



eClinic

IT 497: Graduation Project Report  
Product Release-2

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# eClinic

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## **Abstract (English):**

Graduation projects are considered a major milestone for students studying in the college of computer and information sciences. However, GP students face many challenges and issues where they need help and support. GP students typically lack project experience and find it difficult to make decisions related to their projects, particularly if they haven't seen an example of a project comparable to their own. Currently, College of Computer and Information Sciences does not offer an open library of previous graduation projects for students to benefit from. This makes the process of finding complete project documents more difficult. eClinic is a system that helps students, Head of GP committee, and faculty. It helps students to browse past graduation projects and contact with project owners, view FAQs regarding projects, book an appointment with faculty member for specialized help and support. eClinic also supports the Head of GP committee in management and coordination, as well as faculty members, as it enables them to identify their availability hours, and receive notifications when hours are reserved. The project was developed using the incremental (agile) model. The feedback we obtained for the user acceptance testing has been encouraging and very positive.

### Abstract (Arabic):

تشكل مشاريع التخرج فارقة بالنسبة للطلاب الذين يدرسون في كلية علوم الحاسوب والمعلومات. ومع ذلك، يواجه طلاب مشاريع التخرج العديد من التحديات حيث أنهم يحتاجون إلى المساعدة والدعم. يفتقر طلاب مشاريع التخرج عادةً إلى الخبرة في المشروع ويجدون صعوبة في اتخاذ القرارات المتعلقة بمشاريعهم، خاصةً إذا لم يروا مثلاً لمشروع مشابه لمشروعهم. حالياً، لا تقدم كلية علوم الحاسوب والمعلومات مكتبة مفتوحة لمشاريع التخرج السابقة ليستفيد منها الطلاب. هذا يجعل عملية العثور على مستندات المشروع الكاملة أكثر صعوبة.

eClinic هو نظام يساعد الطلاب ورئيس لجنة مشاريع التخرج وأعضاء هيئة التدريس. يساعد الطلاب على تصفح مشاريع التخرج السابقة والتواصل مع مالكي المشروع(الخريجين) ، وعرض الأسئلة الأكثر شيوعاً المتعلقة بالمشاريع ، وحجز موعد مع عضو هيئة التدريس للحصول على المساعدة والدعم المتخصصين. يدعم eClinic أيضًا رئيس لجنة مشاريع التخرج في الإدارة والتنسيق ، وكذلك أعضاء هيئة التدريس حيث أنها تمكّنهم من تحديد ساعاتهم المتوفرة وتلقي التبيهات عند حجز الطلاب أيّاً من تلك الساعات. تم تطوير المشروع باستخدام أجайл. كانت التعليقات التي حصلنا عليها من تجربة المستخدم مشجعة وإيجابية للغاية.

### Keywords:

Help desk, Graduation project (GP), Frequently asked question (FAQ), Appointment, Specialty, GP library.



# Introduction

## 1 Introduction

Graduation projects are crucial for ensuring educational quality and carrying out desired educational objectives, and their successful completion demonstrates students' preparedness to pursue a professional career [1] [2]. Eventually, students face many challenges in their graduation projects where they would need good guidance by experts. As for College of Computer and Information Sciences students these challenges would be technical and require the knowledge of experts in many fields including artificial intelligence, machine learning, recommender systems, data mining, etc.

We identified a major challenge through our observations and students' feedback: GP students typically lack project management experience and find it difficult to make project-related decisions, especially if they haven't seen an example of a project comparable to their own. Currently, our college does not provide an open e-library of previous graduation projects for students to benefit from, making it more difficult to find complete project documents.

Inspired by the importance of good guidance by experts that graduation project students' needs related to technical issues in correct format, implementation, design and testing tools, we have observed that students and faculty members face a lot of problems regarding the guidance in graduation projects. There is currently no available system that provides fast and flexible services to resolve technical issues in graduation projects in different ways. Also, students face confusion using the current method for scheduling a consultation with faculty members within their available help desk hours, so this lengthens the scheduling process. Moreover, students frequently approach faculty members with similar questions, which wastes the faculty member's time and effort in addressing the same question multiple times. Also, students not being able to know that they are facing a problem that have been faced before by other students would make them wait for the faculty member's solution that is already given to other students and waste their time. In addition, because there isn't a specific source for sharing previous graduation projects documents and connecting with graduates, students struggle to reach out to graduates in order to learn from their experiences.

Our project aims to develop eClinic which is a guidance service that provides a convenient and efficient way to help students and faculty members to overcome consultations scheduling, search previously resolved frequently asked questioned and view previous graduation projects. eClinic system consists of a web portal and android mobile application. Our project will have

four types of users: administrator, faculty members, students and graduates. Firstly, eClinic will allow the admin to manage the help desk in an easy and effective way. Moreover, eClinic will allow the students to find a list for all designated faculty members under a specific specialty to allow the students to schedule a technical consultation with the faculty member within the available help desk hours in an easy and efficient way. Also, eClinic will provide a frequently asked questions section where faculty members can add their suggested solutions for some frequently asked questions by uploading documents or adding links or giving a textual answer to be shared with all students to save faculty member time and effort for dealing with students' similar questions. This section can be viewed by the students for them to see whether their current problem has been faced before by other students and the faculty member have already proposed a suggested solution to that problem. This will save the students time not to wait for their consultation and help them move forward with their project much faster. In addition, eClinic will provide students with previous graduation projects section where the students can share their graduation projects under a technology category after completion to benefit upcoming students. Also, this section will include social media contact links for some of the group members who worked on a project. This will create a specialized e-library for sharing graduation projects to help students learn from previous experiences by reviewing the previous graduation projects and also being able to communicate with the graduates. The ability to view similar graduation projects and communicate with those who worked on them can help to improve the overall quality of the project. This communication will allow the student to gain information that cannot be obtained solely by reading the written document. Having a system that enhances the guidance process for both students and experts would resolve the graduation project issues more efficiently and effectively.

eClinic product objectives are:

- Admin can log in/out
- Admin, faculty members, students, graduates can reset password
- Faculty members, students and graduates can sign up, log in/out.
- Faculty members, students and graduates can view and edit their profile
- Admin can manage semesters, faculty members specialty, graduation projects technology categories and help desk dates.

- Faculty members can add and view their available help desk hours.
- Faculty members can add, update, delete frequently asked questions.
- Faculty members and students can view frequently asked questions.
- Students can view available faculty members for consultations.
- Students can book a consultation appointment with a faculty member.
- Faculty members and students can view their booked appointments.
- Faculty members and students can cancel an appointment.
- Students can browse the graduation project library.
- Students can view graduation projects details.
- Students and graduates can add, view, and delete their own graduation project.
- Faculty members can receive appointment reminder, appointment cancellation notifications, semester completion notification, appointment reminder notification, appointment cancellation notification.
- Students can receive appointment reminder notification, appointment cancellation notification, graduation project upload reminder notification, meeting method change notification.

eClinic system is a web portal and an android application that supports only English language. The system is composed of web-portal and mobile application. The mobile application has three users, the faculty members who are responsible for helping the students with graduation projects and students who want to benefit from experts and graduated who want to share their project. The web-portal will be used by the admin who is the owner of the application. It aims to help College of Computer and Information Sciences students in King Saud University who have graduation projects, and the designated faculty members that are responsible for guidance. The web portal was created for the administrator using JavaScript programming language and the android mobile application was created for faculty members, students and graduates using Futter with Dart programming language. The system database that was used is Firebase Firestore database.

eClinic's vision is for KSU CCIS GP students and faculty members who face problems regarding graduation projects, eClinic is a system that resolves technical issues that students face in their graduation projects in many ways in an easy and efficient manner. Unlike the current help desk done by the collage, our product is solving technical issues in multiple ways rather than just having a consultation with an expert.

eClinic system was developed by following Agile approach to project management and software development. The project was broken down into several phases where the team delivered a working software each sprint. The first sprint focused on business analysis, understanding the market, the user needs and requirements. After that in the next sprint the focus was on the front-end development of the web portal in parallel with the back end and building the database. Then the rest of the sprints were focusing on building the application and continuing the back-end development with each sprint. Lastly, the system was tested using nonfunctional requirement testing and user acceptance testing.

The local impact of eClinic system is that it provides a web portal that will improve the help desk management in CCIS at king Saud University and will enable the admin to manage the help desk in an easy and effective way. Moreover, having an application that enhances the guidance process for both students and faculty members would resolve the graduation project issues more efficiently. As for the global impact, eClinic system is an innovative idea that establishes a system that provides the possibility to manage guidance for graduation projects processes, which could be a good model to use for other universities.

Currently there is no system that supports students who have graduation projects in the way eClinic does. What distinguishes eClinic from others in the market is that it offers specialized and categorized consultations with experts (faculty members) that are related to the technical issues faced by graduation project students. Also, eClinic allows students to find previous graduation projects to browse them and find social media contact links for graduates all at once. In addition to all of that, eClinic offers all services for free, in contrast to the majority of our competitors who charge for their services.

This document has been prepared solely for the purpose of developing the project by delivering an introduction along with stating the background, literature review of similar products, the system design and development, as well as the system evaluation, the conclusion and future work. Finally, the acknowledgements.



# Background

## 2 Background

In this section we provide knowledge in areas that are relevant to our project. This knowledge should help in understanding our project.

### 2.1 Current GP help desk committee

The GP Help Desk Committee was established in 2020. It consists of the head of the committee and other members of the committee. The GP help desk committee head is in charge of overseeing and managing the GP help desk committee members and timelines. Faculty members who work at the help desk are in charge of assisting and advising graduation project students in their areas of specialization to address challenges by setting up consultations with them.

The GP help desk committee members are selected by the head of the college department based on their specializations to ensure sufficient diversity that serves the committee. In addition, each faculty member is selected according to specific criteria based on academic degrees and previous experience to ensure the full efficiency of the counseling process as well as to enrich the students with their knowledge.

The GP help desk committee announces the beginning of the committee through the Learning Management System (LMS) and posts an Excel sheet that contains all the GP help desk members with their specialties and schedule. Then, the student can book a consultation by entering some information in the available slot in the sheet such as: the group name, group leader email, GP1 or GP2 and the supervisor's name. Students will meet the faculty member online or in-person to explain their issue and get the proposed solution to solve it.

Even though, this whole process is still working, it has some drawbacks. One of the main drawbacks is that it is not practical for faculty to use Excel sheets, because they have to frequently check whether or not there are appointments booked as there is no reminder about the appointment, so it can be easily forgotten. On the other hand, some faculty members require students to send them a confirmation and reminder emails after they book the appointment in the sheet to avoid checking it regularly.

Additionally, another group might change any appointment in an Excel sheet by removing the information of the previous group and replacing it with their own. Furthermore, Students usually have to contact the faculty member ahead of the appointment to determine where the

meeting will be online or in-person as most faculty members do not mention that in the sheet. Even if the faculty member has already mentioned that the meeting is online, students still get confused about whether they should send the meeting link to the faculty member first or wait until the faculty member sends it to them, which makes both of them wait for each other and wastes some time on the appointment. Additionally, students can cancel appointments by erasing them from the Excel sheet, leaving the faculty member waiting and wasting her time as she won't get any updates about the appointment unless she checks the sheet again.

We developed eClinic system to be a turning point for the GP help desk committee. The web portal provides services that will help the head of the GP help desk committee to manage the eClinic system. The head of the GP help desk committee can add the semesters and start and end help desk dates in each semester and she can update it if there are any changes. Also, the head can add and update faculty member specialty to manage the topics covered by the help desk committee for graduation projects. After that the faculty member can register to the system under specific semester and specialties, so that the head of the GP help desk committee can monitor the number of faculty members and their specialties, to ensure their effectiveness in helping student and achieving the GP help desk committee goals.

Moreover, we enable the faculty members to add their schedule in an efficient way, by letting them add their available days and hours then, the system will set a schedule for them for the entire GP help desk period that was specified by the head of the GP help desk committee. Then students can view and book an appointment from the faculty member's availabilities in a very easy way through the application. After the student books an appointment, then the faculty members will receive a reminder notification upon the arrival of the appointment to let them know about it and they can open it to see more details. This way eClinic resolves issues regarding scheduling appointments that were in the Excel sheet method. Also, eClinic system enables them to add and manage the frequently asked questions from the students, to save the time and effort of the faculty members instead of dealing with each frequently asked question individually. When it comes to students, students can view the FAQs to solve their issues and move forward with their graduation project much faster. Also, students can book an appointment to consult a faculty member and benefit from their experiences. They also can view their booked appointments and see whether their meeting will be in-person or online. Moreover, students can browse the GP library to view the previous graduation project to make it as a guide for them.



## Literature Review

### 3 Literature Review

#### 3.1 Competitive Product Analysis

Before building our application, we looked for similar applications in order to learn from them and identify their strengths and weaknesses. In this following section we discussed and compared the many characteristics that our competitors' applications have to those of our own.

##### 3.1.1 Navigate Student application

Figure 1 shows Navigate Student [3] and it is an application that is used by many universities to help students organize their academic life. It gives the student many features to manage their courses schedule, to-dos event and notifications. Also, students can book appointment with advisor in person or online and set a remainder.

Note: This application is only for some universities, but it has been reviewed on YouTube [4].



Figure 1 Navigate Student logo

Navigate Student main features:

- Students can view upcoming tasks in to-dos list.
- Students can schedule a meeting with an advisor to receive guidance during their college career.
- Students can see upcoming and past appointments in one interface.
- Send a reminder before the appointment and manage his notifications.
- A student can communicate with current students in the same courses.

Figure 2 shows the Navigate Student interface.

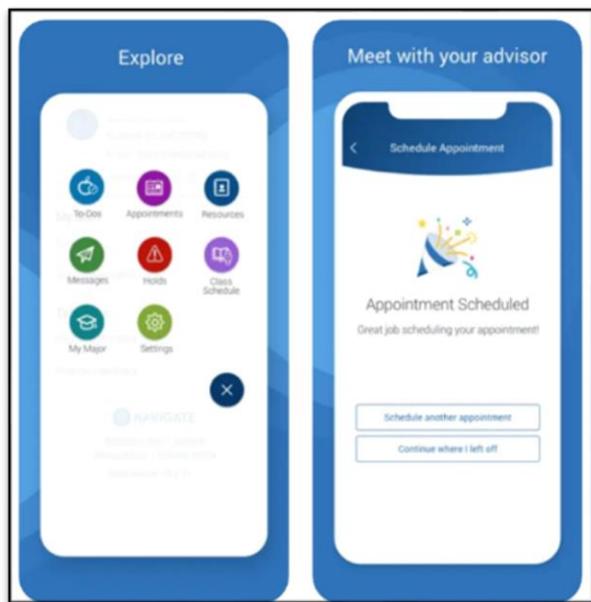


Figure 2 Navigate Student interface

### 3.1.2 Chegg platform

Figure 3 shows Chegg [5]and it is a company that has a mobile application and a website that provide multiple services for students to help them in their educational journey. The student can find their courses, view textbooks, ask questions that will be answered by experts and prepare for exams.



Figure 3 Chegg logo

Chegg main features:

- Students can post any question to get help from an expert.
- Students can prepare for an exam by using flashcards and practice questions prepared by an expert.
- Students can find answers to their questions in published questions by other students.
- Students can get their work professionally proofread by experts.

Figure 4 shows the Chegg interface.

A screenshot of the Chegg website homepage. The header features the Chegg logo and navigation links for Books, Study, Career, Life, For educators, Help, and Sign in. The main banner has a dark teal background with a woman sitting on a tiled floor. The text reads "Study help made for you" and "Expert help, textbook solutions &amp; math support—tailored to your courses." It includes a search bar with "Find solutions to your homework" and "Search" buttons. Below the banner, there's a call to action "Stay ahead of your classes" with a price of "starting at SAR 56.99/mo." and a "Sign up" button. At the bottom, a section titled "Study time, crunch time, anytime" encourages users to "Explore some of our best study tools &amp; get 24/7 support for your assignments".

Figure 4 Chegg interface

### 3.1.3 Calendly platform

Figure 5 shows Calendly [6] and it is a company that has a mobile application and a website for scheduling appointments, meetings, and events in general with some features depending on your work. One of their services are for students and faculty members to schedule meetings and appointments in an easy way. The faculty member can add his office hours and let the students book an appointment.



Figure 5 Calendly logo

Calendly main features:

- A faculty member can create an event with his available hours.
- A faculty member can have one-to-one meeting or group meeting.
- A faculty member can make face to face meeting or online meeting (phone call, zoom, google meet ...).
- Students can check available hours for faculty members.
- Students can book an appointment with faculty members.
- It has subscription packages and plans.

Figure 6 shows the interface.

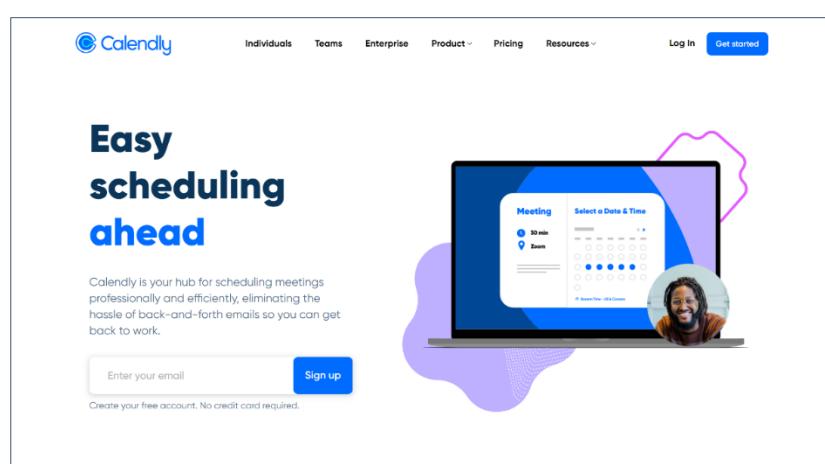


Figure 6 Calendly interface

### 3.1.4 Cambly platform

Figure 7 shows Cambly [7] and it is a company that has a mobile application and a website and provides numerous options for students to improve their English language proficiency by scheduling private lessons whenever and wherever they choose through a mobile application or website. Student may call immediately or make an appointment in advance.



