message should be displayed, and the user should be prompted to



				enter valid credentials.
#3	Update	<ul style="list-style-type: none">• Student navigates to the 'Update Profile' page.• Student updates their information, such as email, phone number, address, bio• User clicks the 'update' button.	<ul style="list-style-type: none">• The software is running and accessible by the student.• The 'Update Profile' page is displayed correctly.• The student is already logged in	<ul style="list-style-type: none">• The student should see a confirmation message that their profile has been updated successfully.• User information should be updated.• The updated information should be saved in the software's database and persisted across sessions.
#4	Search for a subject	<ul style="list-style-type: none">• Student navigates to the 'Home' page.	<ul style="list-style-type: none">• The software is running and accessible by the student.• The 'Home' page is displayed correctly.• The student is already logged in	<ul style="list-style-type: none">• The student should see list of tutors that teach the subject that the student searched for• If the student enters a subject that no tutor teaches an error message with 'no match 'is displayed



#5	View tutor profile	<ul style="list-style-type: none">Student navigates to the 'Tutor Profile' page.	<ul style="list-style-type: none">The software is running and accessible by the student.The 'Tutor Profile' page is displayed correctly and tutors' information is correct.The student is already logged in	<ul style="list-style-type: none">The student should see the tutor's profile with the correct information and last updated.
#6	Message a tutor	<ul style="list-style-type: none">Student navigates to the 'Message' page.	<ul style="list-style-type: none">The software is running and accessible by the student.Students should click on message tutor and write a message.The student is already logged in.	<ul style="list-style-type: none">The student should be able to send any message after writing in the text field and clicking send.If the student doesn't write anything the send button should be displayed.
#7	Book a lesson	<ul style="list-style-type: none">Student navigates to the 'Booking' page.	<ul style="list-style-type: none">The software is running and accessible by the student.Student should click on Book and fill all information.The student is already logged in.	<ul style="list-style-type: none">The student should be redirected to payment page after filling information.If the student does not fill the fields of booking page an error



				message appears.
#8	Pay for a booked lesson	<ul style="list-style-type: none">Student navigates to the 'Payment' page.	<ul style="list-style-type: none">The software is running and accessible by the student.Student should write credit card information.The student is already logged in.	<ul style="list-style-type: none">The student fills all credit card information correctly a conformation message should appear.If student fills the credit card information incorrectly an error message should appear.The lesson should be booked.
#9	Rate Tutor	<ul style="list-style-type: none">Student navigates to the 'Rate' page.	<ul style="list-style-type: none">The software is running and accessible by the student.The student is already logged in.	<ul style="list-style-type: none">The student fills stars icon/ write comment review should be posted in tutors page and a message should appear
#10	Log out	<ul style="list-style-type: none">Student navigates to the 'Log out' page.	<ul style="list-style-type: none">The software is running and accessible by the student.Student clicks on log out button.The student is already logged in.	<ul style="list-style-type: none">The student should be logged out of the system.



5.5.2 Tutor Test Cases

Table 6 Tutor Test Cases

Case Number	Case	Input	Preconditions	Expected Output
#1	Creating an account	<ul style="list-style-type: none">Tutor navigates to the log-up page.The Tutor enters a valid username, email, password, subject, session type, and session price.The student clicks on the register button	<ul style="list-style-type: none">The software is running and accessible by the Tutor.The log-up page is displayed correctly.The student has a valid internet connection.	<ul style="list-style-type: none">The Tutor should see a confirmation message that the account has been created successfully.The Tutor should have an account
#2	Log in	<ul style="list-style-type: none">The tutor navigates to the login page.Tutor enters correct email and password.Tutor clicks the 'Log In' button.	<ul style="list-style-type: none">The software is running and accessible by the student.The 'Log In' page is displayed correctly.The Tutor has a valid account with the correct email and password.	<ul style="list-style-type: none">The Tutor should be redirected to the home page.If the Tutor enters an invalid email or password, an error message should be displayed, and the tutor should be prompted to enter valid credentials.
#3	Update	<ul style="list-style-type: none">Tutor navigates to the 'Update Profile' page.	<ul style="list-style-type: none">The software is running and accessible by the Tutor.	<ul style="list-style-type: none">The Tutor should see a confirmation message that their profile has been



		<ul style="list-style-type: none">Tutor updates their information, such as email, phone number, session type, price.Tutor clicks the 'update' button.	<ul style="list-style-type: none">The 'Update Profile' page is displayed correctly.The Tutor is already logged in.	<ul style="list-style-type: none">updated successfully.Tutor information should be updated.The updated information should be saved in the software's database and persisted across sessions.
#4	Manage Availability	<ul style="list-style-type: none">Tutor navigates to the 'Availability' page.	<ul style="list-style-type: none">The software is running and accessible by the Tutor.The 'Availability' page is displayed correctly.The Tutor is already logged in	<ul style="list-style-type: none">The tutor should choose a date and a start time and an end time then his/her availability should be added to his/her profile.If tutor enters a past date or the start time is bigger than the end time, then an error message should be displayed.
#5	Rate student	<ul style="list-style-type: none">Tutor navigates to the 'Rate' page.	<ul style="list-style-type: none">The software is running and accessible by the Tutor.The Tutor is already logged in.	<ul style="list-style-type: none">The tutor fills stars icon/ write comment review should be posted in tutors page and a message should appear.
#7	Message a student	<ul style="list-style-type: none">Tutor navigates to the 'Message' page.	<ul style="list-style-type: none">The software is running and accessible by the Tutor.Tutor should click on student message.	<ul style="list-style-type: none">The tutor should be able to send any message after writing in the text field and clicking send.If the tutor doesn't write anything the



			<ul style="list-style-type: none">The tutor is already logged in.	send button should be displayed
#9	Cancel a lesson	<ul style="list-style-type: none">Tutor navigates to the 'booked lessons' page.	<ul style="list-style-type: none">The software is running and accessible by the Tutor.The tutor is already logged in.	<ul style="list-style-type: none">The tutor should click on cancel button and a message should appear if the tutor confirms then the lesson should be from booked lessons page
#10	Log out	<ul style="list-style-type: none">Tutor navigates to the 'Log out' page.	<ul style="list-style-type: none">The software is running and accessible by the Tutor.Tutor clicks on log out button.The Tutor is already logged in.	<ul style="list-style-type: none">The Tutor should be logged out of the system.

5.5.3 Admin Test Cases

Table 7 Admin Test Cases

Case Number	Case	Input	Preconditions	Expected Output
#1	Log-in	<ul style="list-style-type: none">Admin navigates to the login page.Admin enters correct ID and password.	<ul style="list-style-type: none">The software is running and accessible by the admin.The 'Log In' page is displayed correctly.	<ul style="list-style-type: none">The admin should be redirected to Admin the home page.If the Admin enters an



		<ul style="list-style-type: none">Admin clicks the 'Log In' button.	<ul style="list-style-type: none">The admin has a valid account with the correct ID and password.	invalid ID/Password an error message should appear
#2	Suspend Student /Tutor	<ul style="list-style-type: none">Admin select suspension reason.	<ul style="list-style-type: none">The software is running and accessible by the admin.	<ul style="list-style-type: none">The Tutor/student should be suspended.
#3	unsuspend Student /Tutor	<ul style="list-style-type: none">Admin select unsuspend button.	<ul style="list-style-type: none">The software is running and accessible by the admin.	<ul style="list-style-type: none">The Tutor/student should be unsuspended.