Figure 7 Cambly logo

Cambly main features:

- Students can get help and ask expert anywhere(online).
- Through one-on-one video chat sessions, students can communicate with native English speakers in the classroom.
- Student can review their recorded lessons.
- Students schedule ahead of time or call immediately.
- Cambly provide a subscription package.
- Cambly can help students to prepare for English exams like IELTS and TOFEL.

Figure 8 shows the Cambly interface.

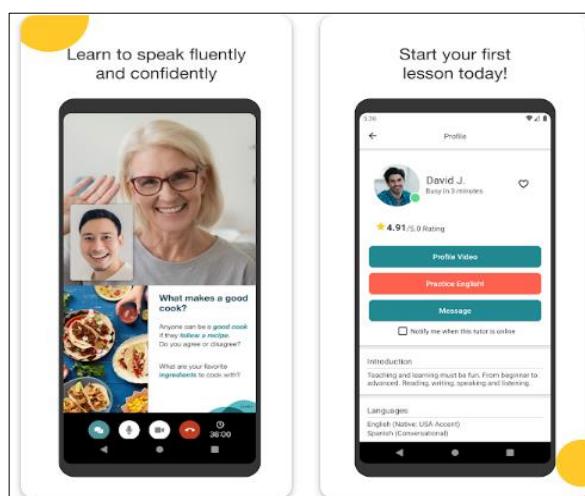


Figure 8 Cambly interface

### 3.1.5 Socratic

Figure 9 shows Socratic [8] and It's a learning application developed by google that helps students in understanding the topic they are studying and find the best online resources for them to learn the concepts by allowing them to choose a subject and view explanations in various formats. Student can also look up a certain issue that you're having trouble understanding.



Socratic main features:

Figure 9 Socratic logo

- Students can write, take a picture, or use their voice to search about any problem or hard topic their facing in their courses.
- Support multiple courses and topics (Biology, chemistry, physics and more).
- Students can find step-by-step tutorials, videos and resources to learn any subjects.
- Teamed up with educators and professionals to provide a visual explanation.

Figure 10 shows the Socratic interface.

Figure 10 Socratic interface

### 3.1.6 Graduation project library

#### 3.1.6.1 Imam Abdulrahman bin Faisal university

Figure 11 shows AIU logo. It is a Saudi university which has a website [9] that contains a page for the past graduation projects for CCSIT department. The projects are collected in PDF file and it has the project title, group members, supervisors and a brief description for the project.



Figure 11 Imam Abdulrahman bin Faisal university

Main features:

- Graduation projects are divided according to the year of graduation.
- The projects in the PDF are divided according to the GP category (CS, CIS, AI...)

Figure 12 shows the university web page.

Figure 12 AIU interface

### 3.1.6.2 Umm Al Qura Universit

Figure 13 shows UQU logo. It a Saudi university which has a website that contain a list of past graduation projects for CCSIT department. Each project contains the following information project title, project year, supervisors, project authors, project abstract, project poster, and so on.



Figure 13 UQU logo

#### Main features:

- You can view each graduation project individually.

Figure 14 shows the university web page.

Project ID	Project Title
UQU-CS-2019F-01	Be your eyes
UQU-CS-2019F-02	Detecting of People Abandon Objects in a Controlled Area using Computer Vision
UQU-CS-2019F-03	Machine Learning for Authentication Using Brain Waves
UQU-CS-2019F-04	Exploring the Similarity of Sibling's Voices Using Automatic Speaker Recognition
UQU-CS-2019F-05	Indoor Positioning Android Application For UQU-Female Campus
UQU-CS-2019F-06	Plan-B
UQU-CS-2019F-07	Maher Application-An Application For Supporting Autism Children in Learning Self-Care Skills
UQU-CS-2019F-08	Follow up
UQU-CS-2019F-09	Snap, Share, Consult
UQU-CS-2019F-10	مَعْهُمْ لَمْ (be with them )
UQU-CS-2019F-11	Dental College Medical Records Management System
UQU-CS-2019F-12	SOS UQU

Figure 14 UQU GP list

Table 1 illustrates a comparison between eClinic and all its competitors.

**Table 1 Competitive analysis**

	eClinic	Navigate Student	Chegg	Calendly	Camply	Socratic	Graduation Projects Library
<b>Book an appointment for help</b>	Yes	Yes	No	Yes	Yes	No	No
<b>Online meeting (zoom, teams ...)</b>	Yes	Yes	No	Yes	Yes	No	No
<b>In person meeting</b>	Yes	Yes	No	Yes	No	No	No
<b>FAQ answers</b>	Yes	No	Yes	No	No	Yes	No
<b>Technical Specialties Consultations</b>	Yes	No	No	No	No	No	No
<b>Free</b>	Yes	Yes	No	No (it has a limited free plan)	No	Yes	Yes
<b>Categorized specialties and expertise</b>	Yes	No	No	No	Yes	Yes	No
<b>Providing a way to communicate with graduates/experienced student</b>	Yes	No	No	No	No	No	No
<b>Previous GP library</b>	Yes	No	No	No	No	No	Yes
<b>language</b>	English	English	English	Multiple languages	English	English	English

### 3.2 Summary of competitive analysis

In summary, we noticed that there is currently no system accessible that supports students who have graduation projects in the way eClinic does. What distinguishes our application from those of our competitors, is that we offer a specialized and categorized consultations with expert (faculty member) that are related to the technical issues faced by graduation project students. Also, we allow students to find previous graduation project documents to browse them and find social media contact links for graduates all at once. In addition to all of that, we offer our services for free, in contrast to the majority of our competitors who charge for their services. In the end, there are some features that are similar between our application and other competitors, but there is no application that combines all these advantages like our application.



## System Design and Development

## 4 System Design and Development

### 4.1 Methodology

In our project we followed Agile approach to project management and software development, which is a framework that takes an iterative approach towards the completion of a project [10] [11]. Moreover, Agile focuses on making a small iteration and breaking down the project into several phases so the team can deliver a working software frequently within couple of weeks or couple of months [12].

Agile has many methodologies one on them is Scrum framework, which is the most commonly used practice [13]. Scrum include 3 roles, 5 events, and 3 artifacts, the 3 roles are product owner, developer, and scrum master. The 5 events are sprint, sprint planning, daily scrum, sprint review, and sprint retrospective. And lastly, we have the 3 artifacts with are the product backlog, sprint backlog, and product increment. Scrum is a structured approach to team collaboration and communication through many events that keep everyone engaged and productive in order to get the best results.

We used Jira<sup>1</sup> and GitHub<sup>2</sup> which are popular project management tools that are widely used by many teams.

Jira is a project management software that allows our team to create and track tasks, issues, and bugs throughout the project lifecycle. It helps our team to stay focused, keep track of progress and easily identify and resolve any issues that arise [14].

GitHub is a code hosting platform that allows our team to collaborate on code repositories for our projects. It allows our team members to create, and review pull requests, manage code versions, identify and resolve issues, and collaborate with one another in an easy and efficient way [15] .

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<sup>1</sup> <https://2022-1st-gp11.atlassian.net/jira/software/projects/GP/boards/1>

<sup>2</sup> <https://github.com/DeemAt10/2022-GP1-Group11>

## 4.2 System Requirements

### 4.2.1 System Users

There are 4 types of users that interact with eClinic system: student, graduate, faculty member and admin.

Student is a person who is studying at King Saud University in College of Computer and Information Sciences in the undergrad program and has Project (1) or Project (2) as part of its attempted courses. The student should be able to read and write in English. To run the application, the student should have a mobile that supports Android system. Little technical experience is needed to operate and interact with the application.

Graduate is a person who studied at King Saud University in College of Computer and Information Sciences in the undergrad program and graduated with a Bachelor's degree. The graduate should be able to read and write in English. To run the application, the graduate should have a mobile that supports Android system. Little technical experience is needed to operate and interact with the application.

Faculty member is a person who is assigned by the collage to be a member of graduation project help desk and has a master's or PhD degree in highly technical areas in the field of computing and information sciences. The faculty member should be able to read and write in English. To run the application, the faculty member should have a mobile that supports Android system. Little technical experience is needed to operate and interact with the application.

Admin is the head of GP help desk committee and has a master's or PhD degree. The admin should have the ability to read and write in English. Also, the admin should have medium technical experience and have a web browser to control and manage the system/services.

#### 4.2.2 Requirements Elicitation and Analysis

Requirements elicitation is used to identify the business need, scope, assumptions, and risks of a project based on data from key stakeholders [16]. To be able to achieve that we agreed with the stakeholders on the primary requirements that should be provided in our system by conducting interviews with faculty members and a questionnaire that was distributed to KSU CCIS graduates.

##### 4.2.2.1 Questionnaire

It is important to understand our users (students) needs to develop a solution that will meet their requirement, and in order to be able to communicate with the largest number of users (students). we distributed a survey to collect and analyze responses using Google Forms that is distributed via WhatsApp platform. we targeted graduates from King Saud University, CCIS Department. Our survey consists of 13 questions (attached in Appendix A), and we receive 67 responses. In order to determine whether our respondents had prior experience with clinics(GP help desk), whether they found it helpful, and what kind of guidance they needed, we asked them if they went to clinics(GP help desk) to solve a problem they faced in their graduation project, do they consider the meeting with the faculty member is beneficial, and under what specialty does the technical experience they faced fall into, we found out that 86.6% of our responders went to clinics(GP help desk) and 91.4% of them consider it useful, and the most common specialty they needed help on was Database design, Software analysis and design, and Machine learning algorithms.

We asked our respondents what they think of the current way for scheduling an appointment for the clinic (GP help desk), and if they face any issues while scheduling their appointments. We discovered that 51.6% find the current way for scheduling confusing and 51.7% face some issues while scheduling an appointment and some of the issues were that sending an email to book an appointment was time consuming and sometimes, even if the appointment booking was done via Excel sheet, they still might need to send the faculty member an e-mail to let her know about the reservation as she may not check the sheet. Another problem one of the respondent faces is that other team took her time slot in the excel sheet.

We also asked our respondents if they needed to refer back to previous graduations project documents to help them, and if they face difficulty in finding previous graduation projects. 92.5% of the responses needed to refer to previous GPs and 71.2% face difficulty in finding

previous GPs. We also asked them if they ever had to get in touch with graduates who worked on similar projects and was it easy to find those graduates, we found out that 77.6% had to get in touch with graduates and 69.1% find it difficult.

At the end of the survey, we asked our respondents would they like to have an application allow them to access previous GPs and offers different ways to communicate with graduates, and 82.1% said “Yes” for both questions. Then we asked if they would like to have an application lets them directly schedule an appointment with a faculty member and displays the students' FAQ in specific filed with a suggested solutions from an expert. And 91% wants to have an application for directly schedule an appointment, and 94% like to have application that has FAQ section with their solutions.

In conclusion, we noticed that students find the clinics (GP help desk) valuable, but they face some difficulties when they want to schedule an appointment with faculty member as we mentioned earlier. Also, student believe that looking at previous GPs, viewing FAQ and their solutions, and communicating with graduates can help them in their current GPs, but it can be difficult for them to access this knowledge. We believe that these issues can be overcome if there is an application that incorporates all the features that students are looking for to close the current gap between sources and access methods.

#### 4.2.2.2 Interviews

This section summarizes the interviews (attached in Appendix B). The interview is the best technique that allows the interviewee to verify their understanding of the question and provide a detailed answer. Also, allows the interviewer to get a deeper answer. We did some interviews with prof.Ghada Alhudhud an Professor at Information Technology department in King Saud University, Dr.Nora Abdulaziz Madi and Dr.Alaa Alhumaisan are faculty members at Information Technology department in King Saud University. The interviews consists of 3 open-ended questions and were conducted on KSU email in 20th of September 2022. We interviewed prof. Ghada Alhudhud (attached in Appendix B, see Table 11 Interview 3), Dr. Nora Abdulaziz Madi(attached in Appendix B, see Table 9 Interview 1), and Dr.Alaa Alhumaisan(attached in Appendix B, see Table 10 Interview 2), because they are knowledgeable about the GP help desk and can provide us with valuable information to help us understand the problems and focus on the important aspects while developing a solution.

We received responses from them. We focused on what the faculty answers had in common and what views they had on certain things while keeping in mind their different views. We asked faculty members about the challenges they have in managing their schedules at the GP help desk, their answers varied , prof.Ghada responded that she has difficulty scheduling multiple appointments at the same time because faculty members forget that another team has booked at the same time, as well as answering students' questions without referring them to an expert in the field. Dr. Nora also mentioned that she faces challenges in continuing to open the registration sheet to see if a new team has booked or not, as well as having to manually register appointments each time, whereas Dr. Alaa responded based on her recent experience and stated that she does not face problems due to the larger group of Relatively mentors. We also asked, "When they suggest a solution to the students' issues, what are the different methods they follow?" Prof.Ghada responded that she presents articles and documents of previous projects, and Dr. Alaa responded that she gives a short explanation for the solution with some links to detailed resources While Dr.Nora method is dependent on the issue, she has previously shared documents and links with students, and she added to her response that she encountered a problem when she sent documents or links via the meeting chat, as they would be deleted after the meeting or when use e-mail, which takes a long time. We asked a last question to them when they receive the same issue multiple times from different students, Do you consider this a problem ? and why? their answers varied , Dr.Nora and prof.Ghada replied yes, as prof.Ghada commented that she was a problem because she needs to repeat the answer every time, while Dr.Nora added in her response that the reason behind this may be a common misunderstanding among students and may be due to a lack of information, lack of awareness, or miscommunication about a certain thing and that she is dealing With the same problem with her students in the courses that her teach by announce any common misunderstandings or issues to all her students in an email or through blackboard announcements, while Dr.Alaa answered no, but she added to her response that it might be some lack of communicating the task to students or could be a relatively new concept to them and that It is possible to deal with this problem by reporting to the scrum masters to circulate further general guidance to all the GP groups.

In conclusion, we discovered that faculty members struggle to remember their appointments because they must be manually recorded, and there is no way to remind them of their appointments, and some of them waste their time and effort to solve the same problem, in

addition to the fact that when the consultation is online, it will be difficult to share documents and files via chat because they will be deleted immediately after the meeting ends. To address the issues, we will develop an Android mobile application. It will schedule the faculty member's appointments as well as send them reminders about their appointments. There will be a section called FAQs where a faculty member may answer to frequently asked questions from different student groups and attach documents, links, etc. There will also be numerous sections.

#### 4.2.3 User Interactions

This section illustrates users' interactions with the software product using a Use Case Diagram that focuses on the major interactions with the system as shown in Figure 15, Figure 16 and Figure 17.

##### 4.2.3.1 Admin Use Case Diagram



Figure 15 Admin Use Case Diagram

#### 4.2.3.2 Faculty member Use Case Diagram

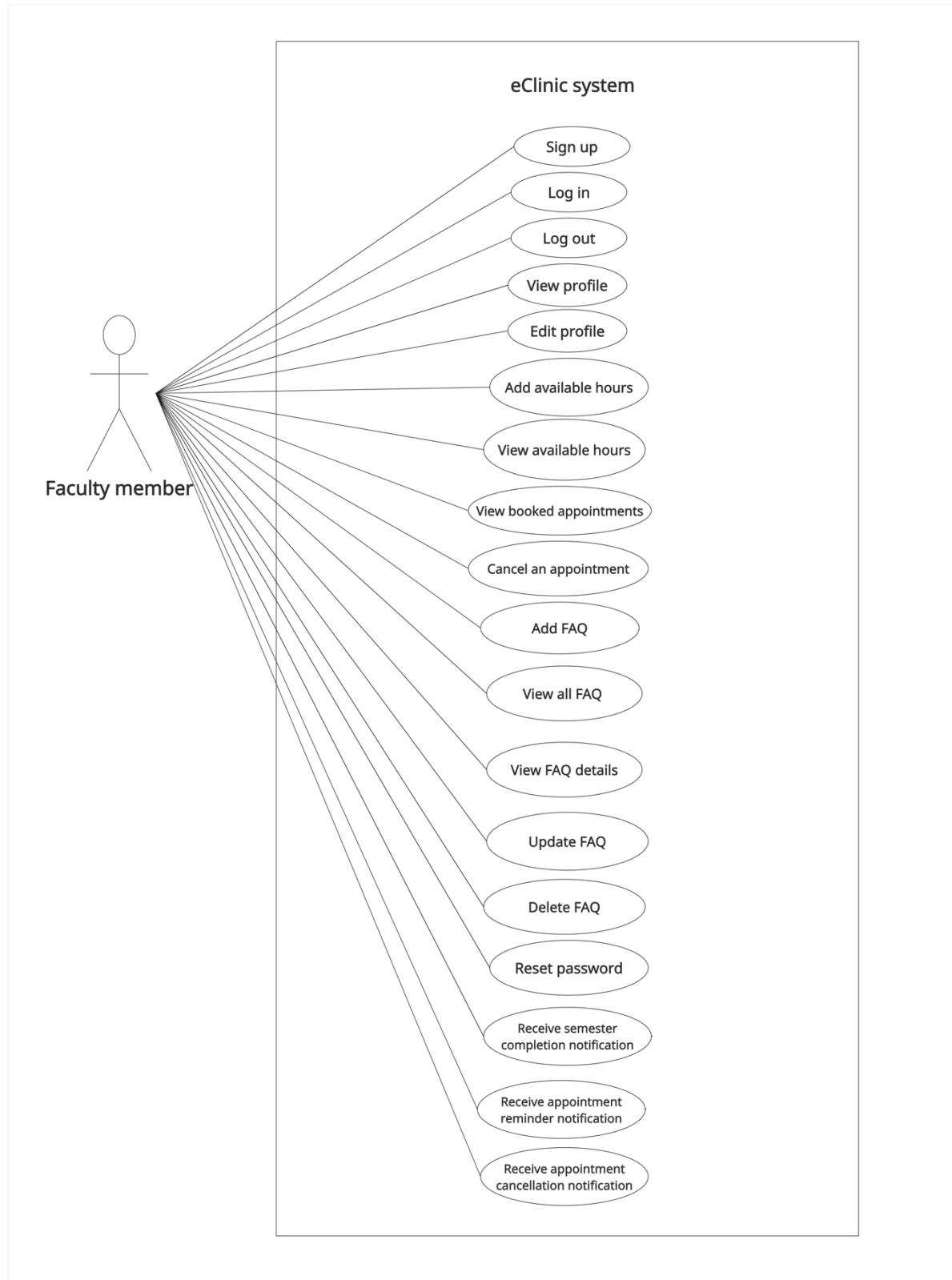


Figure 16 Faculty member Use Case Diagram

#### 4.2.3.3 Student and Graduate Use Case Diagram

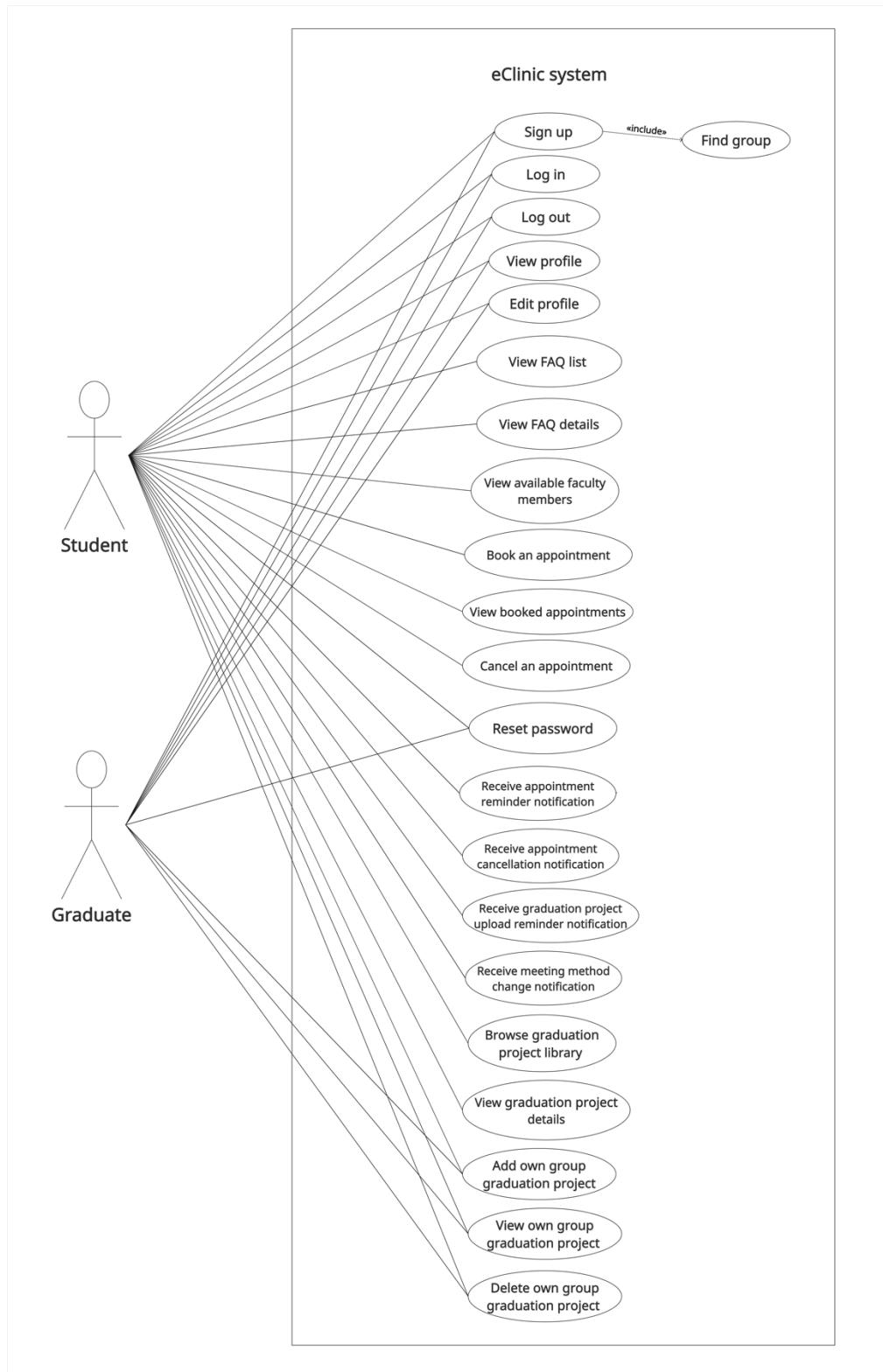


Figure 17 Student and Graduate Use Case Diagram

#### 4.2.4 Roadmap and Product Backlog

##### 4.2.4.1 Product Roadmap

In this section, we will represent our product roadmap as shown in Figure 18. The first release will include the proposal, sprint 0, and sprint 1. The second release will include sprint 2, sprint 3, sprint 4 and sprint 5.

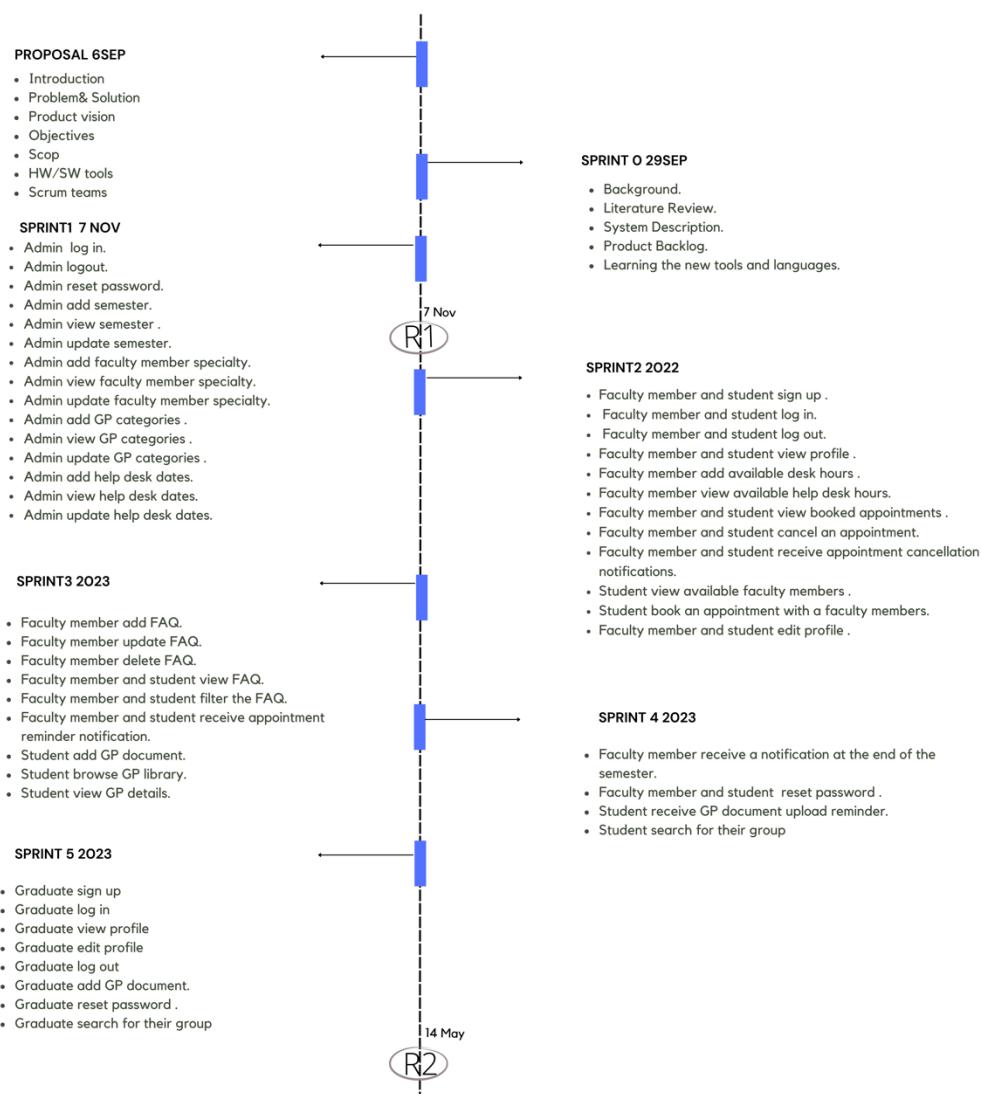


Figure 18 Product Roadmap

#### 4.2.4.2 Product Backlog

Table 2 and 3 shows all the product backlog items for eClinic System.

##### - Functional Requirements:

**Table 2 Product backlog**

#	PBI	Size	Type	Status	Acceptance Criteria
1	As an admin, I want to be able to log in with my email and password so that I grant the ability to perform my functions.	2	Feature	Done	<ul style="list-style-type: none"> <li>- As an admin, If I go to the log in page and enter an invalid email or password and click on "LOGIN" button, then log in fails with an error message.</li> <li>- As an admin, If I go to the log in page and leave the email field or the password field empty and click on " LOGIN " button, then log in fails with an error message.</li> <li>- As an admin, If I go to the log in page and enter a valid email and password and click on " LOGIN " button, then the system will navigate to the home page.</li> </ul>
2	As an admin, I want to be able to log out so that I can protect my account from unauthorized users.	2	Feature	Done	<ul style="list-style-type: none"> <li>- As an admin, If I click on the "Log Out" button from the profile icon, then a conformation message will appear.</li> <li>- As an admin, If I conform, then the system will navigate to the login page.</li> </ul>

					- As an admin, If I don't conform, then I will stay logged in.
3	As an admin, I want to be able to reset my password so that I can set new password if I forget the old one.	2	Feature	Done	<ul style="list-style-type: none"> <li>- As an admin, If I click on the Forget Password link in the login page, then the system will navigate to the reset password page.</li> <li>- As an admin, If I leave the email field empty and click on "SEND" button an error message will appear.</li> <li>- As an admin, If I enter invalid email and click on "SEND" button an error message will appear.</li> <li>- As an admin, If I enter my email and click on "SEND" button, then system will send an email to reset my password, and a message will appear to indicate that the system sent a reset password link to the entered email.</li> </ul>
4	As a logged in admin, I want to be able to reset my password so that, I can set new strong password for my account.	2	Feature	Done	<ul style="list-style-type: none"> <li>- As a logged in admin, If I click on the "Reset Password" button from the profile icon, then the system will navigate to reset password page.</li> <li>- As a logged in admin, if I click on the "SEND RESET PASSWORD LINK" button , then the system will send an email to reset my password, and a message will appear to</li> </ul>

					indicate that the system sent a reset password link to my email.
5	As an admin, I want to be able to add semesters so that I can organize the system by the start of each semester.	5	Feature	Done	<p>-As an admin, If I click on the "Semesters" button in the home page or from the side bar, then the system will navigate to the semesters page.</p> <p>-As an admin, If I click on the "Add New Semester" button in the semesters page, then Add New Semester section will appear in the same page.</p> <p>- As an admin, If I choose a semester, and choose the first year and second year that are added previously and I click the "ADD" button, then the addition fails with an error message.</p> <p>-As an admin, If I don't choose a semester, and choose the first year and second year and I click on the "ADD" button, then the addition fails with an error message.</p> <p>-As an admin, If I choose a semester, and I don't choose the first year and I click on the "ADD" button, then the addition fails with an error message.</p> <p>- As an admin, If I choose a semester and choose the first year</p>

					<p>and the second year, and they are not already added and I click the "ADD" button, then a message will appear indicating that the addition has been posted successfully.</p> <p>-As an admin, If I go to Add New Semester section and click on "CANCEL" button ,then a confirmation message will appear.</p> <p>-As an admin, If I confirm, then the Add New Semester section will be hidden.</p> <p>- As an admin, If I don't confirm, then I will stay in Add New Semester section in the same page.</p>
6	As an admin, I want to be able to view semesters so that I can review what semesters are currently available on my system.	3	Feature	Done	<p>-As an admin,If I click on the "Semesters " button in the home page or from the side bar, then the system will navigate to the semesters page.</p> <p>-As an admin,If I am in semesters page, and there is no semester added yet, then the message will appear indicating semester has not been added yet.</p> <p>-As an admin,If I am in the semesters page, and there is a semester, then the list of all semesters will be displayed.</p>

7	As an admin, I want to be able to update semesters so that I can correct any mistake.	5	Feature	Done	<p>-As an admin, If I click on the "Semesters" button in the home page or from the side bar, then the system will navigate to the semesters page.</p> <p>-As an admin, If I click on the update button next to a semester name, then update semester section will appear in the same page.</p> <p>- As an admin, If I don't change anything and I click on the "UPDATE" button, then the updating fails with an error message.</p> <p>-As an admin, If I choose a semester and choose the first year and second year that are added previously and click on the "UPDATE" button, then the updating fails with an error message.</p> <p>- As an admin, If I choose a semester, and I choose the first year and the second year, and they are not already added and I click the "UPDATE" button, then a message will appear indicating that the updating has been posted successfully.</p> <p>-As an admin, If I go to update semester section and I click on</p>
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					"CANCEL" button, then a confirmation message will appear.  - As an admin, If I confirm, then the update semester section will be hidden.  - As an admin, If I don't confirm, then I will stay in update semester section in the same page .
8	As an admin, I want to be able to add faculty member specialty so that the system can be organized and easy to use and up to date.	5	Feature	Done	<p>-As an admin,If I click on the "Faculty member specialty " button in the home page or from side bar, then the system will navigate to faculty member specialty page.</p> <p>- As an admin, If I click on "Add New Specialty" button in the faculty member specialty page, then the add faculty member specialty section will appear.</p> <p>- As an admin, If I leave the specialty name empty and click on the "ADD" button in the add faculty member specialty section, then the addition fails with an error message.</p> <p>- As an admin, If I enter the specialty name in Arabic and click on the "ADD" button in the add faculty member specialty section,</p>

				<p>then the addition fails with an error message.</p> <ul style="list-style-type: none"><li>- As an admin, If I enter only digits and/or special characters in the specialty name and click on the "ADD" button in the add faculty member specialty section, then the addition fails with an error message.</li><li>- As an admin, If I enter a specialty name that is added previously and click on the "ADD" button in the add faculty member specialty section, then the addition fails with an error message.</li><li>- As an admin, If I enter a specialty name that is in English and with/without digits and/or special characters and it is not already added and click on the "ADD" button in the add faculty member specialty section, then a message will appear indicating that the addition has been posted successfully.</li><li>-As an admin, If I click on "CANCEL" button in the add faculty member specialty section, then a conformation message will appear.</li></ul>
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					<p>-As an admin, If I confirm, then the addition fails and what I entered in the specialty name field will be gone section will be hidden.</p> <p>- As an admin, If I don't confirm, then I will stay in add faculty member specialty section in the same page.</p>
9	As an admin, I want to be able to view faculty members listed under specific semester/specialty so that I can review what specialties are available or missing in that semester.	3	Feature	Done	<p>-As an admin, If I click on the " Faculty member specialty " button in the home page or from side bar, then the system will navigate to faculty member specialty page.</p> <p>-As an admin, If I go to faculty member specialty page and there exist a specialty, then a list of all specialties will be displayed.</p> <p>-As an admin, If I go to faculty member specialty page and there is no specialty added yet, then the message will appear indicating no specialty added yet.</p>
10	As an admin, I want to be able to add faculty member specialty so that the system can be organized and easy to use and up to date.	5	Feature	Done	<p>-As an admin, If I click on the " Faculty member specialty " button in the home page or from side bar, then the system will navigate to faculty member specialty page.</p>