5.6 Users Tasks

We used the table above to help us navigate through the tasks and how they were going. each participant was given the following tasks to follow:

- student:**

- Create an account
- Use the credentials of the following account that u created to log in to the system
- Update your information
- Upload a photo you choose
- Search for a subject u would like to learn
- Filter your search results
- View the tutor's profile
- Contact the tutor
- Book a lesson
- Pay for the lesson



- Rate the tutor
- Contact the admin of the system and send an email about your options on the application
- Log out

- **Tutor:**

- Create an account
- Use the credentials of the following account that u created to log in to the system
- Update your information
- Upload a photo of you choose
- Add an availability
- Edit your availability
- Delete an available time
- Cancel a lesson
- Answer a student's message
- Rate

- **Admin:**

- Sign in
- choose a reason to suspend any user
- unsuspend that user



5.6.1 Demographics of Participants

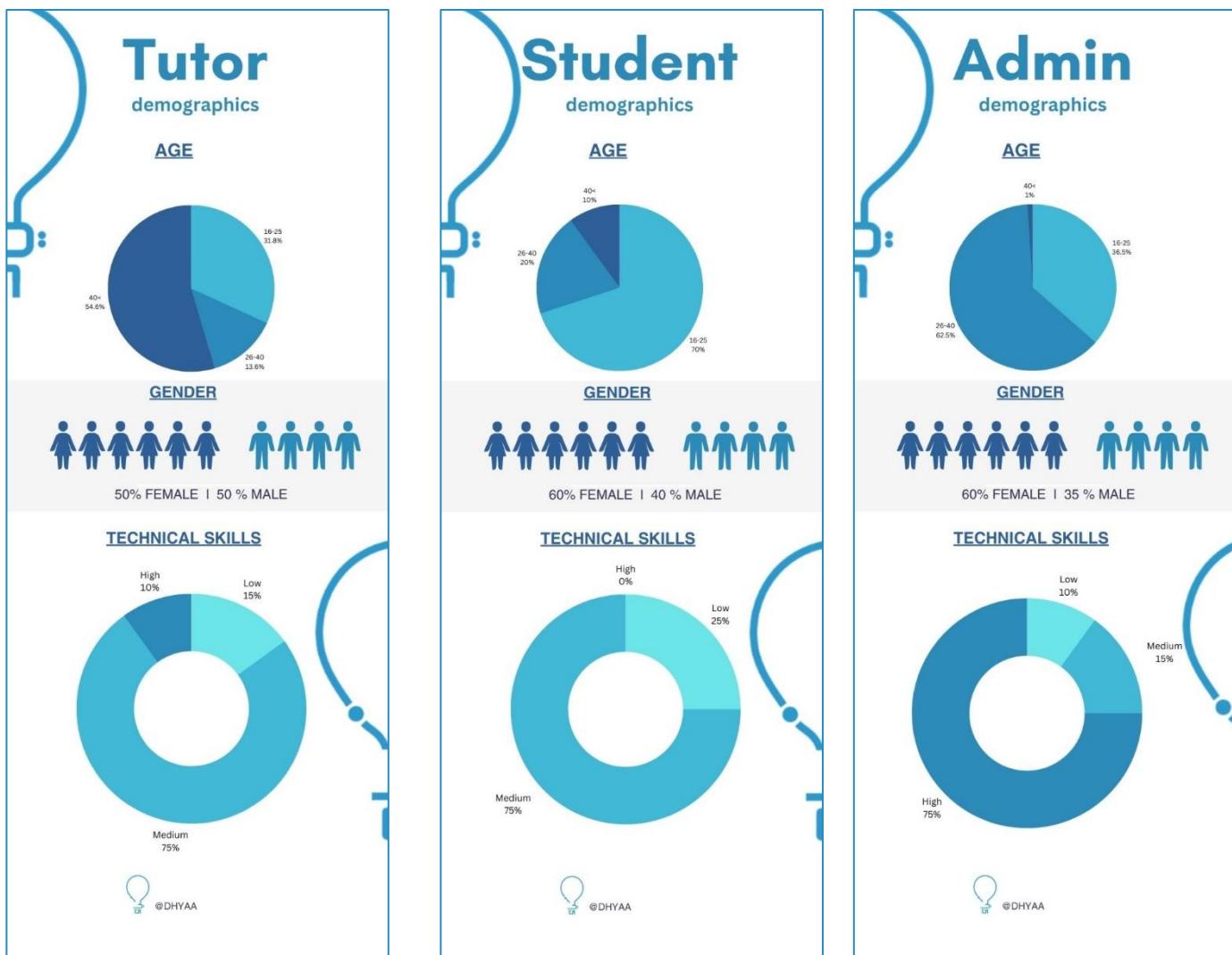


Figure. 25 Demographics of Participants

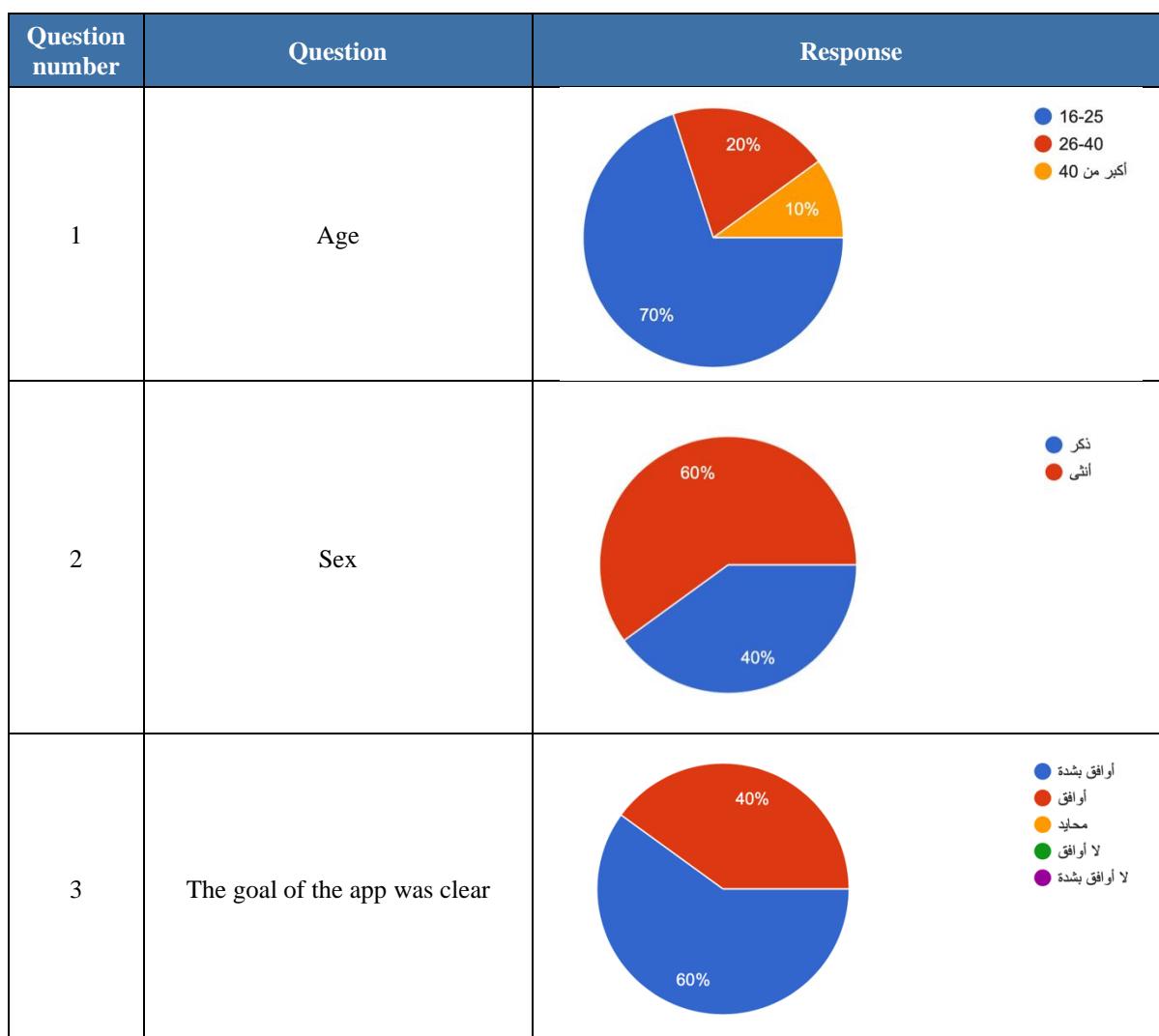


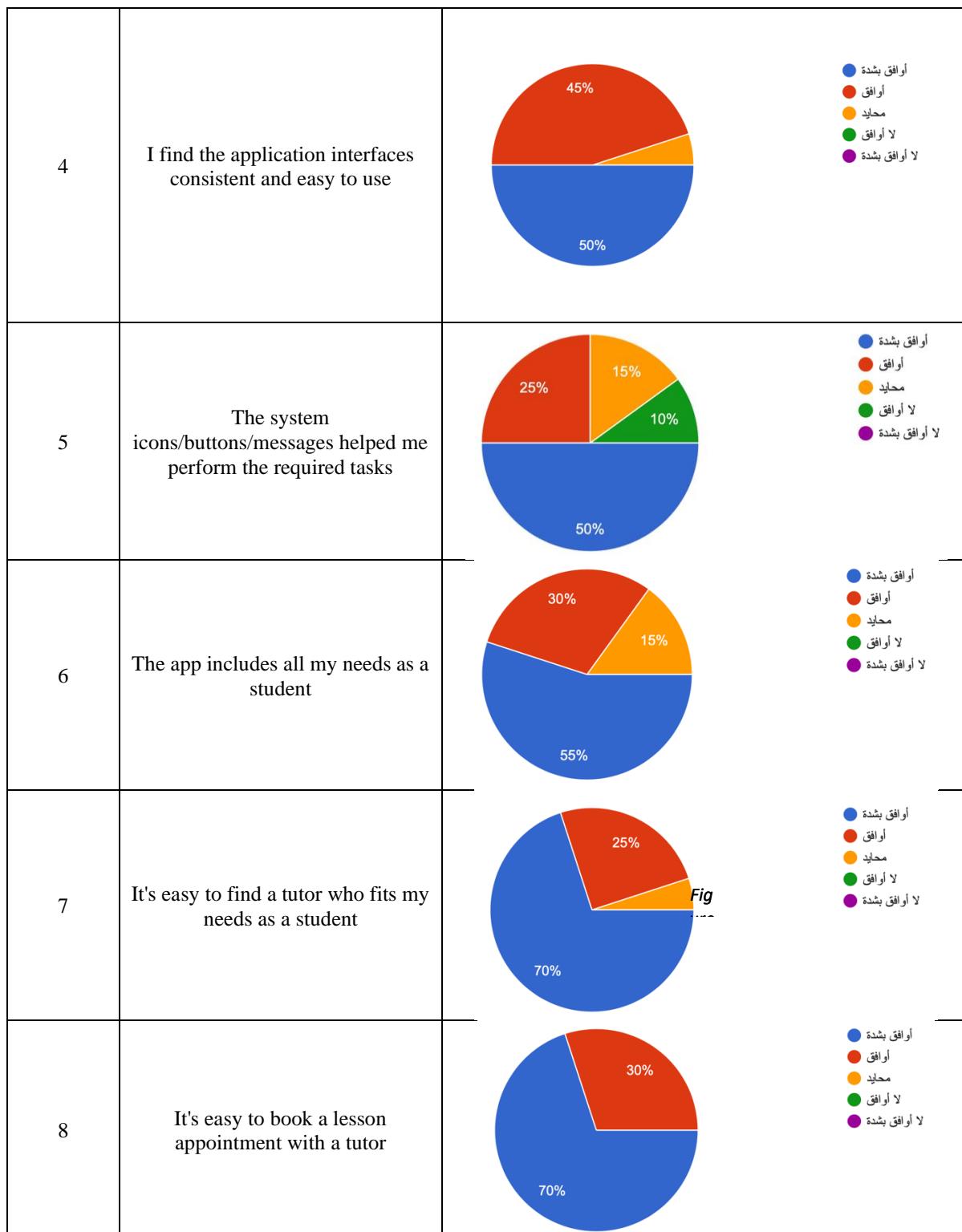
5.6.2 Questionnaire/ Interviews Results

After the test, we asked the participants to answer an electronic questionnaire to gather their feedback about the system. We provide 3 questionnaires for 3 different types of users (Student, Tutor, and Admin). The total number of participants is 20, and answering the questionnaire took around 5 minutes.