				<ul style="list-style-type: none"><li>- As an admin, If I click on "Add New Specialty" button in the faculty member specialty page, then the add faculty member specialty section will appear.</li><li>- As an admin, If I leave the specialty name empty and click on the "ADD" button in the add faculty member specialty section, then the addition fails with an error message.</li><li>- As an admin, If I enter the specialty name in Arabic and click on the "ADD" button in the add faculty member specialty section, then the addition fails with an error message.</li><li>- As an admin, If I enter only digits and/or special characters in the specialty name and click on the "ADD" button in the add faculty member specialty section, then the addition fails with an error message.</li><li>- As an admin, If I enter a specialty name that is added previously and click on the "ADD" button in the add faculty member specialty section, then the addition fails with an error message.</li></ul>
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					<ul style="list-style-type: none"> <li>- As an admin, If I enter a specialty name that is in English and with/without digits and/or special characters and it is not already added and click on the "ADD" button in the add faculty member specialty section, then a message will appear indicating that the addition has been posted successfully.</li> <li>-As an admin, If I click on "CANCEL" button in the add faculty member specialty section, then a conformation message will appear.</li> <li>-As an admin, If I confirm, then the addition fails and what I entered in the specialty name field will be gone section will be hidden.</li> <li>- As an admin, If I don't confirm, then I will stay in add faculty member specialty section in the same page.</li> </ul>
11	As an admin, I want to be able to update faculty specialty so that I can rename them to a more accurate and up to date name.	5	Feature	Done	<ul style="list-style-type: none"> <li>-As an admin, If I click on the "Faculty member specialty " button in the home page or from side bar, then the system will navigate to faculty member specialty page.</li> </ul>

					<ul style="list-style-type: none"><li>- As an admin, If I click on update button next to a specialty name, then the update faculty member specialty section will appear.</li><li>- As an admin, If I leave the specialty name empty and click on the "UPDATE" button in the update faculty member specialty section, then the updating fails with an error message.</li><li>- As an admin, If I don't change the specialty name and click on the "UPDATE" button in the update faculty member specialty section, then the updating fails with an error message.</li><li>- As an admin, If I enter the specialty name in Arabic and click on the "UPDATE" button in the update faculty member specialty section, then the updating fails with an error message.</li><li>- As an admin, If I enter only digits and/or special characters in the specialty name and click on the "UPDATE" button in the update faculty member specialty section, then the updating fails with an error message.</li></ul>
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				<ul style="list-style-type: none"><li>- As an admin, If I enter a specialty name that is added previously and click on the "UPDATE" button in the update faculty member specialty section, then the updating fails with an error message.</li><li>- As an admin, If I enter a specialty name that is added previously and click on the "UPDATE" button in the update faculty member specialty section, then the updating fails with an error message.</li><li>- As an admin, If I enter a specialty name that is in English and with/without digits and/or special characters and it is not already added and click on the "UPDATE" button in the update faculty member specialty section, then a message will appear indicating that the updating has been posted successfully.</li><li>-As an admin, If I click on "CANCEL" button in the update faculty member specialty section, then a conformation message will appear.</li><li>-As an admin, If I confirm, then the updating fails and what I entered in the specialty name field will be gone section will be hidden.</li></ul>
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					<ul style="list-style-type: none"><li>- As an admin, If I don't confirm, then I will stay in update faculty member specialty section in the same page .</li></ul>
12	As an admin, I want to be able to add categories for graduation projects so that the GP library can be organized and easy to use.	5	Feature	Done	<ul style="list-style-type: none"><li>- As an admin, If I click on the "graduation projects category" button in the home page or from side bar, then the system will navigate to graduation projects category page.</li><li>- As an admin, If I click on "Add New Category " button in the graduation projects category page, then the add graduation project category section will appear.</li><li>- As an admin, If I leave the category name empty and click on the "ADD" button in the add graduation project category section, then the addition fails with an error message.</li><li>- As an admin, If I enter the category name in Arabic and click on the "ADD" button in the add graduation project category section, then the addition fails with an error message.</li><li>- As an admin, If I enter only digits and/or special characters in the</li></ul>

				<p>category name and click on the "ADD" button in the add graduation project category section, then the addition fails with an error message.</p> <p>- As an admin, If I enter a category name that is added previously and click on the "ADD" button in the add graduation project category section, then the addition fails with an error message.</p> <p>- As an admin, If I enter a category name that is in English and with/without digits and/or special characters and it is not already added and click on the "ADD" button in the add graduation project category section, then a message will appear indicating that the addition has been posted successfully.</p> <p>-As an admin, If I click on "CANCEL" button in the add graduation project category section, then a confirmation message will appear.</p> <p>-As an admin, If I confirm, then the addition fails and what I entered in the category name field will be gone and the section will be hidden.</p>
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					<ul style="list-style-type: none"> <li>- As an admin, If I don't confirm, then I will stay in add graduation project category section in the same page .</li> </ul>
13	As an admin, I want to be able to view categories for graduation projects so that I can see what type of graduation projects are available on the GP library.	3	Feature	Done	<ul style="list-style-type: none"> <li>-As an admin, If I click on the "graduation projects category" button in the home page or from side bar, then the system will navigate to graduation projects category page.</li> <li>-As an admin, If I go to graduation projects category page and there exist is graduation projects category, then a list of all categories will be displayed.</li> <li>-As an admin, If I go to graduation projects category page and there is no graduation projects category added yet, then the massage will appear indicating no graduation projects category added yet</li> </ul>
14	As an admin, I want to be able to update categories for graduation projects so that I can rename them to a more accurate and up to date name.	5	Feature	Done	<ul style="list-style-type: none"> <li>- As an admin, If I click on the "Graduation projects category" button in the home page or from side bar, then the system will navigate to graduation projects category page.</li> <li>- As an admin, If I click on update button next to a category name,</li> </ul>

				<p>then the update graduation projects category section will appear.</p> <ul style="list-style-type: none"><li>- As an admin, If I leave the category name empty and click on the "UPDATE" button in the update graduation projects category section, then the updating fails with an error message.</li><li>- As an admin, If I don't change the category name and click on the "UPDATE" button in the update graduation projects category section, then the updating fails with an error message.</li><li>- As an admin, If I enter the category name in Arabic and click on the "UPDATE" button in the update graduation projects category section, then the updating fails with an error message.</li><li>- As an admin, If I enter only digits and/or special characters in the category name and click on the "UPDATE" button in the update graduation projects category section, then the updating fails with an error message.</li><li>- As an admin, If I enter a category name that is added previously and click on the "UPDATE" button in the update graduation projects</li></ul>
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				<p>category section, then the updating fails with an error message.</p> <p>- As an admin, If I enter a category name that is added previously and click on the "UPDATE" button in the update graduation projects category section, then the updating fails with an error message.</p> <p>- As an admin, If I enter a category name that is in English and with/without digits and/or special characters and it is not already added and click on the "UPDATE" button in the update graduation projects category section, then a message will appear indicating that the updating has been posted successfully.</p> <p>-As an admin, If I click on "CANCEL" button in the update graduation projects category section, then a conformation message will appear.</p> <p>-As an admin, If I confirm, then the updating fails and what I entered in the category name field will be gone section will be hidden.</p> <p>- As an admin, If I don't confirm, then I will stay in update graduation projects category section in the same page .</p>
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15	As an admin, I want to be able to add GP help desk dates so that help desk appointments for a semester will be within a limited period.	5	Feature	Done	<ul style="list-style-type: none"> <li>- As an admin, If I click on the "help desk dates" button in the home page or from side bar, then the system will navigate to help desk dates page.</li> <li>- As an admin, If I go to help desk dates page, then a list of the added semesters will be displayed.</li> <li>- As an admin, If I don't choose a semester from the list and click "NEXT" button, then an error message will appear.</li> <li>- As an admin, If I choose a semester that hasn't been assigned a help desk dates yet from the list and click "NEXT" button, then the system will show add help desk dates section.</li> <li>- As an admin, If I go to add help desk dates section, then I can choose dates for that semester.</li> <li>- As an admin, If I don't choose dates and click "ADD" button, then an error message will appear.</li> <li>- As an admin, If I choose a start date that is after the end date and click "ADD" button, then an error message will appear.</li> <li>- As an admin, If I choose dates that are in the past and click "ADD"</li> </ul>
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					<p>button, then an error message will appear.</p> <p>-As an admin, If I choose the start date that is equal to the end date and click "ADD" button, then an error message will appear.</p> <p>- As an admin, If I choose a start and end dates that are not in the same year of the chosen semester and click "ADD" button, then an error message will appear.</p> <p>- As an admin, If I choose valid dates and click "ADD" button, then a message will appear indicating that the addition has been posted successfully.</p> <p>-As an admin, If I click on "CANCEL" button in the add help desk dates section, then a confirmation message will appear.</p> <p>-As an admin, If I confirm, then the adding fails and what I have chosen for the dates will be gone and the section will be hidden.</p> <p>- As an admin, If I don't confirm, then I will stay in add help desk dates section in the same page .</p>
16	As an admin, I want to be able to view GP help desk dates so that I can	3	Feature	Done	-As an admin, If I click on the "help desk dates" button in the home page or from side bar, then the system

	know the help desk duration for a semester.				will navigate to help desk dates page and a list of the added semesters will be displayed.  -As an admin, If I choose a semester that has been assigned a help desk dates from the list and click "NEXT" button, then the system will show help desk dates section.  -As an admin, If I am in help desk dates section and the semester is over, then the chosen semester's help desk dates will be displayed as a text.  -As an admin, If I am in help desk dates section and the semester did not end, then the chosen semester's help desk dates will be displayed as an assigned dates input.
17	As an admin, I want to be able to update GP help desk dates so that I can extend/shrink the help desk duration.	5	Feature	Done	-As an admin, If I click on the "help desk dates" button in the home page or from side bar, then the system will navigate to help desk dates page and a list of the added semesters will be displayed.  -As an admin, If I choose a semester that has been assigned a help desk dates from the list and click "NEXT" button, then the system will show update help desk dates section and the chosen

				<p>semester's help desk dates will be displayed.</p> <p>-As an admin, If I change the start date to a date that is after the end date and click "UPDATE" button, then an error message will appear.</p> <p>-As an admin, If I change the start date so that it is equal to the end date or vice versa and click "UPDATE" button, then an error message will appear.</p> <p>- As an admin, If I change the start or end date to a date in the past and click "update" button, then an error message will appear.</p> <p>- As an admin, If I change the start date that has been reached and click "UPDATE" button, then an error message will appear.</p> <p>- As an admin, If I did not change the start or end date and click "UPDATE" button, then an error message will appear.</p> <p>- As an admin, If I change the start and end dates to dates that are not in the same year of the chosen semester and click "UPDATE" button, then an error message will appear.</p>
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					<p>-As an admin, If I change start or end dates to a valid dates and click "UPDATE" button, then a message will appear indicating that the updating has been posted successfully.</p> <p>-As an admin, If I click on "CANCEL" button in the update help desk dates section, then a conformation message will appear.</p> <p>-As an admin, If I confirm, then the updating fails and what I have chosen for the dates will be gone and the section will be hidden.</p> <p>- As an admin, If I don't confirm, then I will stay in update help desk dates section in the same page .</p>
18	As an admin, I want to be able to view available faculty members with their specialties under a specific semester so that I can determine which specialty requires faculty member.	2	Feature	Done	<p>-As an admin, If I click on the "Semesters " button in the home page or from the side bar, then the system will navigate to the semesters page.</p> <p>-As an admin, If I click on the grey faculty member button next to a semester name, then a message will appear indicating that no faculty are listed for that semester.</p> <p>-As an admin, If I click on the blue faculty member button next to a semester name, then Semester</p>

					<p>Faculty List section and specialty will appear on the same page.</p> <ul style="list-style-type: none"><li>- As an admin, If I choose a specialty and there are no faculty members associated with that specialty, then a message will appear indicating that there are no faculty members in that specialty.</li><li>- As an admin, If I choose a specialty and there are faculty members associated with that specialty, then the semester faculty list will be displayed.</li></ul>
19	As a faculty member, I want to be able to sign up, so that I can gain access to the system.	5	Feature	Done	<ul style="list-style-type: none"><li>- As a faculty member, If I go to the main page and click on “Faculty member” button, then the system will navigate to login page if I don't have an account and I click on sign up link,then the system will navigate to sign up page.</li><li>- As a faculty member, If I am in sign up page, then I will be able to see a form with the fields (my first name, last name, email, password, department, semester specialty).</li><li>- As a faculty, If I enter my first name or last name with any character other than the letters and click " Sign up " button, then the</li></ul>

				<p>sign up fails and an error message will appear.</p> <ul style="list-style-type: none"><li>- As a faculty member, If I enter my email that does not match with a KSU email format and click " Sign up " button, then the sign up fails, and an error message will appear.</li><li>- As a faculty member,If I enter an existing email and click " Sign up " button, then the sign up fails, and an error message must appear.</li><li>- As a faculty member, If I enter a password that is less than 8 characters or does not have small and capital or does not have a number and click on "Sign up" button, then sign up fails and an error message will appear.</li><li>- As a faculty, If I enter my first name or last name or ksu email or password with any language other than the English and click " Sign up " button, then the sign up fails and an error message will appear.</li><li>- As a faculty member,If I leave any field empty and click on " Sign up " button, then the sign up fails and an error message will appear.</li><li>- As a faculty member,If I click on " Sign up " button with fill all field</li></ul>
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					<p>and satisfied all condition, then the system should send a verification link and navigate to verification page.</p> <p>-As a faculty member, if I am in verification page, and click on "Done" button without verifying my email,then an error message will appear.</p> <p>- As a faculty member, if I click on "Resend" another verification link will be sent.</p> <p>-As a faculty member, if I verify my email and click on "Done" button then, the system will navigate to booked an appointment page.</p>
20	As a faculty member, I want to be able to log in with email, password so that I can access the system and use all features.	2	Feature	Done	<p>- As a faculty member, If I am in the main page and click on "Faculty member" button, then the system should navigate to log in page</p> <p>- As a faculty member, If I am in the log in page and enter invalid KSU email or password and click on "Log in" then the log in fails and an error message will appear.</p> <p>- As a faculty member,If I am in the log in page and leave email or password filed empty and click on "Log in ",then the log in fails and an error message will appear.</p>

					<ul style="list-style-type: none"> <li>- As a faculty member, If I am in the log in page, enter my KSU email and password correctly, but I didn't verify my email, then the system will navigate to verification page to verify my email.</li> <li>- As a faculty member, If I am in the log in page, enter my KSU email and password correctly, and click on "Log in", then the system will navigate to booked appointments page.</li> </ul>
21	As a faculty member, I want to be able to log out so that I can protect my account from unauthorized users.	1	Feature	Done	<ul style="list-style-type: none"> <li>- As a faculty member, If I click on menu icon, then the system will display menu section.</li> <li>- As a faculty member, If I click on "Log out" from menu section, then a confirmation message will appear.</li> <li>- If I confirm, then the system will navigate to the main page.</li> <li>- As a faculty member, If I don't confirm, then I will stay logged in.</li> </ul>
22	As a faculty member, I want to be able to view my profile so that I can ensure that all my information is accurate.	5	Feature	Done	<ul style="list-style-type: none"> <li>- As a faculty member, If I click on menu icon, then the system will display menu section.</li> <li>- As a faculty member, if I click on "my profile", then the system will display my information which are</li> </ul>

					first name, last name, email, semester, department, specialty.
23	As a student, I want to be able to sign up so that I can gain the access to the system.	8	Feature	Done	<ul style="list-style-type: none"><li>- As a student, If I am in the main page and click on "Student" button, then the system will navigate to login page if I don't have an account and I click on sign up link the system will navigate to sign up page.</li><li>- As a student, If I go to sign up page, then I will be able to see a form with the fields (first name, last name, email, password, department, social media link).</li><li>- As a student, If I leave any of the fields empty and click on "Next" button, then an error message will appear.</li><li>- As a student, If I enter an existing email and click " Next" button, an error message will appear.</li><li>- As a student, If I enter my email that does not match with an email format an error message will appear.</li><li>- As a student, If I enter a password that is less than 8 characters or does not have small and capital or does not have a number and click on "</li></ul>

					<p>Next "button, then an error message will appear.</p> <ul style="list-style-type: none"> <li>- As a student, If I enter my first name or last name or email or password or, social media link with any language other than the English and click " Next " button, then an error message will appear.</li> <li>- As a student, If I click on " Next" button with fill all field and satisfied all condition, then the system should navigate to select group page.</li> </ul>
24	As a student, I want to be able to search for my group, so that I can join it.	8	Feature	Done	<ul style="list-style-type: none"> <li>-As a student, If I am in select group page and click on " Sign up " button without choosing my group then, the sign up will fail with an error message will appear.</li> <li>-As a student, If I search for my group, then the groups that match the name that I wrote should appear.</li> </ul> <p>As a student, if I search for my group and I don't find any result, I can create a new group.</p> <p>-As a student, if I click on "create a new group" , then the dialog box will appear with project name filed and project completion date filed.</p>

				<ul style="list-style-type: none"><li>-As a student, if I leave project name filed or project completion date filed empty and click on "Create" button, an error message will appear.</li><li>-As a student, if I click on "Cancel" button, I will stay on the select group page.</li><li>-As a student, if I filled all dialog fields and click on "Create" button the project will be added, then a message will appear indicating that adding has been done successfully.</li><li>-As a student, if I click on "edit" icon ,then I can edit my project name or project completion date.</li><li>-As a student, if I edit my project information and click on "Edit" button, then the information will be changed successfully.</li><li>-As a student, if I edit my project information and click on "Cancel" button, the information will stay the same without change.</li><li>-As a student, if I choose my group or create a new group and click on " Sign up " button, then the system should send a verification link and navigate to verification page.</li></ul>
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					<ul style="list-style-type: none"> <li>-As a student, if I am in verification page, and click on "Done" button without verifying my email, an error message will appear.</li> <li>- As a student, if I click on "Resend" , then another verification link will be sent.</li> <li>-As a student, if I verify my email and click on "Done" button, then the system will navigate to booked an appointment page.</li> </ul>
25	As a student, I want to be able to log in with my email and password so that I can access the system and use all the features.	2	Feature	Done	<ul style="list-style-type: none"> <li>-As a student, If I go to the main page and click on "Student" button, then the system should navigate to log in page.</li> <li>-As a student, If I enter an invalid email or password and click on "Log in", then the log in fails with an error message.</li> <li>- As a student, If I leave the email or password filed empty and click on "Log in", then the log in fails with an error message.</li> <li>- As a student, If I am in the log in page, enter my email and password correctly, but I didn't verify my email then, the system will navigate to verification page to verify my email.</li> </ul>