- **Student questionnaire results:**

Table 8 Student questionnaire results





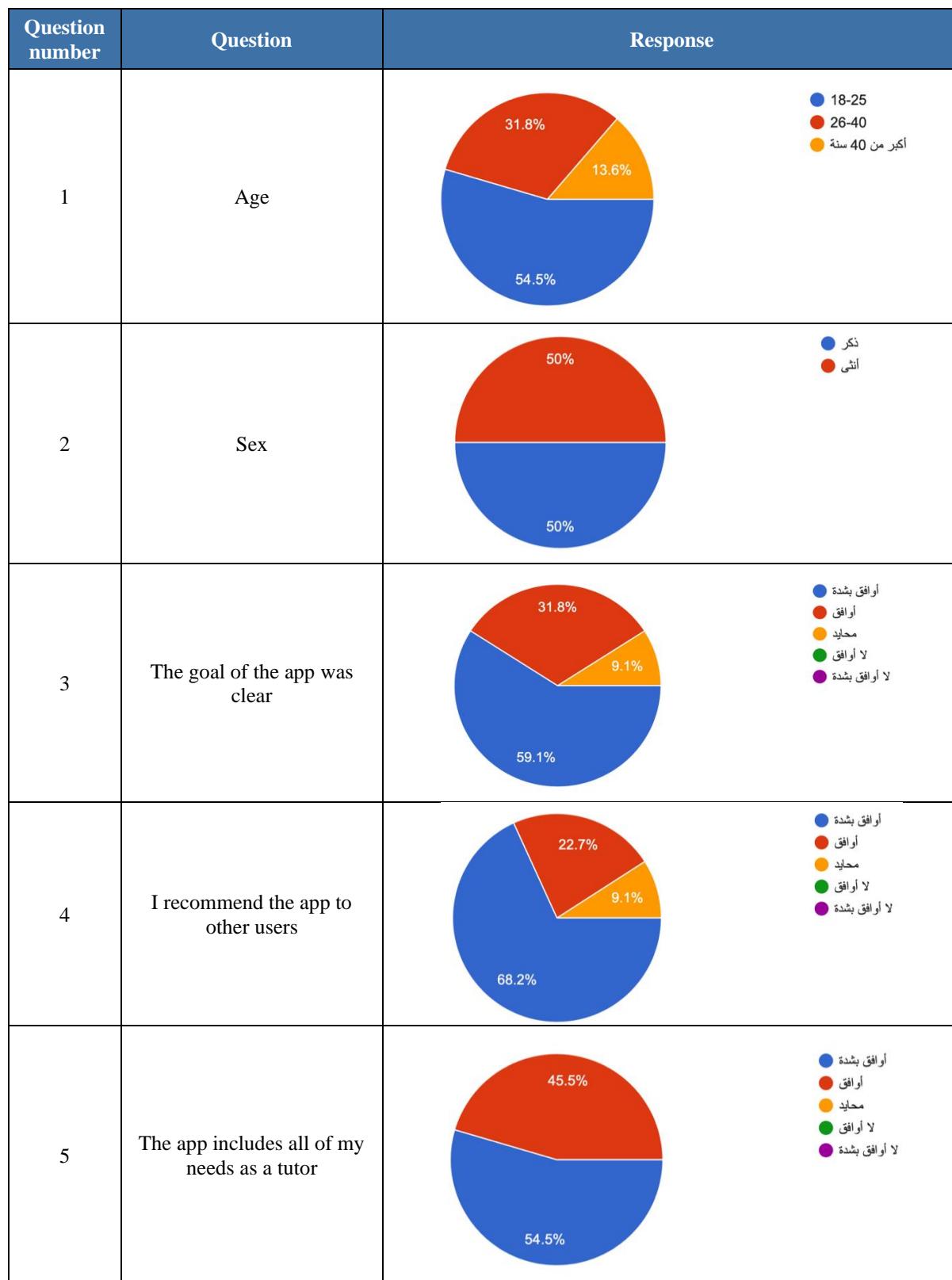


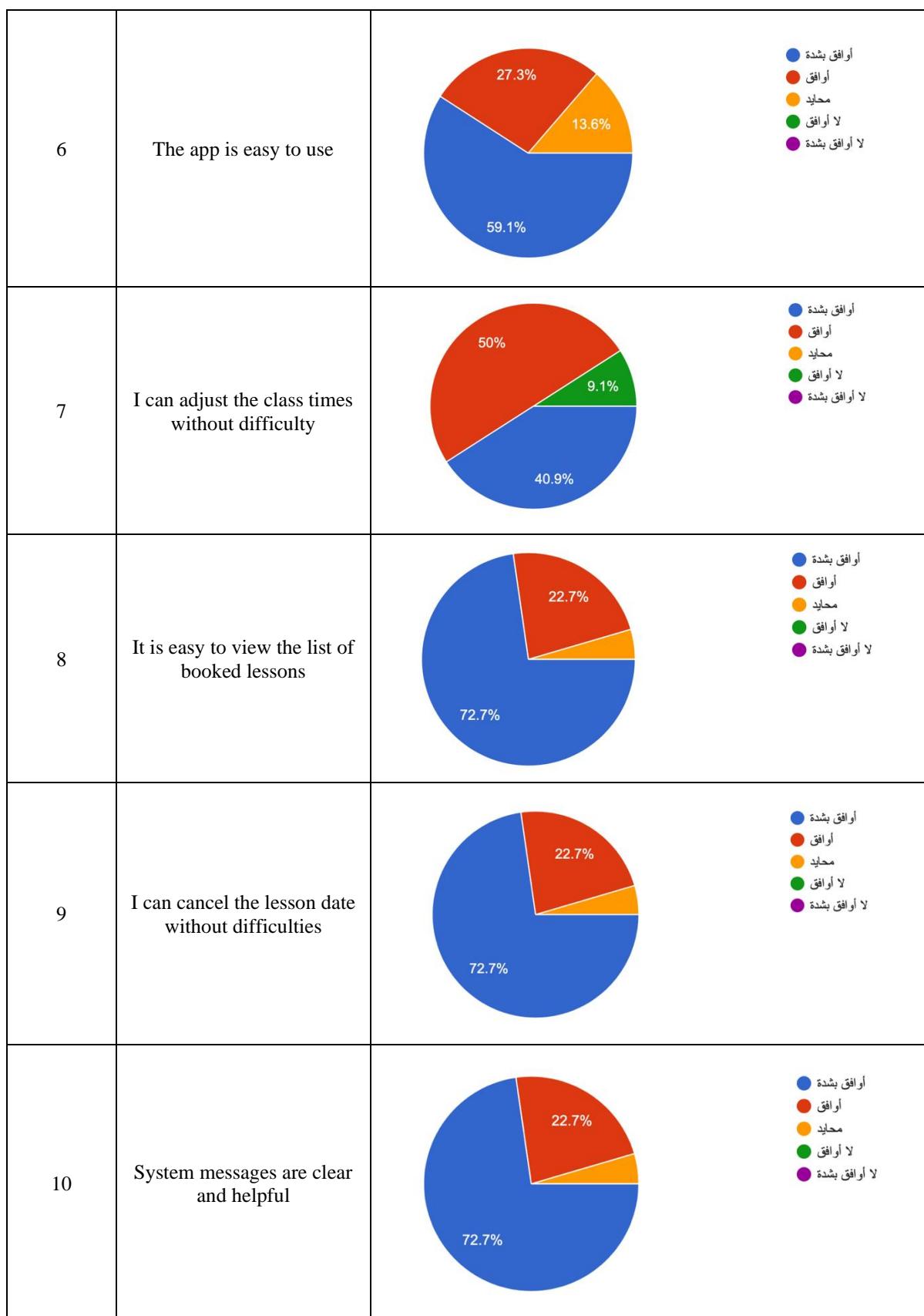
9	I can cancel the lesson without difficulty	<table border="1"><thead><tr><th>Response</th><th>Percentage</th></tr></thead><tbody><tr><td>أوافق بشدة</td><td>45%</td></tr><tr><td>أوافق</td><td>25%</td></tr><tr><td>محيد</td><td>25%</td></tr><tr><td>لا أوافق</td><td>5%</td></tr></tbody></table>	Response	Percentage	أوافق بشدة	45%	أوافق	25%	محيد	25%	لا أوافق	5%
Response	Percentage											
أوافق بشدة	45%											
أوافق	25%											
محيد	25%											
لا أوافق	5%											
10	The application's messages were clear	<table border="1"><thead><tr><th>Response</th><th>Percentage</th></tr></thead><tbody><tr><td>أوافق بشدة</td><td>50%</td></tr><tr><td>أوافق</td><td>40%</td></tr><tr><td>محيد</td><td>5%</td></tr><tr><td>لا أوافق</td><td>5%</td></tr></tbody></table>	Response	Percentage	أوافق بشدة	50%	أوافق	40%	محيد	5%	لا أوافق	5%
Response	Percentage											
أوافق بشدة	50%											
أوافق	40%											
محيد	5%											
لا أوافق	5%											
11	It's easy to pay to book a lesson	<table border="1"><thead><tr><th>Response</th><th>Percentage</th></tr></thead><tbody><tr><td>أوافق بشدة</td><td>45%</td></tr><tr><td>أوافق</td><td>30%</td></tr><tr><td>محيد</td><td>15%</td></tr><tr><td>لا أوافق</td><td>10%</td></tr></tbody></table>	Response	Percentage	أوافق بشدة	45%	أوافق	30%	محيد	15%	لا أوافق	10%
Response	Percentage											
أوافق بشدة	45%											
أوافق	30%											
محيد	15%											
لا أوافق	10%											
12	Thank you for using our platform, give us a comment after you have used the program	<p>Some of the responses:</p> <p>“The application is excellent, but it is missing paying with Apple Pay.”</p> <p>“Suggestion, in the filtering options, it is preferable to put a filter by universities, and then filter by colleges for easy searching for subjects. “</p> <p>“I suggest adding an instant chat with the admin when facing any problem in the application.”</p> <p>“My comment is to add a favorite button for the tutors who I liked studying with.”</p> <p>“Can you suggest me a password while signing up, or (remember me) option while logging in?”</p>										



- Tutor questionnaire results:

Table 9 Tutor questionnaire results







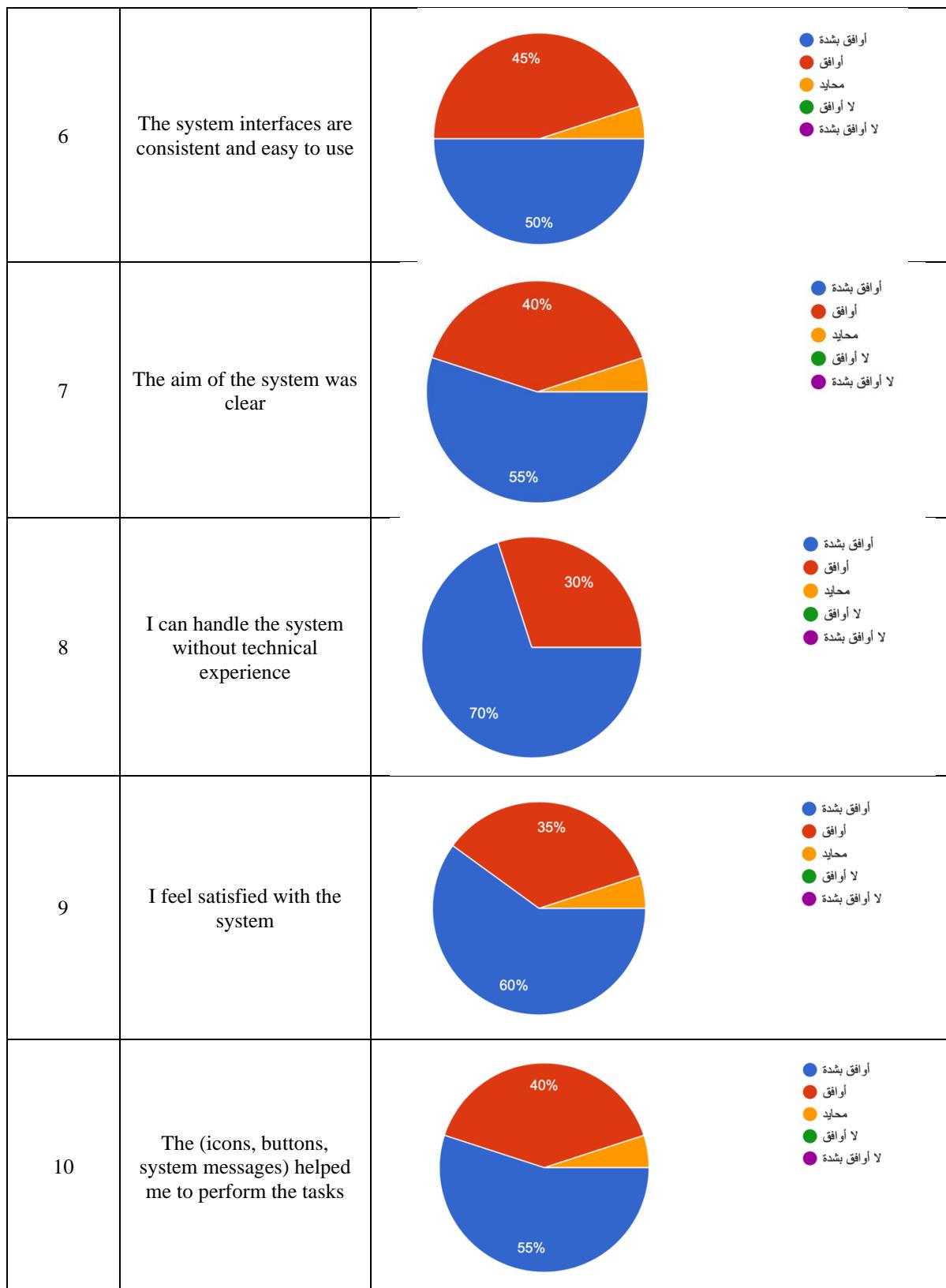
11	The application performance satisfies me	<table border="1"><thead><tr><th>Rating</th><th>Percentage</th></tr></thead><tbody><tr><td>أوافق بشدة</td><td>63.6%</td></tr><tr><td>أوافق</td><td>36.4%</td></tr></tbody></table>	Rating	Percentage	أوافق بشدة	63.6%	أوافق	36.4%		
Rating	Percentage									
أوافق بشدة	63.6%									
أوافق	36.4%									
12	I find the application interfaces consistent and easy to use	<table border="1"><thead><tr><th>Rating</th><th>Percentage</th></tr></thead><tbody><tr><td>أوافق بشدة</td><td>68.2%</td></tr><tr><td>أوافق</td><td>27.3%</td></tr><tr><td>محيد</td><td>0.5%</td></tr></tbody></table>	Rating	Percentage	أوافق بشدة	68.2%	أوافق	27.3%	محيد	0.5%
Rating	Percentage									
أوافق بشدة	68.2%									
أوافق	27.3%									
محيد	0.5%									
13	The system icons/buttons/messages helped me perform the required tasks	<table border="1"><thead><tr><th>Rating</th><th>Percentage</th></tr></thead><tbody><tr><td>أوافق بشدة</td><td>59.1%</td></tr><tr><td>أوافق</td><td>31.8%</td></tr><tr><td>محيد</td><td>9.1%</td></tr></tbody></table>	Rating	Percentage	أوافق بشدة	59.1%	أوافق	31.8%	محيد	9.1%
Rating	Percentage									
أوافق بشدة	59.1%									
أوافق	31.8%									
محيد	9.1%									
14	Thank you for using our platform, give us a comment after you have used the program	<p>Some of the responses:</p> <p>“I suggest adding the feature of displaying all available appointments as a list, instead of choosing each date to see the appointments.”</p> <p>“I suggest adding a number for each lesson or an invoice for each lesson.”</p> <p>“I hope to get an experience certificate upon completing a certain number of lessons or hours.”</p> <p>“I suggest adding points to teachers, and they can also be added to students (such as loyalty points) to make the application more interesting for students and teachers.”</p>								