					<ul style="list-style-type: none"> <li>- As a student, If I enter email and password correctly, and click on "Log in", then the system will navigate to booked an appointment page.</li> </ul>
26	As a student, I want to be able to log out so that I can access the system again at my own convenience.	1	Feature	Done	<ul style="list-style-type: none"> <li>-As a student, If I click on my menu icon, then the system will display the menu section.</li> <li>-As a student, If I click on "Log out" from menu section, then a confirmation message will appear.</li> <li>-As a student, If I confirm, then the system will navigate to the main page.</li> <li>-As a student, If I don't confirm, then I will stay logged in.</li> </ul>
27	As a student, I want to be able to view my profile so that I can ensure that all my information is accurate.	8	Feature	Done	<ul style="list-style-type: none"> <li>- As a student, If I click on the menu icon, then the system will display menu section.</li> <li>-As a student, if I click on "my profile" ,then the system will display my information which are first name, last name, email, department, social media, project name, project completion date.</li> </ul>
28	As a faculty member, I want to be able to add my available help desk days and hours so that	8	Feature	Done	<ul style="list-style-type: none"> <li>- As a faculty member, If I click on "Available Hours" button in the navigation bar, then the system will navigate to available Hours page.</li> </ul>

	students can know when I am available.		<ul style="list-style-type: none"><li>-As a faculty member, If I am in Available Hours page and I don't choose a day or time and tried to click on "Confirm" button, the button will not be clicked.</li><li>- As a faculty member, If I am in the Available Hours page and I click on the checkbox next to a day, then I will be able to choose a start and end time from the time picker for my availability at that day.</li><li>- As a faculty member, If I am in the Available Hours page and I click "Cancel" in the time picker dialog, then the dialog will be closed, and the time will not be saved.</li><li>- As a faculty member, If I am in the Available Hours page and I click "Ok" in the time picker dialog, then the time will be displayed under the chosen day.</li><li>- As a faculty member, If I am in the Available Hours page and I click on "+Add" button under a day, then I can add another available period of time I have under that day.</li><li>- As a faculty member, If I am in the Available Hours page and I choose a start and end time that is within</li></ul>
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					<p>the previous period of time, then an error message will appear.</p> <p>- As a faculty member, If I am in the Available Hours page and I choose a start time that is after the end time, then an error message will appear.</p> <p>- As a faculty member, If I click on "Confirm" button, then a dialog will appear, and I can enter my meeting method.</p> <p>-As a faculty member, If I click on "Confirm" button before filling the meeting method, then an error message will appear.</p> <p>- As a faculty member, If I don't confirm the time will not be added.</p> <p>- As a faculty member, If I filled all the fields and click on "Confirm", then all my available hours will be added successfully, and the system will navigate to view available hours.</p>
29	As a faculty member, I want to be able to view available help desk days and hours so that I know what hours I provided my student with.	3	Feature	Done	<p>- As a faculty member, If I click on "Available hours" button from navigation bar, then the system will navigate to Available hours page and my available help desk time and meeting method will be displayed.</p>

30	As a faculty member, I want to be able to edit my meeting method so that I can keep it updated.	2	Feature	Done	<ul style="list-style-type: none"> <li>- As a faculty member, If I click on "Available hours" button from navigation bar, then the system will navigate to Available hours page.</li> <li>- As a faculty member, If I am in Available Hours page and I click on the edit button next to the meeting method, then I can edit my meeting method.</li> <li>-As a faculty member, If I leave any field empty and click on "Save" button, then an error message will appear.</li> <li>- As a faculty member, If I filled all the field and click on "Save" button, all my changes will be saved successfully.</li> </ul>
31	As a student, I want to be able to receive a notification when the faculty member changes the meeting method before less than 24 hours of my appointment so that I am aware of the latest updates	3	Feature	Done	<ul style="list-style-type: none"> <li>-As student, If I have an appointment with a faculty member in the coming 24 hours and the faculty changes the meeting method, then I will receive a notification to inform me about that change.</li> </ul>
32	As a faculty member, I want to be able to view booked appointments	8	Feature	Done	<ul style="list-style-type: none"> <li>- As a faculty member, If I click on "Appointment" button in the</li> </ul>

	so that I can know exactly when my booked appointments are.				navigation bar, then the system will navigate to appointments page  - As a faculty member, If I am in appointments page, then I can view upcoming appointments.  - As a faculty member, if I click on an appointment, when the appointment details will appear (date and time of the appointment, the appointment is in what specialty, the group name that booked the appointment with the students names).  - As a faculty member If I am in appointments page and there is no booked appointments, then a message will appear indicating that I don't have any upcoming appointments.
33	As a faculty member, I want to be able to cancel my appointments so that I can control any sudden change.	3	Feature	Done	- As a faculty member, If I click on "Appointments" button in the navigation bar, then the system will navigate to booked appointments page and the booked appointments will be displayed.  - As a faculty member, If I click on "Cancel" button under to any appointment from booked appointments page before less than 24 hours of the appointment, then a

					<p>message will appear telling me that I cannot cancel an appointment before less than 24 hours.</p> <ul style="list-style-type: none"> <li>- As a faculty member, If I click on "Cancel" button under to any appointment from booked appointments page before more than 24 hours, then a message will appear to confirm the cancellation.</li> <li>- As a faculty member, If I confirm the cancellation, then the booked appointments will be canceled.</li> <li>- As a faculty member, If I don't confirm the cancellation, then the booked appointments will not be canceled.</li> </ul>
34	As a faculty member, I want to be able to receive a notification if a student cancels the appointment so that I don't waste my time waiting for them.	2	Feature	Done	<ul style="list-style-type: none"> <li>- As a faculty member, If the student cancels a booked appointment with me, then the system will send a notification to me that the appointment has been canceled.</li> </ul>
35	As a student, I want to be able to view available faculty members so that I can see who is available in my semester.	8	Feature	Done	<ul style="list-style-type: none"> <li>- As a student, If I click on "Book An Appointment" button in the navigation and there are no faculty members in the same semester/department as me, or they don't have appointments available under any specialty, then a message</li> </ul>

				<p>will appear indicating that no appointments are currently available in all specialties.</p> <p>- As a student, If I click on “Book An Appointment” button in the home page and there are faculty members available in the same semester/department as me, and they have appointments available under specific specialty, then a list of available specialties will be displayed.</p> <p>- As a student, If I choose a specialty from the list and there are no faculty members in the same semester/department as me, or they don't have appointments available under chosen specialty, then a message will appear indicating that no appointments are available with the selected specialty .</p> <p>- As a student, If I choose a specialty from the list and there are faculty members with the same semester/department as me, and they have appointments available to book under chosen specialty, then a list of available faculty members will be displayed.</p> <p>- As a student, If I click on any of the faculty members, then the</p>
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					<p>system will navigate to available appointment page.</p> <ul style="list-style-type: none"> <li>- As a student, If I click on "Choose Another Specialty" button and there are faculty members with the same semester/department as me, and they have appointments available to book , then a list of available specialties will be displayed.</li> <li>- As a student, If I click on "Choose Another Specialty" button and there are no faculty members in the same semester/department as me, or they don't have appointments available under any specialty, then a message will appear indicating that no appointments are currently available in all specialties.</li> </ul>
36	As a student, I want to be able to book an appointment with a faculty member so that I can consult her about the problem I have.	8	Feature	Done	<ul style="list-style-type: none"> <li>- As a student, If I click on “Book An Appointment” button in the navigation bar and go to faculty members list page and choose any faculty members under chosen specialty, then the system will navigate to available appointment page.</li> <li>- As a student, If I click on available date from calendar , then a list of available times will appear under chosen date.</li> </ul>

					<ul style="list-style-type: none"><li>- As a student, If I click on the available time under the chosen date, then a confirmation message will appear with the faculty name, time, date, specialty and meeting location (online by zoom or in person by office number).</li><li>-As a student, If I click on "Yes, Confirm" button, then the appointment will be successfully booked and the system will navigate me to the booked appointment information page.</li><li>-As a student, If I click on "Cancel" button, then the appointment will be canceled and I will be able to choose different date.</li><li>- As a student, If I go to booked appointment information page, then I can view the faculty name, time, date, specialty and meeting location (online by zoom or in person by office number).</li><li>- As a student, If I go to booked appointment information page and I click on "OK" button , then the system will take me to the appointments page.</li></ul>
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					<ul style="list-style-type: none"><li>- As a student, If I go to booked appointment information page and I click on back arrow, then the system will take me back to the available appointments page.</li><li>- As a student, If I return to the available appointments page and there are no dates available to book, then a message will appear indicating me that I must return to the faculty list page and choose another faculty member to book again.</li><li>- As a student, If I return to the available appointments page and there are dates available for booking, then I can choose available time and book again.</li></ul>
37	As a student, I want to be able to view appointments that I booked or one of my group members so that I can know exactly when my booked appointments are.	8	Feature	Done	<ul style="list-style-type: none"><li>- As a student, If I click on “Appointment” button in the navigation bar, then the system will navigate to appointment page.</li><li>- As a student, If I am in booked appointment page and I have upcoming appointment which was booked by any member of my group, then I will be able to see list of my upcoming appointments.</li><li>- As a student, if I click on an appointment, when the</li></ul>

					<p>appointment details will appear (date and time of the appointment the appointment is with whom, in what specialty, meeting method type and details).</p> <p>- As a student, If I am in appointment page and I don't have any upcoming appointment, then a message will appear indicating that I don't have any upcoming appointment.</p>
38	As a student, I want to be able to cancel my appointment so that I can book another appointment that is more suitable for my schedule.	2	Feature	Done	<p>-As a student, If I click on "Appointment" button in the navigation bar, then the system will navigate to booked appointment page I can see upcoming appointment if I have any.</p> <p>-As a student, If click on "Cancel" button under any appointment, then message will appear asking me to choose my cancelation reason.</p> <p>-As a student, if I click on "Yes" button before choosing a reason, then an error massage will appear.</p> <p>-As a student, If I choose a reason and click on "Yes" then the appointment will be canceled.</p> <p>-As a student, If I choose a reason and click on "No" then the appointment will not be canceled</p>

					and I will go back to view booked appointment page
39	As a student, I want to be able to receive notification when the faculty member cancels an appointment so that I can book replacement appointment.	2	Feature	Done	-As a student, If the faculty member cancels a booked appointment, then the system will send a notification to me that the appointment has been canceled.
40	As a faculty member, I want to be able to add FAQ so that I can save my time and effort by circulating answers to all students.	5	Feature	Done	<ul style="list-style-type: none"> <li>- As a faculty member, if I click on "FAQ" from navigation bar, then the system will navigate to FAQs page.</li> <li>- As a faculty member, If I click on "+Add" button in FAQ page, then the system will navigate to the add FAQ page.</li> <li>-As a faculty member,If I go to add FAQ page, then I can add FAQ details (FAQ title, FAQ specialty, question, answer, upload document, add links).</li> <li>-As a faculty member, if fill all fields and click on "Add" button, a message will appear indicating that the added has been done successfully.</li> <li>- As a faculty member, if I click on the "Upload file" button will</li> </ul>

					<p>navigate to the file browser in the phone to enable me to add file.</p> <p>-As a faculty member, if I click on "Add link" button then, dialog will appear.</p> <p>- As a faculty member, if I fill all fields and click on "Add" button, then the link will added successfully.</p> <p>-As a faculty member, if I leave any filed empty in add link dialog and click on "Add" button, then an error message will appear.</p> <p>- As a faculember, if I delete the link or the file that already added the confirmation message will appear if I click on "YES" the link or the file will be deleting if I click on "NO" it will stay.</p> <p>- As a faculty member, If I enter the FAQ title that already exists in the same specialty, then an error message will appear.</p> <p>- As a faculty member, If I leave any field empty, then an error massage will appear.</p>
41	As a faculty member, I want to be able to update FAQ so that I	5	Feature	Done	<p>-As a faculty member,If I click on "FAQ" button from navigation bar ,then the system will navigate to FAQs page and display all FAQs if</p>

	can improve the suggested answer.			I choose any FAQ, then the system will navigate to view the FAQ details.  - As a faculty member, If I go to view FAQ page and click on "update" icon ,then the system will navigate to update FAQ page.  -As faculty member, If I go to update FAQ page, then I will be able to update (Question, answer, upload document, add link) if I update any filed and click on "Save" button, then a message will appear indicating that the updated has been done successfully.  - As a faculty member, if I click on the "Upload file" button will navigate to the file browser in the phone to enable me to add file.  -As a faculty member, if I click on "Add link" button then, dialog will appear.  - As a faculty member, if fill all fields and click on "Add" button the link will added successfully.  -As a faculty member, if I leave any filed empty in add link dialog and click on "Add" button, then an error message will appear.
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					<ul style="list-style-type: none"> <li>- As a faculty member, if I delete the link or the file that already added the confirmation message will appear, if I click on "YES", then the link or the file will be deleting if I click on "NO" it will stay.</li> <li>- As a faculty member, If I leave any field empty, then an error message will appear.</li> </ul>
42	As a faculty member, I want to be able to view FAQ list so that I can know what is already in the system.	5	Feature	Done	<ul style="list-style-type: none"> <li>- As a faculty member, If I click on "FAQ" button from navigation bar, then the system will navigate to FAQ list page.</li> <li>- As a faculty member, If I am in FAQ list page, then a list of the FAQ specialties and semesters will be displayed.</li> <li>- As a faculty member, If I am on the FAQ list page and the list of specialties and semesters is displayed, and there are no FAQs under any of the specialties or semesters on the list, then a message will appear indicating that there are no FAQs available currently.</li> <li>- As a faculty member, If I am in the FAQs list page and I click on any</li> </ul>

					FAQ, then the system will navigate to FAQ details page.
43	As a faculty member, I want to be able to view FAQ details so that I can avoid adding a FAQ that already added.	3	Feature	Done	<p>-As a faculty member, If I click on "FAQ" button from navigation bar, then the system will navigate to FAQs page and display all FAQs</p> <p>-As a faculty member, if I choose any FAQ the system will navigate to view the FAQ details.</p> <p>-As a faculty member, If I am in FAQ details page, then I will be able to see FAQ details such as semester and specialty for this FAQ, Question description, answer and a PDF file or link if it was added.</p>
44	As a faculty member, I want to be able to delete the FAQ so that I can remove unwanted FAQ.	2	Feature	Done	<p>- As a faculty member,If I click on "FAQ" button from navigation bar, then the system will navigate to FAQs page and display all FAQs if I choose any FAQ the system will navigate to view the FAQ details.</p> <p>- As a faculty member,If I go to view FAQ page and click on "update" icon the system will navigate to update FAQ page.</p> <p>-As a faculty member, if I click on the "delete" icon, then a confirmation message will appear.</p>

					<p>-As a faculty member, if I confirm, then the message will appear indicating that the deleting has been successfully.</p> <p>- As a faculty member, if I don't confirm, then the FAQ will not be deleted.</p>
45	As a faculty member, I want to be able to receive a reminder notification a day in advance of an appointment so that I can remember to attend.	5	Feature	Done	<p>-As a faculty member, If I have an appointment or multiple appointments, then I will receive a reminder notification one day before the appointment(s).</p> <p>-As a faculty member, if I have an appointment or multiple appointments that has been booked a few hours or minutes before the appointment, then immediately I will receive a reminder notification for that appointment.</p>
46	As a student, I want to be able to view FAQ list so that I can find a similar question to mine	5	Feature	Done	<p>- As a student, If I click on "FAQ" button from navigation bar, then the system will navigate to to FAQ list page.</p> <p>- As a student, If I am in FAQ list page, then a list of the FAQ specialties and semesters will be displayed.</p> <p>-As a student, If I am on the FAQ list page and the list of specialties and semesters is displayed, and</p>

					<p>there are no FAQs under any of the specialties or semesters on the list, then a message will appear indicating that there are no FAQs available currently.</p> <ul style="list-style-type: none"> <li>- As a student, If I am in the FAQs list page and I click on any FAQ, then the system will navigate to FAQ details page.</li> </ul>
47	As a student, I want to be able to view FAQ details so that I can move forward my project.	2	Feature	Done	<ul style="list-style-type: none"> <li>- As a student, If I click on "FAQ" button from navigation bar, then the system will navigate to FAQ list page.</li> <li>- As a student, If I am in the FAQs list page and I click on any FAQ, then the system will navigate to FAQ details page.</li> <li>- As a student, If I am on the FAQ details page, I will be able to see FAQ details such as the semester, specialty, question, answer, any files or links that have been added and Who created it and who modified it, if any.</li> </ul>
48	As a student, I want to be able to receive a notification a day in advance of an appointment so that I	5	Feature	Done	<ul style="list-style-type: none"> <li>-As a student, If I booked an appointment with a faculty member, then I will receive a reminder notification one day before the appointment.</li> </ul>

	don't forget my appointment.				<ul style="list-style-type: none"> <li>- As a student, If one of my group members booked an appointment a few hours or minutes before the appointment, then immediately I will receive a reminder notification for that appointment.</li> </ul>
49	As a student, I want to receive a reminder notification to upload my GP document so that it reminds me that it's to share my full experience.	2	Feature	Done	<ul style="list-style-type: none"> <li>-As a student, If I enter the date of my graduation project, then I will receive a reminder notification when it's time to add my project</li> </ul>
50	As a student, I want to be able to add my graduation project after completion so that I can benefit others from my experience.	5	Feature	Done	<ul style="list-style-type: none"> <li>-As a student, If I click on "GP library" button in the navigation bar, then the system will navigate to GP library page.</li> <li>-As a student, If I am in the GP library page and click on the "upload" icon, then the system will navigate to upload GP page.</li> <li>-As a student, If I am in the upload GP page before my specified graduation project completion date, then a message will appear indicating that I cannot upload until I finish my graduation project.</li> <li>-As a student, If I am in the upload GP page after my specified graduation project completion date</li> </ul>