- Admin questionnaire results:

Table 10 Admin questionnaire results

Question number	Question	Response						
1	Age	<table><tr><td>18-25</td><td>60%</td></tr><tr><td>26-40</td><td>35%</td></tr><tr><td>أكبر من 40 سنة</td><td>5%</td></tr></table>	18-25	60%	26-40	35%	أكبر من 40 سنة	5%
18-25	60%							
26-40	35%							
أكبر من 40 سنة	5%							
2	Sex	<table><tr><td>ذكر</td><td>35%</td></tr><tr><td>أنثى</td><td>65%</td></tr></table>	ذكر	35%	أنثى	65%		
ذكر	35%							
أنثى	65%							
3	I can suspend tutors and students accounts easily	<table><tr><td>أوافق بشدة</td><td>70%</td></tr><tr><td>أوافق</td><td>30%</td></tr></table>	أوافق بشدة	70%	أوافق	30%		
أوافق بشدة	70%							
أوافق	30%							
4	The reasons for suspending users were sufficient and useful	<table><tr><td>أوافق بشدة</td><td>70%</td></tr><tr><td>أوافق</td><td>25%</td></tr><tr><td>محيلاً</td><td>5%</td></tr></table>	أوافق بشدة	70%	أوافق	25%	محيلاً	5%
أوافق بشدة	70%							
أوافق	25%							
محيلاً	5%							
5	The system messages were clear and helpful	<table><tr><td>أوافق بشدة</td><td>75%</td></tr><tr><td>أوافق</td><td>25%</td></tr></table>	أوافق بشدة	75%	أوافق	25%		
أوافق بشدة	75%							
أوافق	25%							





11	I feel confident and safe while using the system	<table border="1"><thead><tr><th>Response</th><th>Percentage</th></tr></thead><tbody><tr><td>أوافق بشدة</td><td>60%</td></tr><tr><td>أوافق</td><td>25%</td></tr><tr><td>محيط</td><td>15%</td></tr><tr><td>لا أوافق</td><td>0%</td></tr><tr><td>لا أوافق بشدة</td><td>0%</td></tr></tbody></table>	Response	Percentage	أوافق بشدة	60%	أوافق	25%	محيط	15%	لا أوافق	0%	لا أوافق بشدة	0%
Response	Percentage													
أوافق بشدة	60%													
أوافق	25%													
محيط	15%													
لا أوافق	0%													
لا أوافق بشدة	0%													
12	Thanking you for using our platform, give us a comment after you have used it	<p>The responses:</p> <p>“Nice design 🙌”</p> <p>“Excited to use the application and its development.”</p> <p>“I suggest adding a field to explain the reason for the suspend in detail.”</p>												

Overall, the test and questionnaire produced very good results, the goal of the app was clear to all types of users which is a result of the ease of use as agreed by most of the users. The application interfaces were consistent, and the icons, buttons, and system messages were clear and helped the users to perform the required tasks without problems. The application functionality and service met the users' requirements and needs, also it was easy to use without any technical experience.

Lastly, this test and questionnaire allowed us to gain a deeper understanding of the different opinions expressed by users. In this manner, we improved Dhyaa application to meet users' needs and it helped us to make future improvement plans and ideas.



5.7 Quality Attributes (NFR testing)

Table 11 Quality Attributes (NFR testing)

User story	Quality Attribute	Measure	Results
<p>As a user of the Dhyaa application, I want my account to be secured So that it can be protected from, unauthorized access.</p>	<p>Security: Ability to protect information from unauthorized access while providing service to authorized users.</p>	<p>Authentication: can be measured by the rate of successful logins, by unauthorized users.</p>	<p>20 tries for unauthorized access login. The system did not allow any unauthorized access</p>
<p>As a user in Dhyaa, I want the application to be available 95% of the time I try to access it So that I don't get frustrated.</p>	<p>Availability: Can the software carry out a task when needed?</p>	<p>Metrics 1: Measured as (uptime) / (total time observed) [35]</p>	<p>We observed running our application for a week. the uptime = 168 hours (7 days x 24 hours per day) the total time observed= 168 hours. $\text{Availability} = (162 / 168) \times 100\% = 96.4\%$ as for our performance Which was affected by the downtime of system maintenances? Note: The period observing the application can affect the availability metric. The longer the observed period, the more opportunities there are for the application to experience downtime, affecting the availability metric.</p>



As a registered student in the Dhyaa application, I want to be able to book a lesson after a maximum of 10 minutes of learning how to use the application so that I can understand the application and navigate through it easily.	Usability: user's experience when interacting with products or systems.	Using the following metrics: task time: $(\text{Average Time for n users}) / (\text{total number of users})$ [35]	Task Time: 5 users were asked to book a lesson on Dhyaa after spending a maximum of 6 minutes learning how to use the application. The average time it took for these 5 users to complete the task was 3 and half minutes, and the total number of users who were able to complete the task within 6 minutes was 4
As a user of Dhyaa application, I want the application to process any request within less than 4 seconds So that I don't get irritated.	Performance: Ability to meet timing requirements. When events occur, the system must respond quickly.	Latency: The time between the arrival of the stimulus and the system's response to it.[35]	Dhyaa application was tested for its response time to 10 requests, and the average time it took for the application to process each request was 3 seconds, we can calculate the latency: $\text{Latency} = (\text{total time for 10 requests}) / (\text{number of requests})$ $\text{Latency} = (3 \text{ seconds} \times 10 \text{ requests}) / 10 = 3 \text{ seconds}$
As a user of Dhyaa application, I want the application to respond with informative feedback if an error occurred So that I can	Error handling: the routines in a program, that respond to abnormal input or conditions.	Error messages: This measures the quality and clarity of error messages displayed to the user when an error occurs.	The error message was evaluated based on its quality and clarity, using a scale of 1 to 10, with a score of 10 representing the highest quality and clarity.



understand what I did wrong		Error messages should be informative, concise, and provide actionable guidance to the user.[35]	10 users were asked to evaluate it. -> 90% give it 10 score out of 10 ->10% give it 9 score out of 10
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5.8 Discussion

The current version of Dhyaa application has met the user's requirements and specifications. Based on the results shown in Section 5, results indicated that the purpose of the system was clear to the users, and their feedback provided valuable insights that helped to improve the system. By incorporating the feedback that we received from testers during the UAT phase, we were able to make valuable changes in our system that helped us gain our users satisfaction. The feedback leads us into making enhancement to our UX. Also, one user mentioned that there was no confirmation message after contacting the admin, so we added a confirmation message to address this issue. Additionally, we noticed that the users had difficulty finding the edit availability button, so we made the button larger to make it easier for them to find. After we tested the non-functional requirements, we concluded that our system was successful against unauthorized access, However, to maintain and enhance its security, we will conduct regular security testing to detect and look for vulnerabilities. As for our performance, we had a 3-second average latency across 10 requests, which suggests that the performance of the application is fast but also has the potential for enhanced speed. As for usability, the fact that 4 out of 5 users were able to complete the booking task within less than 6 minutes shows that the current version of Dhyaa application is relatively easy to learn and pick up, Also The error handling was clear to the users all, and the availability was good. These results are indicators that our system has good security, performance, usability, and error handling, availability based on the testing that has been performed. However, we will continuously work to improve Dhyaa through testing, gathering feedback, and evaluation of the system.



6 Conclusions and Future Work

In conclusion, we understand that many students struggle to find the right tutor for their needs, while tutors face challenges in managing their schedules and reaching out to potential students. That's why we developed Dhyaa our goal was mainly to create a platform that connects students and tutors, making it easier to find each other and provide a more effective tutoring service. Our goal is to address these challenges and provide a more convenient and accessible way for students and tutors to connect. With Dhyaa, we aim to enhance the learning experience for students while also helping tutors reach a larger audience.

To complete our project, we followed the Agile methodology, which allowed us to divide the requirements into four sprints. Each sprint took four weeks and went through a five-step process: planning, designing, building, testing, and reviewing. We found that having daily meetings was crucial to staying on track and making sure everyone was on the same page. The scrum team was an essential part of the process, providing valuable input and contributions. By breaking down the tasks into smaller pieces, we were able to assemble everything together to create the final product. Overall, using the agile methodology gave us a chance to gain experience with this approach and work more efficiently as a team.

We're pleased that the current version of the Dhyaa has met the requirements and specifications of our users. Based on the feedback we received, we found that the purpose of the system was clear to our users, and they found the system easy to use. We're excited to see that our efforts to create a user-friendly and efficient tutoring platform have paid off. Dhyaa is a promising solution to the problem of connecting students with tutors and improving the private tutoring process.

6.1 Global and local impact

The problem is that many students struggle to find the right tutors, and tutors struggle to reach students. All of that is due to the lack of communication platforms between the two. The project solves the problem by developing Dhyaa application. That helps at making private tutoring easier for both students and tutors; it generates significant impacts, both locally and globally. Locally, it improves tutoring access for students, provides new income streams for tutors, and strengthens the tutoring marketplace by enabling more connections and transactions. Globally, given the flexibility of options that Dhyaa provides, such as enabling chat with the tutor



anytime anywhere it allows tutors to reach students, giving them a larger base and diverse opportunities. It also expands students' access to specialized tutors and resources.

Overall, Dhyaa has the potential to positively transform learning and work in the tutoring industry at both local and global levels. It equips students, tutors, and the tutoring market.

6.2 Problems and challenges

No project proceeds without difficulties of some kind, expected or otherwise. A diverse range of obstacles were faced in bringing Dhyaa to life, including both programming and soft skills challenges. We first encountered some difficulties in understanding the requirements and which information was necessary to gather from both the tutor and student, but after conducting many interviews and questionnaires, we had a better understanding of the requirements, also developing Dhyaa while balancing coursework and learning a new framework added significant time pressures and management challenges. But Through wrestling with time constraints and unanticipated time sinks, our team developed stronger time management skills. Developing the recommender system for Dhyaa introduced several programming challenges that complicated our progress. Selecting an appropriate similarity measurement technique to determine recommendations proved Cosine similarity seemed a good option theoretically but translating the steps to code it appropriately posed obstacles to overcome. Also, Iterating designs to achieve a satisfactory user interface added further complications, as the UI required repeated changes to meet UX guidelines and ultimately gain user satisfaction. But valuable lessons emerged from navigating a multitude of issues. Overall, the journey to develop Dhyaa was one of continual learning and overcoming.

6.3 Limitations of the system

Dhyaa is an Arabic mobile application that supports android platform designed mainly to provide a platform for tutors and students to find each other. Dhyaa at this stage, doesn't support English language or IOS platform, Dhyaa also does not allow online sessions inside the app which allows communication outside of the application like zoom, teams, etc., for online sessions.



6.4 The main contribution of the project

Dhyaa aims to transform learning by making private tutoring easier. By providing students with a system that helps in searching for tutors and providing tutors with a system that helps in managing their availability, it will make the private tutoring process effortless with less time-consuming for both tutors and students.

6.5 Future work

As a future work, Dhyaa. could be adapted to support the English language and the IOS platform, increasing its potential users and accessibility. Additionally, Dhyaa plans on allowing online sessions within the app, this could involve integrating video conferencing features directly within the app, eliminating the need for users to communicate outside of the application for online sessions. Some additional features that could be added to the app would include sorting search results, providing users with a list of their liked tutors, and enhancing our filtering system by including universities and majors. To engage users to complete more lessons, Dhyaa could also introduce a certificate program for both tutors and students. Moreover, Dhyaa aims to improve its location services to enable users to quickly find the nearest tutors in their area.



7 Acknowledgments

We would like to express our gratitude to Allah, the most gracious and merciful, for giving us the strength, courage, and opportunity to complete this project. We would also like to extend our appreciation to our supervisors, Dr. Hend albassam and Dr.Mona alshardan for their support, and encouragement throughout the project. We would like to acknowledge the College of Computer and Information Sciences at King Saud University, particularly the Information Technology department, for providing us with an excellent learning environment and resources. Finally, we want to express our deepest gratitude and appreciation to our family and friends for their love, support, and encouragement throughout this journey. Without their kindness and encouragement, we would not have been able to accomplish this project successfully.



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9 Appendix

9.1 APPENDIX A: Committee comments

Table 12 Committee comments

Committee comments	Section	Resolved
Add subheadings to the background section	2	✓
Add more justification for why you choose content-based recommender	2	✓
Be more specific with the system user'	4.2.1	✓
User story size	4.2.4.2	✓
Picture resolution	4	✓
Data dictionary (change description)	4.4.3	✓
References styling, Wikipedia reference.	8	✓
Message user story (specify who initiate the message)	4.2.4.2	✓
Add relation between Tutor and DM	4.2.3	✓
	Application	
Add distance/location.		✓
Availability.		✓
Hint text		✓
Add more than one subject.		✓

9.2 APPENDIX B: Requirements elicitation

- Tutors survey

Table 13 Tutor survey 1

Interview outline	
Interviewee: Teacher khayreya	Interviewer: Hala almohareb
Location/Medium: Phone call	Appointment Date: 15-09-2022



	Start Time: 06:31 P.M.	End Time: 06:51 P.M.		
Objectives: Collect useful tips about the application functions.	Reminders: The interviewee is a private tutor , that teach student from elementary school to middle school .			
Agenda: Introduction Background about the application Overview of the interview Topics to be covered. Permission to record. Questions from Interviewee Summary of Major points Closing	Approximate Time: 1 minute 2 minutes 1 minute 13minutes 2 minutes 1 minutes			
General Observation: None.				
Unresolved Issues, Topics Not Covered: None.				
Questions:	Notes:			
Questions 1: what is the most difficult part of private tutoring?	Answer: Since I mostly give lessons in person, the most difficult part for me is that I cannot reach the students at time , and sometimes I have to ask them for a ride or a taxi. Observations: None.			
Questions 2: do you struggle with communicating with students, why?	Answer: No, I get contact with the students' parents through WhatsApp, or I get my students social media accounts to make the communication process easier. Observations: None.			

Questions 3: is it often that students cancel at last minute? And are you okay with it?	Answer: It happens that I come close to the student house, and they call me for cancelation, in general I give people their excuses but it's really time consuming.
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	<p>Observations: She sounded sad about it; bit did not want to complain.</p>
<p>Questions 4: do you find it difficult managing private lessons booking?</p>	<p>Answer: Well, for me I've build my name and I have my students for a very long time now, but I find it difficult with having new student because I wouldn't know how I would deal with them and if they can be trusted since I go to my students houses. I could really use rating and recommendations from other tutors like me.</p>
<p>Questions 5: have you ever used private tutoring platform? If yes what is the advantage/disadvantage?</p>	<p>Answer: During Covid I only used zoom for my students, although I got asked about the students' parents if I knew private tutors especially in math's, chemistry, and physics because they are hard to find, and their hourly rate differ.</p>
<p>Questions 6: Would you be interested in an app that links you with students based on your availability and take care of payments? and how do you think it will benefit you?</p>	<p>Answer: Of course, although I know my students, but I would be interested in the application because I would really like it to help me with getting an experience certificate or at least shows my students feedbacks and comment, I actually studied journalism and worked for a newspaper. then I moved to private tutoring. I teach Arabic language and I really have experience with students but that wasn't enough to make me a teacher. so, I think the application will save my effort and show others the good feedbacks I'm having along with me being able to see other tutors' feedbacks about students this way I can have more students without being worried.</p> <p>Observations: She was excited about the idea and asked me to tell her when the project see the lights.</p>



Table 14 Tutor interview 2

Interview outline	
Interviewee: Teacher intsar	Interviewer: Hala almohareb
Location/Medium: WhatsApp voice messages.	Appointment Date: 16-09-2022
	Start Time: 10:11 P.M. End Time: 11:31 P.M.
Objectives: Collect useful tips about the application functions.	Reminders: The interviewee is a private tutor for preschool to the fourth-grade students.
Agenda: Introduction Background about the application Overview of the interview Topics to be covered. Permission to record. Questions from Interviewee Summary of Major points Closing	Approximate Time: 1 minute 2 minutes 1 minute 13minutes 2 minutes 1 minutes
General Observation: None.	