					<p>and none of my group have already added the project, then a button will appear to choose a file.</p> <p>-As a student, If I choose a file other than PDF then an error message will appear.</p> <p>-As a student, If I choose a file then I will be able to choose a semester and a graduation project category and a GitHub repository link.</p> <p>-As a student, If don't choose a semester or at least one graduation project category and click upload button an error message will appear.</p> <p>-As a student if I click on the upload button then I message will appear indicating that the uploading was successful and the system will navigate to the GP library page.</p>
51	As a student, I want to be able to view my graduation project after completion so that I can see what my group members have uploaded.	2	Feature	Done	<p>-As a student, If I click on "GP library" button in the navigation bar, then the system will navigate to GP library page.</p> <p>-As a student, If I am in the GP library page and click on the "upload" icon, then the system will navigate to upload GP page.</p> <p>-As a student, If I am in the upload GP page and me or one of my group</p>

					<p>members have already added the project, then I will be able to view the uploaded file, GitHub repository(if it was added) and group members social media contact links.</p> <p>-As a student if I click on the file icon then I will be able to view the file</p> <p>-As a student if I click on the code icon then the system will navigate to the browser to open the GitHub repository link.</p> <p>-As a student if I click on the social media icon then the system will navigate to the bowser to open these social media contact link.</p>
52	As a student, I want to be able to delete my graduation project after completion so that I can read the correct project.	1	Feature	Done	<p>-As a student, If I click on "GP library" button in the navigation bar, then the system will navigate to GP library page.</p> <p>-As a student, If I am in the GP library page and click on the upload icon, then the system will navigate to upload GP page.</p> <p>-As a student, If I am in the upload GP page and me or one of my group members have already added the project, then I will be able to view the uploaded file, GitHub</p>

					<p>repository(if it was added), group members social media contact links and a “Delete” button.</p> <p>-As a student if I click on the “Delete” button then a confirmation message will appear.</p> <p>-As a student if I confirm then the project will be deleted and a message will appear indicating that the project was deleted successfully and the system will navigate to the GP library page .</p>
53	As a student, I want to browse the graduation project library so that I can benefit from other groups experiences.	3	Feature	Done	<p>-As a student, If I click on "GP library" button in the navigation bar, then the system will navigate to GP library page.</p> <p>-As a student, If I am in the GP library page, then I will be able to browse the GP library.</p>
54	As a student, I want to view a graduation project details so that I can access all the information that a group shared.	3	Feature	Done	<p>-As a student, If I click on "GP library" button in the navigation bar, then the system will navigate to GP library page.</p> <p>-As a student, If I am in the GP library page, then I will be able to browse the GP library.</p> <p>- As a student if I click on one of the projects in the library then the system will navigate to view graduation project details page.</p>

					<p>-As a student if I am in the view graduation project details page, then I will be able to view the uploaded file, GitHub repository (if it was added) and group members social media contact links.</p> <p>-As a student if I click on the file icon then I will be able to view the file</p> <p>-As a student if I click on the code icon then the system will navigate to the browser to open the GitHub repository link.</p> <p>-As a student if I click on the social media icon then the system will navigate to the bowser to open these social media contact link.</p>
55	As a faculty member, I want to be able to edit my profile so that I can reflect any change in my information.	5	Feature	Done	<p>- As a faculty member, If I click on menu icon then the menu section will display.</p> <p>-As a faculty member, if I click on "my profile", then the system will navigate to profile page.</p> <p>- As a faculty member, If I am in profile page, then I should be able to edit my information (first name, last name ,department,semester,specialty)</p> <p>- As a faculty member, If I leave any field empty and click on "Save"</p>

					<p>button, then the update fails with an error message.</p> <p>As a faculty member, if I click on "Save" button without any changes, then the error message will appear.</p> <ul style="list-style-type: none"><li>- As a faculty member, If I edit department or semester click on "Save" button, then a conformation message will appear .</li><li>- As a faculty member, If I click on "Confirm", then a message will appear indicating that updating has been done successfully.</li><li>- As a faculty member, If I click on "Cancle" then I will stay on the same page and there is no changes will happened.</li><li>- As a faculty member, If I edit and enter first name or last name or specialty and click on "Save" button, then a message will appear indicating that updating has been done successfully.</li></ul>
56	As a faculty member, I want to be able to reset my password so that I can set new password if I forgot the old one.	2	Feature	Done	<ul style="list-style-type: none"><li>-As a faculty member, If I am in log in page and click on "forgot my password" link, then the system will navigate to forgot password page.</li><li>-As a faculty member, If I am in forgot password page and enter</li></ul>

					<p>email with incorrect format, then an error message will appear.</p> <p>-As a faculty member, If I enter an existent email and click on "Send" button, then the system will send a link to my email, then the system will navigate to another page.</p> <p>-As a faculty member, If I click on the "Resend" another link will be sent, the the message will appear.</p> <p>As a faculty member, If I click on "Log in" button, then the system will navigate to login page.</p>
57	As a logged in faculty member, I want to be able to reset my password so that, I can set new strong password for my account.	2	Feature	Done	<ul style="list-style-type: none"> <li>- As a logged in faculty member, If I click on menu icon then the menu section will display.</li> <li>-As a logged in faculty member, if I click on "Reset password", then the system will navigate to reset page.</li> <li>- As a logged in faculty member, if I click on "Send" a reset link will send, then a message will appear.</li> <li>-As a logged in faculty member, if I click on "Resend" another reset link will send, then a message will appear.</li> </ul>
58	As a faculty member, I want to filter FAQs by semester so that I can	5	Feature	Done	<ul style="list-style-type: none"> <li>- As a faculty member, If I click on "FAQ" button from navigation bar, then the system will navigate to FAQ list page,</li> </ul>

	<p>get the latest proposed solution quickly.</p>		<ul style="list-style-type: none"><li>- As a faculty member, If I am on the FAQ list page, then a list of the FAQ specialties and semesters will be displayed.</li><li>-As a faculty member, If I am on the FAQ list page and the list of specialties and semesters is displayed, and there are no FAQs under any of the specialties or semesters on the list, then a message will appear indicating that there are no FAQs available currently.</li><li>-As a faculty member, If I am on the FAQ list page and the list of specialties and semesters is displayed, and there are no FAQs under the specialties or semesters selected, then a message will appear indicating that there are no FAQs available with the selected options.</li><li>-As a faculty member, If I am in the FAQ list page and the list of specialties and semesters is displayed, and there are FAQs under the specialties and semesters selected, then a list of FAQs will be displayed.</li></ul>
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59	As a faculty member, I want to receive a notification at the end of the semester so that I can know that the GP help desk dates has been ended	3	Feature	Done	<ul style="list-style-type: none"> <li>- As a faculty member, if the help desk dates for the semester I am in role in ended, then I will receive a notification to inform me of that.</li> </ul>
60	As a student, I want to be able to edit my profile so that I can keep my information up-to-date.	8	Feature	Done	<ul style="list-style-type: none"> <li>- As a student If I click on menu icon, then the menu section will display.</li> <li>-As a student, if I click on "my profile", then the system will navigate to profile page.</li> <li>- As a student, If I am in profile page, then I should be able to edit my information (first name, last name , department, project name , project completion date ,social media links, group)</li> <li>- As a student, If I leave the any field empty and click "Save" button, then the update fails with an error message.</li> <li>- As a student, If I edit a project name and write exist project name with the same department a warning message will appear that force me to click on "Check" button, then the system will navigate to another page to display</li> </ul>

				<p>the existed group, if I didn't find my group I can choose nothing and return to profile page. If I find my group and choose it, then click on "Select group" I will return to profile page with new group. If I click on "Save" button, then a message will appear indicating that updating has been done successfully.</p> <p>-As a student if I click on my department field, then the system will navigate to another page to change my department and display all groups that related to chosen department to select group or create new group. If I choose or create a new group and click on "Select group" button the system will return to profile page. If I click on "Save" button, then a message will appear indicating that updating has been done successfully.</p> <p>-As a student, if I click on "Change group" button, then the system will navigate to another page to choose or create new group. if I click on "Select group", then the system will return to profile page. If I click on "save" button, then a message will</p>
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					<p>appear indicating that updating has been done successfully.</p> <p>- As a student, If I edit and enter first name or last name or departments or project name or project completion date and click on "Save " button, then a message will appear indicating that updating has been done successfully.</p>
61	As a student, I want to be able to reset my password so that I can set new password if I forget the old one.	2	Feature	Done	<p>- As a student, If I am in log in page and click on "forgot my password" link, then the system will navigate to forgot password page.</p> <p>- As a student, If I am in forgot password page and enter email with incorrect format, then an error message will appear.</p> <p>- As a student, If I enter an existent email and click on "Send" button , then the system will send a link to my email, then the system will navigate to another page.</p> <p>- As a student, If I click on the "Resend" another link will be sent ,then the message will appear.</p> <p>-As a student, If I click on "Log in" button, then the system will navigate to login page.</p>

62	As a logged in student, I want to be able to reset my password so that, I can set new strong password for my account.	2	Feature	Done	<ul style="list-style-type: none"> <li>- As a logged in student, If I click on menu icon, then the menu section will display.</li> <li>-As a logged in student, if I click on "Reset password", then the system will navigate to reset page.</li> <li>- As a logged in student, if I click on "Send" ,then a reset link will send, then a message will appear.</li> <li>-As a logged in student, if I click on "Resend", then another reset link will send, then a message will appear.</li> </ul>
63	As a student, I want to be able to use filter for FAQs so that I can get the latest proposed answer quickly.	5	Feature	Done	<ul style="list-style-type: none"> <li>- As a student, If I click on "FAQ" button from navigation bar, then the system will navigate to FAQ list page</li> <li>- As a student, If I am in FAQ list page, then a list of the FAQ specialties and semesters will be displayed.</li> <li>-As a student, If I am on the FAQ list page and the list of specialties and semesters is displayed, and there are no FAQs under any of the specialties or semesters on the list, then a message will appear indicating that there are no FAQs available currently.</li> </ul>

					<p>-As a student, If I am on the FAQ list page and the list of specialties and semesters is displayed, and there are no FAQs under the specialties or semesters selected, then a message will appear indicating that there are no FAQs available with the selected options.</p> <p>-As a student, If I am in the FAQ list page and the list of specialties and semesters is displayed, and there are FAQs under the specialties and semesters selected, then a list of FAQs will be displayed.</p>
64	As a student, I want to be able to filter GP so that I can get the latest GPs quickly.	5	Feature	Done	<p>-As a student, If I click on "GP Library" button from the navigation bar, then the system will navigate to GP library page, and I can see a list of GPs</p> <p>-As a student, If I am in GP library page and click on the filter to choose specific semester or/and category, then a drop-down list of semesters and category will be displayed,</p> <p>-As a student, If I choose semester and/or category from the drop-down and there are GPs under the chosen options, then the system will</p>

					<p>display GPs that spotted in this semester/ category.</p> <p>-As a student, If I choose semester and/or category from the drop-down and there are no GPs under the chosen options, then a message will appear indicating that there are no GPs available currently.</p>
65	As a graduate, I want to be able to sign up so that I can gain the access to the system.	8	Feature	Done	<ul style="list-style-type: none"> <li>- As a graduate, If I am in the main page and click on "Graduate" button, then the system will navigate to login page if I don't have an account and I click on sign up link, then the system will navigate to sign up page.</li> <li>- As a graduate, If I go to sign up page, then I will be able to see a form with the fields (first name, last name, email, password, department, social media link).</li> <li>- As a graduate, If I leave any of the fields empty and click on "Next" button, then an error message will appear.</li> <li>- As a graduate, If I enter an existing email and click " Next" button, then an error message will appear.</li> <li>- As a graduate, If I enter my email that does not match with an email</li> </ul>

					<p>format, then an error message will appear.</p> <p>- As a graduate, If I enter a password that is less than 8 characters or does not have small and capital or does not have a number and click on " NEXT "button, then an error message will appear.</p> <p>- As a graduate, If I enter my first name or last name or email or password or, social media link with any language other than the English and click " Next " button, then an error message will appear.</p> <p>- As a graduate, If I click on " Next" button with fill all field and satisfied all condition, then the system should navigate to select group page.</p>
66	As a graduate, I want to be able to search for my group, so that I can join it.	8	Feature	Done	<p>-As a graduate, If I am in select group page and click on " Sign up" button without choosing my group the sign up will fail, then an error message will appear.</p> <p>-As a graduate, If I search for my group, then the groups that match the name that I wrote should appear.</p>

				<ul style="list-style-type: none"><li>-As a graduate, if I search for my group and I don't find any result, I can create a new group.</li><li>-As a graduate, if I create a new group the dialog box will appear with project name filed.</li><li>-As a graduate, if I leave project name filed empty and click on "Create" button, then an error message will appear.</li><li>-As a graduate, if I click on "Cancel" button, I will stay on the select group page.</li><li>-As a graduate, if I filled all dialog fields and click on "Create" button the project will be added, then a message will appear indicating that adding has been done successfully.</li><li>-As a graduate, if I click on "edit" icon then, I can edit my project name.</li><li>-As a graduate, if I edit my project information and click on "Edit" button the information will be changed successfully.</li><li>-As a graduate, if I edit my project information and click on "Cancel" button the information will stay the same without change.</li></ul>
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					<p>-As a graduate, if I choose my group or create a new group and click on "Sign up" button, then the system should send a verification link and navigate to verification page.</p> <p>-As a graduate, if I am in verification page, and click on "Done" button without verifying my email, then an error message will appear.</p> <p>- As a graduate, if I click on "Resend", then another verification link will be sent.</p> <p>-As a graduate, if I verify my email and click on "Done" button, then the system will navigate to upload GP page.</p>
67	As a graduate, I want to be able to log in with my email and password so that I can access the system and use all the features.	2	Feature	Done	<p>-As a graduate, If I go to the main page and click on "Graduate" button, then the system should navigate to log in page.</p> <p>-As a graduate, If I enter an invalid email or password and click on "Log in", then the log in fails with an error message.</p> <p>- As a graduate, If I leave the email or password filed empty and click on "Log in", then the log in fails with an error message.</p>

					<ul style="list-style-type: none"><li>- As a graduate, If I am in the log in page, enter my email and password correctly, but I didn't verify my email, then the system will navigate to verification page to verify my email.</li><li>- As a graduate, If I enter email and password correctly, and click on "Log in", then the system will navigate to upload GP page.</li></ul>
68	As a graduate, I want to be able to log out so that I can protect my account from unauthorized users.	1	Feature	Done	<ul style="list-style-type: none"><li>- As a graduate, If I click on menu icon, then the system will display menu section.</li><li>- As a graduate, If I click on "Log out" from menu section, then a confirmation message will appear.</li><li>- As a graduate, If I confirm, then the system will navigate to main page.</li><li>- As a graduate, If I don't confirm, then I will stay logged in.</li></ul>
69	As a graduate, I want to be able to reset my password so that I can set new password if I forget the old one.	2	Feature	Done	<ul style="list-style-type: none"><li>- As a graduate, If I am in log in page and click on "forgot password" link, then the system will navigate to forgot password page.</li><li>- As a graduate, If I am in forgot password page and enter email with incorrect format, then an error message will appear.</li></ul>

					<p>-As a graduate, If I enter an existent email and click on "Send" button , then the system will send a link to my email, then the system will navigate to another page.</p> <p>-As a graduate, If I click on the "Resend" ,then another link will be sent then, the message will appear.</p> <p>-As a graduate, If I click on "Log in" button, then the system will navigate to login page.</p>
70	As a graduate, I want to be able to add my graduation project after completion so that I can benefit others from my experience.	5	Feature	Done	<p>-As a graduate, If I am in the upload GP page and none of my group members have already added the project, then a button will appear to choose a file.</p> <p>-As a graduate, If I choose a file other than PDF, then an error message will appear.</p> <p>-As a graduate, If I choose a file then I will be able to choose a semester and a graduation project category and a GitHub repository link.</p> <p>-As a graduate, If don't choose a semester or at least one graduation project category and click upload button ,then an error message will appear.</p>

					-As a graduate, if I click on the upload button, then a message will appear indicating that the uploading was successful and I will be able to view my project .
71	As a graduate, I want to be able to view my graduation project after completion so that I can see what my group members have uploaded.	3	Feature	Done	<p>-As a graduate, If I am in the upload GP page and me or one of my group members have already added the project, then I will be able to view the uploaded file, GitHub repository(if it was added) and group members social media contact links.</p> <p>-As a graduate if I click on the file icon, then I will be able to view the file</p> <p>-As a graduate, if I click on the code icon then the system will navigate to the browser to open the GitHub repository link.</p> <p>-As a graduate, if I click on the social media icon then the system will navigate to the bowser to open these social media contact link.</p>
72	As a graduate, I want to be able to delete my graduation project after completion so that I can readd the correct project.	1	Feature	Done	- As a graduate, If I am in the upload GP page and me or. one of my group members have already added the project, then I will be able to view the uploaded file, GitHub repository(if it was added), group