Unresolved Issues, Topics Not Covered:	
None.	
Questions:	Notes:
Questions 1: what is the most difficult part of private tutoring?	Answer: Firstly, I used to be a school teacher then I change to be a private tutor, the most thing I struggle with is the students I'm teaching are not the same in term of understanding and getting the knowledge. Also, I struggle when the student delay lessons.
	Observations: None.
Questions 2: do you struggle with communicating with students, why?	Answer: No, mostly I get contact with parents and sometimes I call the child mom through video call during the lesson.
	Observations: None.

Questions 3: is it often that students cancel at last minute? And are you okay with it?	Answer: Yes, but I tell them to inform me before a day of cancellation at least.
	Observations: None.
Questions 4:	Answer:



do you find it difficult managing private lessons booking?	I'm an organized person, I like to keep track with my student, and I sat a calendar for myself to help me.
Observations: None.	
Questions 5: have you ever used private tutoring platform? If yes what is the advantage/disadvantage?	Answer: I used zoom but I prefer to give my students lessons in person.
	Observations: None.
Questions 6: Would you be interested in an app that links you with students based on your availability and take care of payments? and how do you think it will benefit you ?	Answer: If it will allow me to meet students in person and from nearby location it will be really good, but I wouldn't prefer to use it if it was only for online lessons.
	Observations: None.

Table 15 Tutor interview 3

Interview outline	
Interviewee: Teacher suher	Interviewer: Hala almohareb
Location/Medium: Phone call	Appointment Date: 17-09-2022



	Start Time: 06:30 P.M.	End Time: 06:50 P.M.
Objectives: Collect useful tips about the application functions.	Reminders: The interviewee is a private tutor, that teaches Quran.	
Agenda: Introduction Background about the application Overview of the interview Topics to be covered. Permission to record. Questions from Interviewee Summary of Major points Closing	Approximate Time: 1 minute 2 minutes 1 minute 13minutes 2 minutes 1 minutes	
General Observation: None.		
Unresolved Issues, Topics Not Covered: None.		
Questions:	Notes:	
Questions 1: what is the most difficult part of private tutoring?	Answer: The transportation for sure, I find it hard to reach students.	
Observations: None.		



Questions 2: do you struggle with communicating with students, why?	Answer: No, the communication is mostly through the phone.
	Observations: None.

Questions 3: is it often that students cancel at last minute? And are you okay with it?	Answer: I do not mind cancellation but at last minute.
	Observations: None.
Questions 4: do you find it difficult managing private lessons booking?	Answer: Yeah, sometimes I take more time than what we agreed on; therefore, my other lessons get delayed, and students get a little upset about it.
	Observations: None.
Questions 5: have you ever used private tutoring platform? If yes what is the advantage/disadvantage?	Answer: No, I usually reach my students through my connections or other students.
	Observations:



	None.
Questions 6: Would you be interested in an app that links you with students based on your availability and take care of payments? and how do you think it will benefit you?	Answer: I think it will save me a lot of effort and I expect it to provide me with tools that would help me manage my lessons, also I would like to have new students because sometimes I struggle with it.
	Observations: None.

- **Students survey**

Table 16 Student interview 1

Interview outline		
Interviewee: Leen Altwajri	Interviewer: Remaz Altuwaim	
Location/Medium: Face to face interview	Appointment Date: 15-09-2022	
	Start Time: 07:17 A.M.	End Time: 07:42 A.M.
Objectives: Collect useful tips about the application functions.	Reminders: The interviewee is a student at KSU	
Agenda: Introduction Background about the application Overview of the interview Topics to be covered. Permission to record. Questions from Interviewee Summary of Major points Closing	Approximate Time: 1 minute 2 minutes 1 minute 17 minutes 3 minutes 1 minutes	
General Observation: None.		



Unresolved Issues, Topics Not Covered: None.	
Questions:	Notes:
Questions 1: when you find a difficulty with your studies, what do you do?	Answer: Whenever I have difficulty with my studies, I resort to looking for alternative sources, such as educational YouTube channels or private tutors. Observations: None.
Questions 2: Usually, how do you find private tutor?	Answer: By asking relatives, friends, and neighbors. Observations: None.

Questions 3: what are the most important qualities you look for in a private tutor?	Answer: The tutor's previous experience and knowledge of his specialty, gender, commitment, and availability. Observations: She was very precise about what information she wants to be displayed.
Questions 4: in your opinion what is the most crucial part of finding a private tutor?	Answer: finding a tutor that is near to me. Observations:
Questions 5: have you ever struggled with paying a private tutor?	Answer: No, I haven't. Observations: None.



Questions 6: have you ever used private tutoring platform? If yes what is the advantage/disadvantage?	Answer: Yes, I have used Cambly application. Advantages: it has clean and simple layout, and I can choose the tutor and I can take the lesson online also there is a large list of tutors. Disadvantages: high price, it's required annual or monthly subscription and the application is only specialized in learning English.
Questions 7: Would you be interested in an app that recommend you a list of tutors based on your need and helps you with achieving your Academic goals?	Observations: Our application does not require annual or monthly subscription, but the interviewee does not know this.
	Answer: Yes of course because it will help me to improve my education grade.

Table 17 Student interview 2

Interview outline		
Interviewee: Lujain Altwaim	Interviewer: Remaz Altwaim	
Location/Medium: zoom	Appointment Date: 15-09-2022	
	Start Time: 05:00P.M.	End Time: 05:23 P.M.
Objectives: Collect useful tips about the application functions.	Reminders: The interviewee is a student in Princess Noura University	
Agenda: Introduction Background about the application Overview of the interview Topics to be covered. Permission to record. Questions from Interviewee Summary of Major points Closing	Approximate Time: 1 minute 2 minutes 1 minute 15 minutes 3 minutes 1 minutes	
General Observation: None.		



Unresolved Issues, Topics Not Covered: None.	
Questions:	Notes:
Questions 1: when you find a difficulty with your studies, what do you do?	Answer: Whenever I have difficulty with my studies, I asked friends or teachers in their spare time Observations: None.
Questions 2: usually how do you find private tutor?	Answer: Via social media or applications such as camply. Observations: She has used tutoring application.
Questions 3: what are the most important qualities you look for in a private tutor?	Answer: Commitment, whether they have Experience Observations: None.
Questions 4: in your opinion what is the most crucial part of finding a private tutor?	Answer: Price, how to communicate with the tutor. Observations: None.
Questions 5: have you ever struggled with paying a private tutor?	Answer: Yes, if the private tutor requires only one payment method, such as cash. Observations: She is not satisfied with only one payment option.



Questions 6: have you ever used private tutoring platform? If yes what is the advantage/disadvantage?	Answer: No, I haven't.
	Observations: None.
Questions 7: Would you be interested in an app that recommend you a list of tutors based on your need and helps you with achieving your Academic goals?	Answer: Yes, I think it will save me a lot of time and help to improve my grades.
	Observations: She was a strong supporter of this idea.

Table 18 student interview 3

Interview outline		
Interviewee: Rama Aljebiri	Interviewer: Remaz Altuwaim	
Location/Medium: Face to face interview	Appointment Date: 15-09-2022	
	Start Time: 06:30 P.M.	End Time: 06:56 P.M.
Objectives: Collect useful tips about the application functions.	Reminders: The interviewee is a student in Princess Noura University	
Agenda: Introduction Background about the application Overview of the interview Topics to be covered. Permission to record. Questions from Interviewee Summary of Major points Closing	Approximate Time: 1 minute 2 minutes 1 minute 18 minutes 3 minutes 1 minutes	
General Observation: None.		
Unresolved Issues, Topics Not Covered: None.		



Questions:	Notes:
Questions 1: when you find a difficulty with your studies, what do you do?	Answer: Subscribe to educational platforms like Noon.
	Observations: None.
Questions 2: usually how do you find private tutor?	Answer: Through educational platforms such as Noon
	Observations: None
Questions 3: what are the most important qualities you look for in a private tutor?	Answer: COMMITMENT
	Observations: None.
Questions 4: in your opinion what is the most crucial part of finding a private tutor?	Answer: it is difficult for me to find a women tutor that is near to me.
	Observations: She is very supportive of organizing attractions based on location.
Questions 5: have you ever struggled with paying a private tutor?	Answer: Yes, when they gave me no choice but to bay in cash.
	Observations: She wants more payment options.
Questions 6: have you ever used private tutoring platform? If yes what is the advantage/disadvantage?	Answer: Yes, noon platform. Advantages: I can find the Suitable tutors regardless of their location since it's available online Disadvantages: price, it's required annual or monthly subscription.
	Observations: Our application does not require annual or monthly subscription, but the interviewee does not know this.



Questions 7:

Would you be interested in an app that recommend you a list of tutors based on your need and helps you with achieving your Academic goals?

Answer:

Yes, because honestly, it will make it easier for me to find the tutors.

Observations:

She was a strong supporter of this idea.

● **Tutor questionnaire**

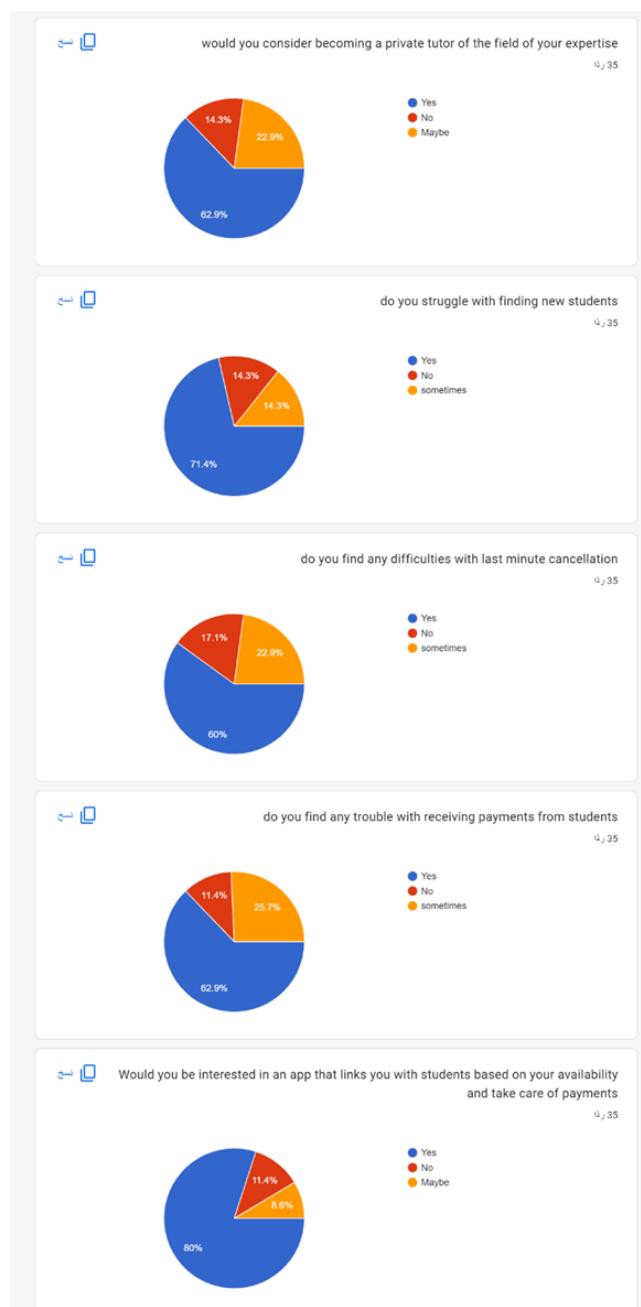


Figure. 26 Tutor questionnaire



- Student questionnaire

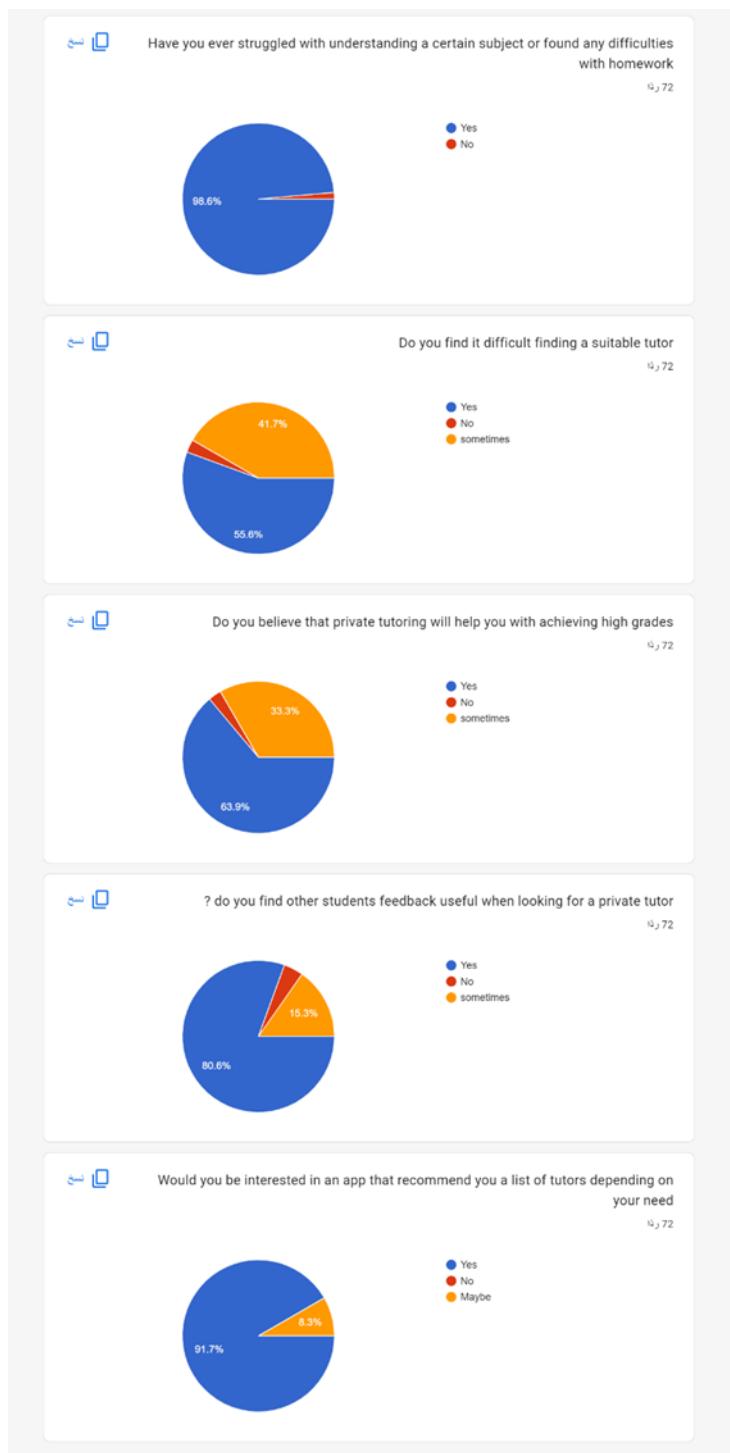


Figure. 27 student questionnaire



9.3 APPENDIX C: Moyasar dashboard

The top screenshot displays the Moyasar dashboard for a payment of 100.00 SAR. The payment was initiated on 30/03/2023 at 05:46 PM and succeeded in the test environment. The payment details include the card holder's name (Hala), gateway ID, response, and invoice ID. The payment timeline shows the transition from initiated to paid. The test keys section contains publishable and secret keys.

The bottom screenshot shows a list of recent payments. The table includes columns for STATUS, SOURCE, PAYMENT ID, CUR, AMOUNT, DESCRIPTION, and CREATED AT. The payments listed are:

STATUS	SOURCE	PAYMENT ID	CUR	AMOUNT	DESCRIPTION	CREATED AT
PAID	VISA	a5204dea7527	SAR	300.00	رسوم	10/04/2023 - 05:36 PM
PAID	VISA	6b12fdd0ff6a	SAR	150.00	رسوم	05/04/2023 - 11:37 PM
PAID	VISA	c40396ed7d65	SAR	150.00	رسوم	05/04/2023 - 11:35 PM
PAID	VISA	e2efba149f4e	SAR	100.00	رسوم	04/04/2023 - 08:28 PM
FAILED	VISA	418208a5182a	SAR	100.00	رسوم	04/04/2023 - 08:26 PM
PAID	VISA	930d278fc11c	SAR	150.00	رسوم	03/04/2023 - 05:28 AM
PAID	VISA	baf879a71b5b	SAR	150.00	رسوم	03/04/2023 - 03:37 AM
PAID	VISA	7e2c6875f32d	SAR	150.00	رسوم	03/04/2023 - 01:30 AM
FAILED	VISA	07897899d33b	SAR	150.00	رسوم	03/04/2023 - 01:30 AM

Figure. 28 Moyasar dashboard