					<p>members social media contact links and a “Delete” button.</p> <p>-As a graduate , if I click on the “Delete” button then a confirmation message will appear .</p> <p>-As a graduate , if I confirm then the project will be deleted and a message will appear indicating that the project was deleted successfully and the system will navigate to the upload GP page.</p>
73	As a logged in graduate, I want to be able to reset my password so that, I can set new strong password for my account.	2	Feature	Done	<ul style="list-style-type: none"> <li>- As a logged in graduate, If I click on menu icon, then the menu section will display.</li> <li>-As a logged in graduate, if I click on "Reset password" ,then the system will navigate to reset page.</li> <li>- As a logged in graduate if I click on "Send" ,then a reset link will send then a message will appear.</li> <li>-As a logged in graduate, if I click on "Resend" ,then another reset link will send, then a message will appear.</li> </ul>
74	As a graduate, I want to be able to edit my profile so that I can keep my information up-to-date.	5	Feature	Done	<ul style="list-style-type: none"> <li>- As a graduate, If I click on menu icon ,then the menu section will display.</li> </ul>

				<ul style="list-style-type: none"><li>-As a graduate, if I click on "my profile", then the system will navigate to profile page.</li><li>- As a graduate, If I am in profile page, then I should be able to edit my information (first name, last name , department, project name,social media links, group)</li><li>- As a graduate, If I leave the any field empty and click " Save " button, then the update fails with an error message.</li><li>- As a graduate, If I edit a project name and write exist project name with the same department, then a warning message will appear that force me to click on "Check" button, then the system will navigate to another page to display the existed group, if I didn't find my group I can choose nothing and return to profile page. If I find my group and choose it then , click on "Select group" I will return to profile page with new group. If I click on " Save " button, then a message will appear indicating that updating has been done successfully.</li><li>-As a graduate if I click on my department field, then the system</li></ul>
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					<p>will navigate to another page to change my department and display all groups that related to chosen department to select group or create new group. If I choose or create a new group and click on "Select group" button, then the system will return to profile page. If I click on "Save" button, then a message will appear indicating that updating has been done successfully.</p> <p>-As a graduate, if I click on "Change group" button, then the system will navigate to another page to choose or create new group. If I click on "Select group", then the system will return to profile page. If I click on "Save" button, then a message will appear indicating that updating has been done successfully.</p> <p>- As a graduate, If I edit and enter first name or last name or departments or project name and click on " Save " button, then a message will appear indicating that updating has been done successfully.</p>
75	As a graduate, I want to be able to view my profile so that I can	3	Feature	Done	<p>- As a graduate, If I click on menu icon, then the system will display menu section.</p>

	ensure that all my information is accurate.			-As a graduate, if I click on "my profile" ,then the system will display my information which are first name, last name, email, department, social media, project name.
--	---	--	--	---

- Non-Functional Requirements:

**Table 3 Non-Functional Requirements**

#	PBI	Size	Type	Status	Acceptance Criteria
1	As a user, I want to be able to quickly understand how to use the system, so that I won't get frustrated and confused.	-	Feature	Done	<ul style="list-style-type: none"> <li>- As a user, if I am using one of the system pages, then the page layout should be clear and organized.</li> <li>- As a user, if I see a message that the system displayed, then it shouldn't have an ambiguous meaning.</li> <li>- As a user, if I see a button or icon, then I should understand the meaning and idea of it without any confusion.</li> </ul>
2	As a user, I want the system to be able store my sensitive information securely in database, so that I can trust the system.	-	Feature	Done	<ul style="list-style-type: none"> <li>- As a user, if I enter my password, then the system should be able to hash my password before storing it in the database.</li> </ul>
3	As a user, I want the system to be able to prove my identity, so that no one can impersonate me.	-	Feature	Done	<ul style="list-style-type: none"> <li>- As a user, If I register to the system for the first time, then the system should only grant me the access for my account after verifying my email</li> </ul>

					<p>through the sent verification link.</p> <ul style="list-style-type: none"> <li>- As a user, If I try to login, then the system will be secured by authenticating my email and password.</li> </ul>
4	As a user, I want the system to response for any operation within 3-25 seconds so that I can use the system without waiting so long.	-	Feature	Done	<ul style="list-style-type: none"> <li>- As a user, if I do any action, then the system should response with result and display the content within 3-25 seconds.</li> </ul>

## 4.3 System Design

### 4.3.1 Architectural Diagram

Client-Server architecture is an architecture of a computer network in which several remote clients request a service from a server. Client computers provide an interface to allow a user to request services of the server and to display the results the server returns. As the server delivers, and manages most of the resources and services requested by the client [17]. Servers wait for requests to arrive from clients and then respond to them. Server provides a transparent interface to clients so that clients need not be aware of the specifics of the system (hardware and software) that is providing the service [18].

As shown in Figure 19, eClinic is a Client- Server system architecture. The client side consists of the mobile application, and the web portal. The client side is responsible for presentation and the graphical user interface and all interactions with users.

The client side is also in responsibility of initiating communication with the server for data access. The server side is responsible for authentication, storing data, and retrieving data from the database.

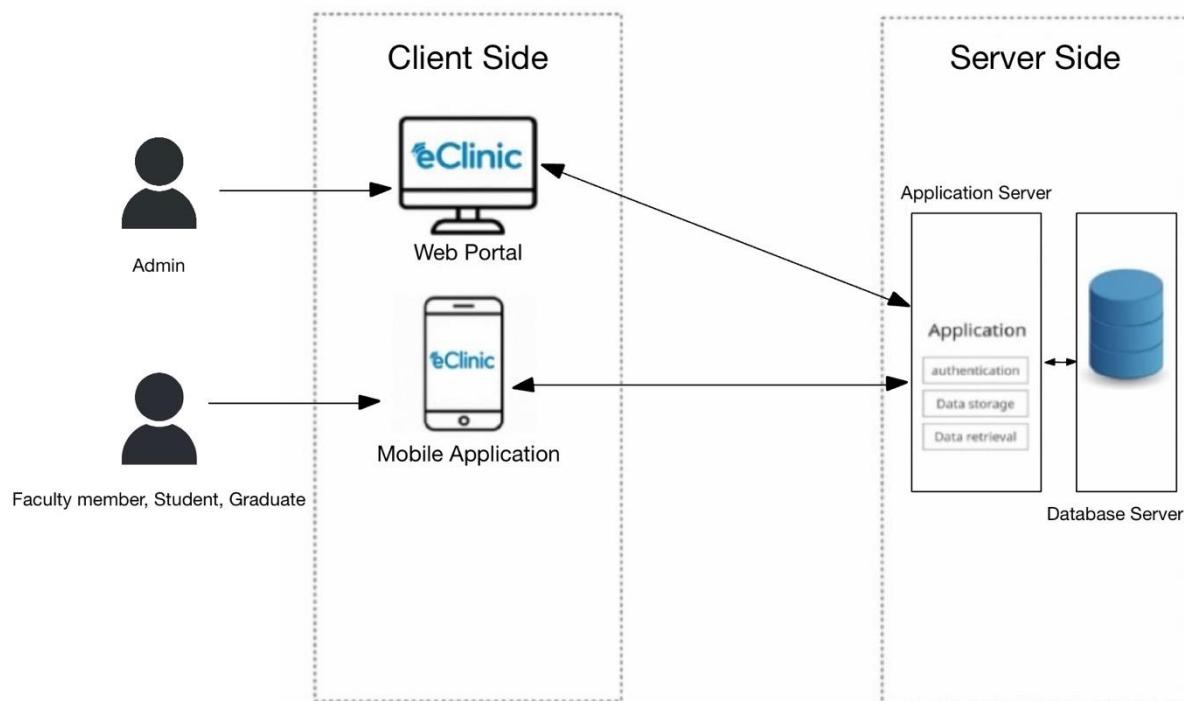


Figure 19 System Architecture

### 4.3.2 Class Diagram

eClinic system is decomposed into 12 classes as shown in Figure 20.

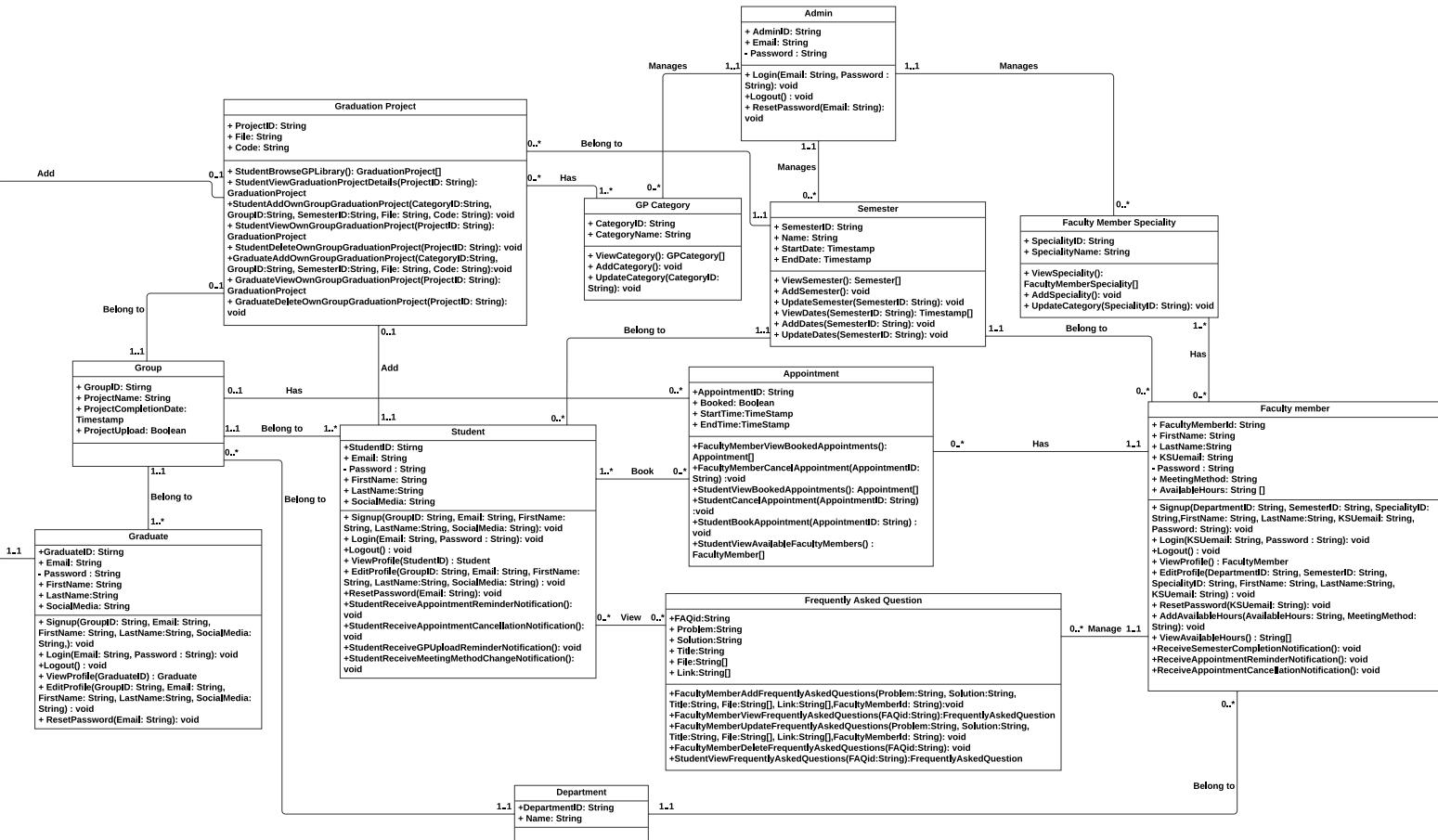


Figure 20 Class Diagram

### 4.3.3 Component Level Design

This section will include details of several components of eClinic web portal and application such as add help desk dates, update faculty member specialty, book an appointment, add available help desk days and hours, and search to find group which are shown in Figure 21, Figure 22, Figure 23, Figure 24, Figure 25.

#### 4.3.3.1 Add help desk dates

Flowchart:

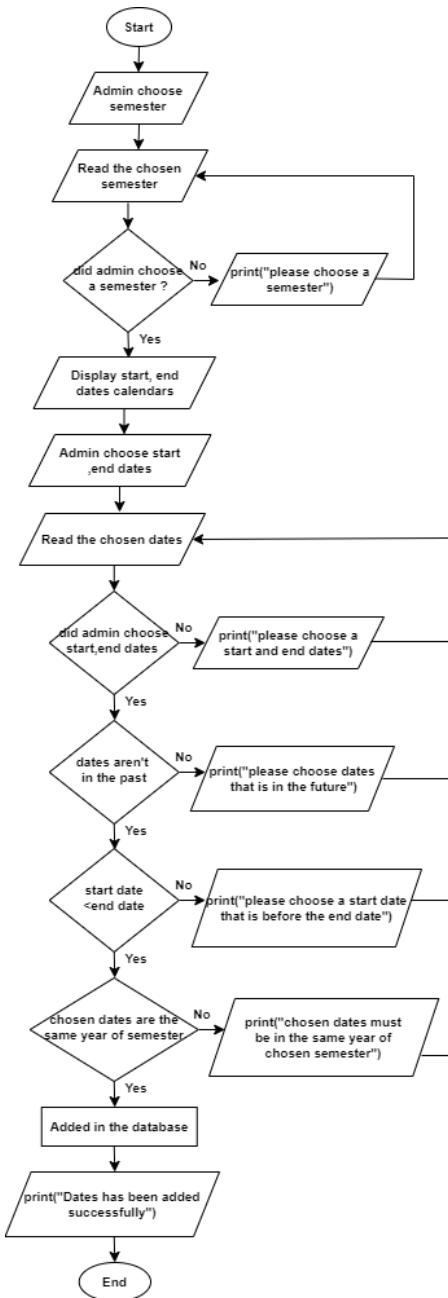


Figure 21 Add semester Flowchart

#### 4.3.3.2 Update faculty member specialty

Activity Diagram:

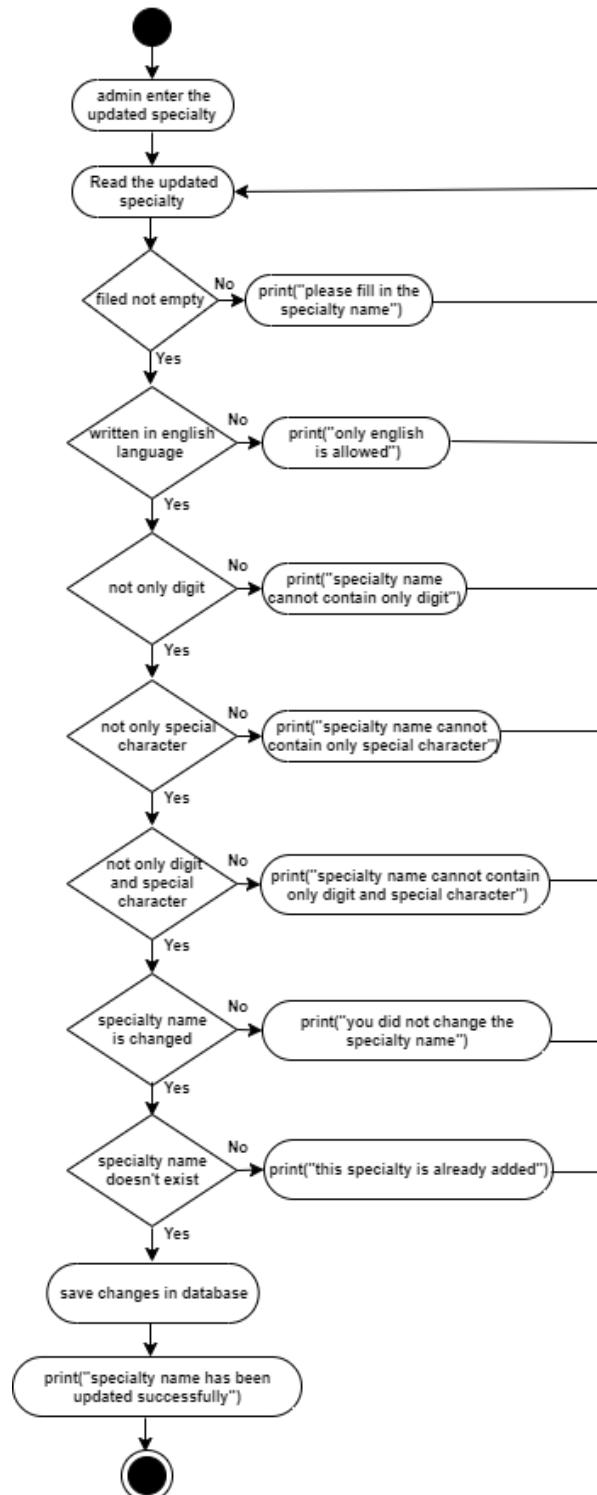


Figure 22 update faculty specialty Activity diagram

#### 4.3.3.3 Book an appointment

Flowchart:

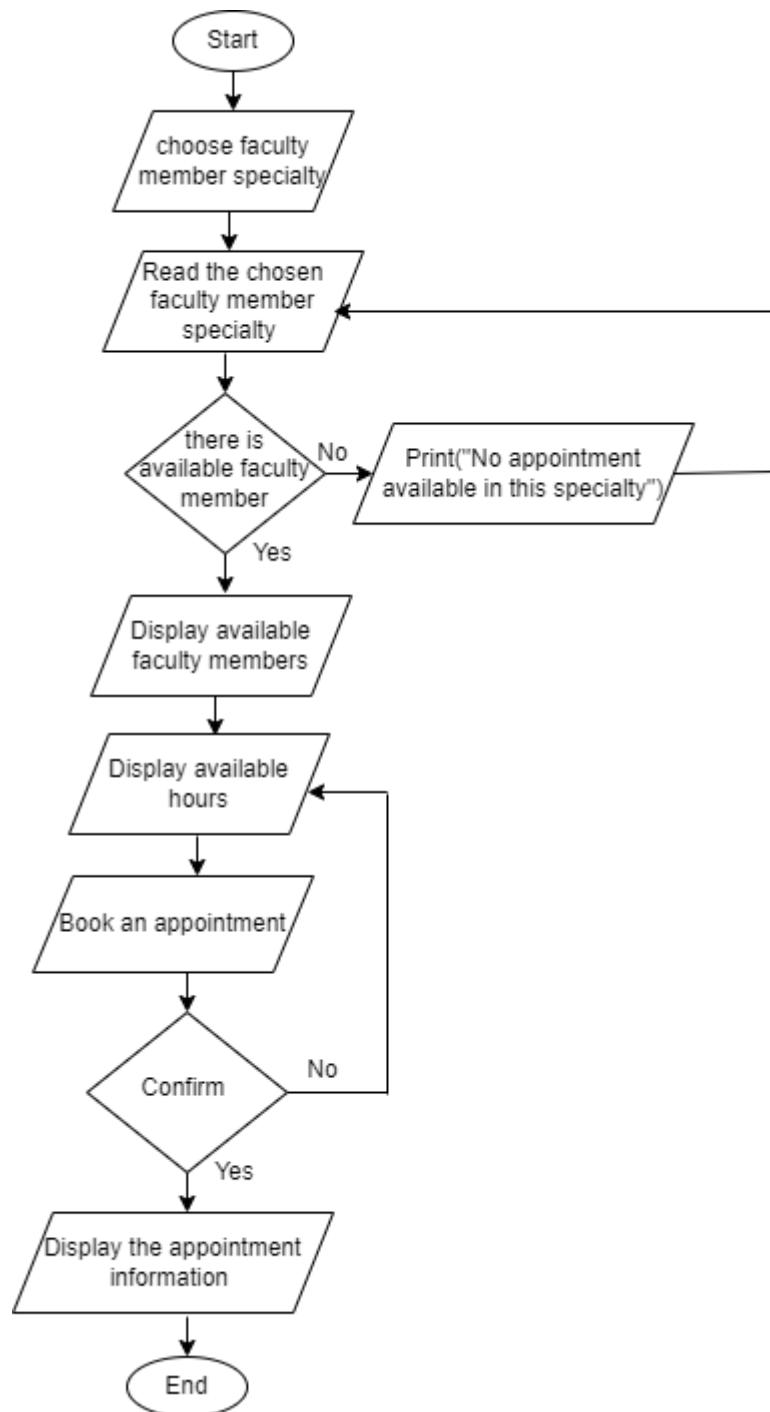


Figure 23 Book an appointment Flowchart.

#### 4.3.3.4 Add available help desk days and hours:

Flowchart:

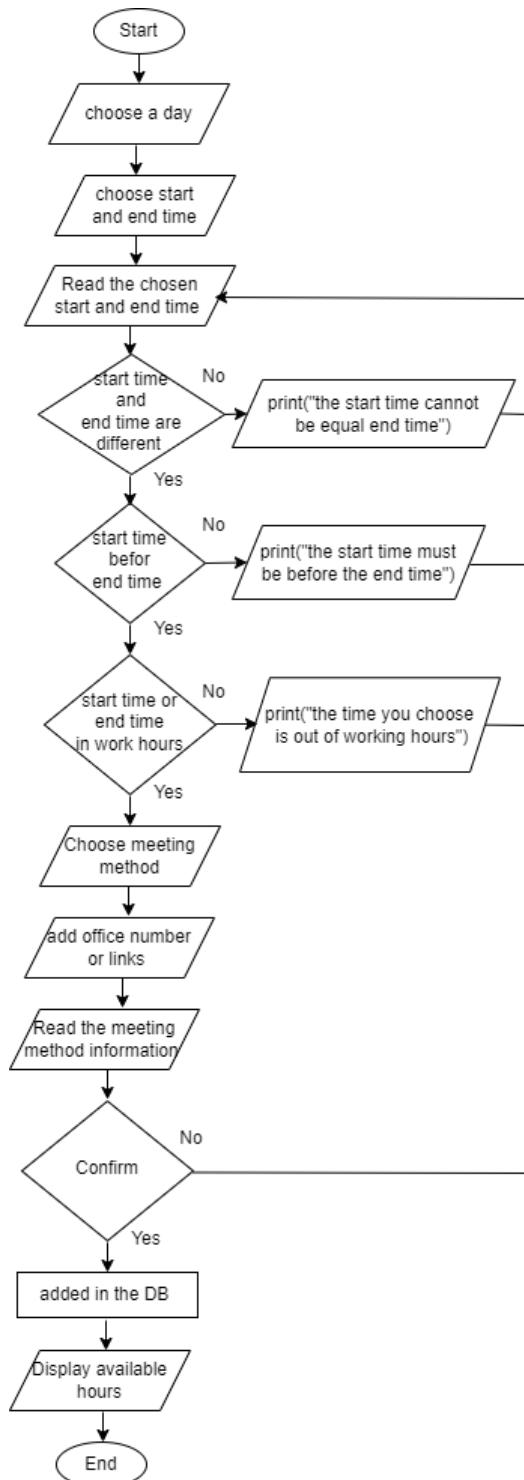


Figure 24 add available hours flowchart

#### 4.3.3.5 Search to find group

Flowchart:

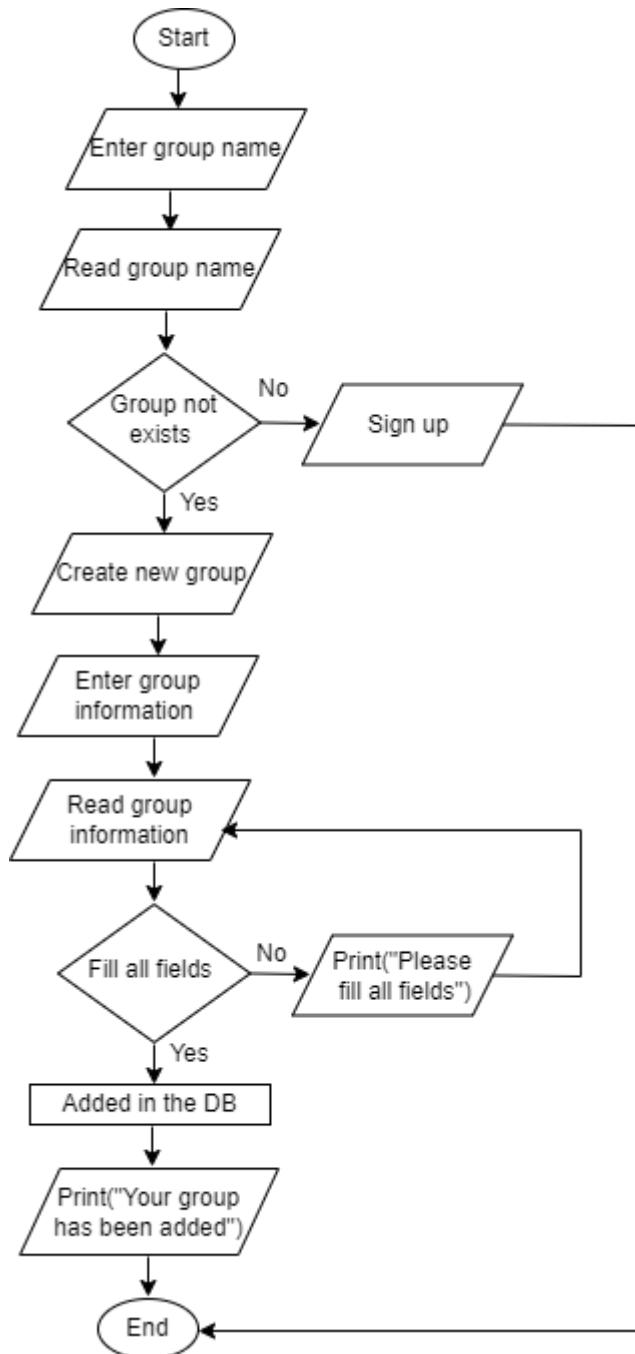


Figure 25 Search for group flowchart

## 4.4 Data Design

This section contains different representations of the system data. It includes the entity relation diagram shown in Figure 26 and the non-relational data model shown in Figure 27.

### 4.4.1 Data Models

#### 4.4.1.1 ER Diagram

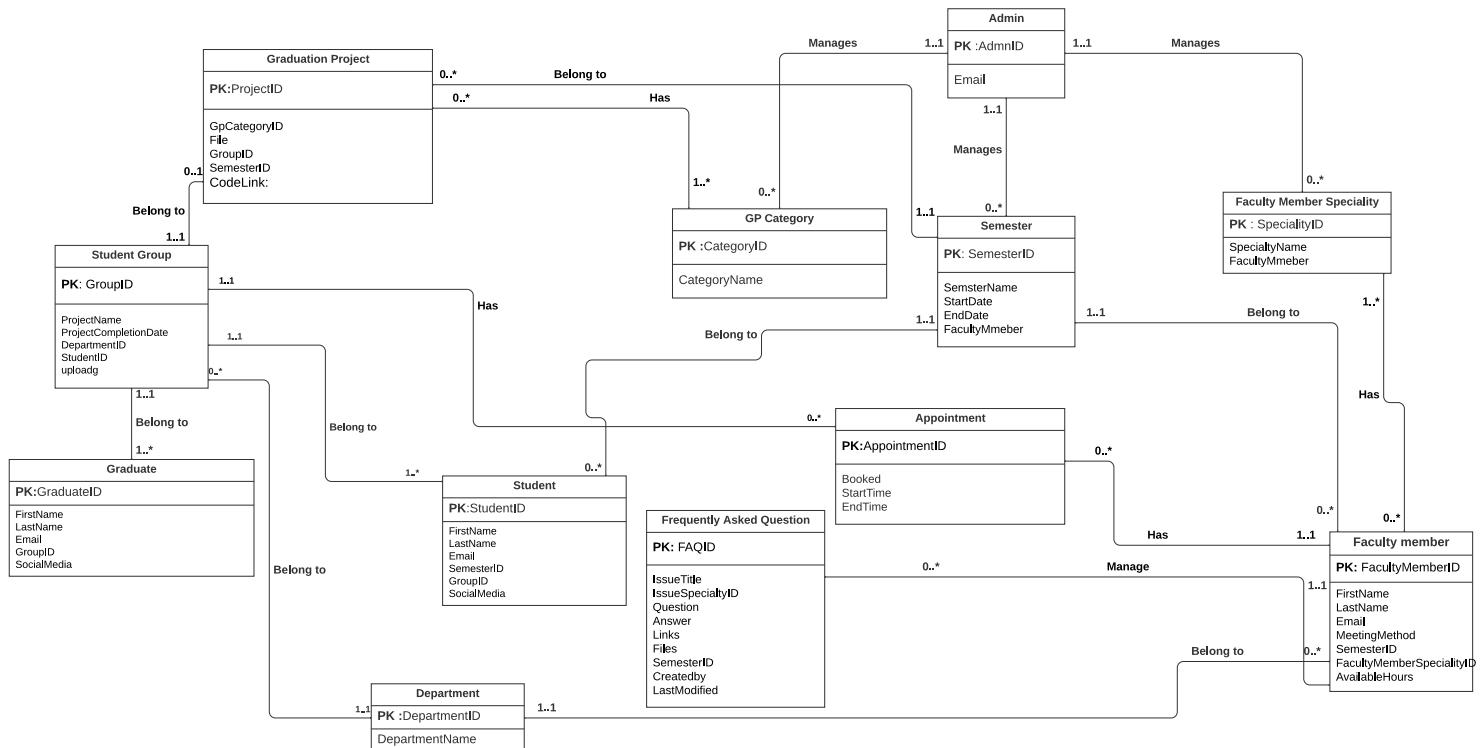


Figure 26 ER diagram

#### 4.4.1.2 Non-Relational Data Model

In our system, according to [19] " The parent entity acts as the primary document and the children entities are the embedded documents." there are embedding relationships between the admin document with faculty member specialty, GP category and semester documents. Also, between semester document with students, graduation project and faculty member documents. And between faculty member document with frequently asked question, and department documents. And between student group document with department, student, appointment, and graduate documents. Also, between graduation project document with GP category document. According to G11 in [20], "avoid embedding a child document/object if it will be at one time accessed alone" and G12 in [20] " Use an array of references for the many side of the relationship: when a relationship is one-to-many as in [19] or a document is a standalone document, array of references are best recommended", we chose to use an array of reference rather than embedding a document in the many side document since all documents are needed to be accessed directly at one time. Moreover, according to [19], " Both entities will reference each other by listing the corresponding referenced documents ids in an array variable." There are two referencing relationships between graduation project with GP category and faculty member with faculty member specialty. Finally, there is embedding relationship between faculty member document with appointment document. According to G5 in [20] " Embed dependent documents: dependency is one of the key indicators to embed a document. For example, order details are solely dependent to the order itself; thus they should be kept together. "appointment document is embedded inside the faculty member document since it is dependent on it, as an appointment document won't exist if faculty member document didn't exist.

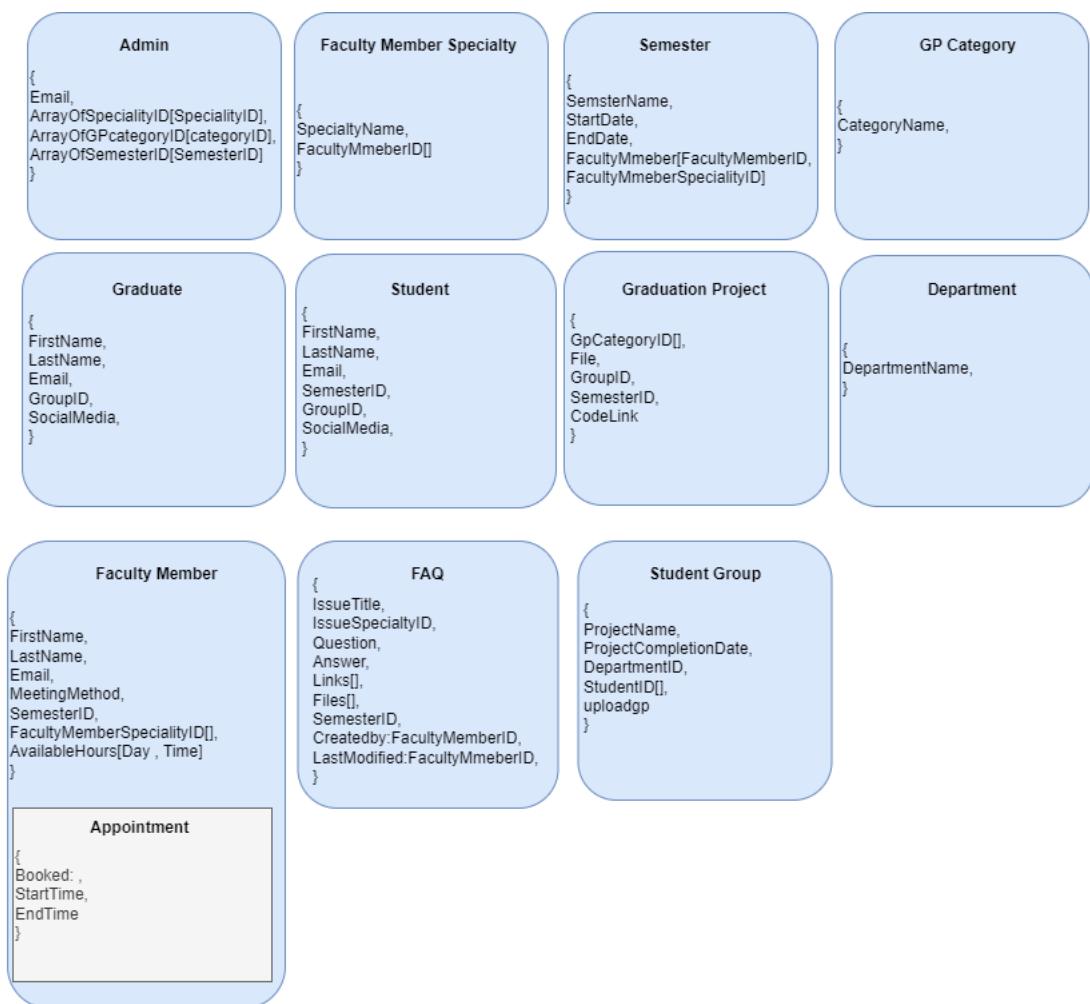


Figure 27 Data Model

## 4.5 Interface Design

This part will include the navigation diagram as shown in Figure 28, Figure 29, Figure 30, and Figure 31, which shows how the user will move between the system interfaces. Additionally, we will outline seven UX guidelines that are applied to our system.

### 4.5.1 Navigation Diagram

#### 4.5.1.1 Admin Navigation Diagram

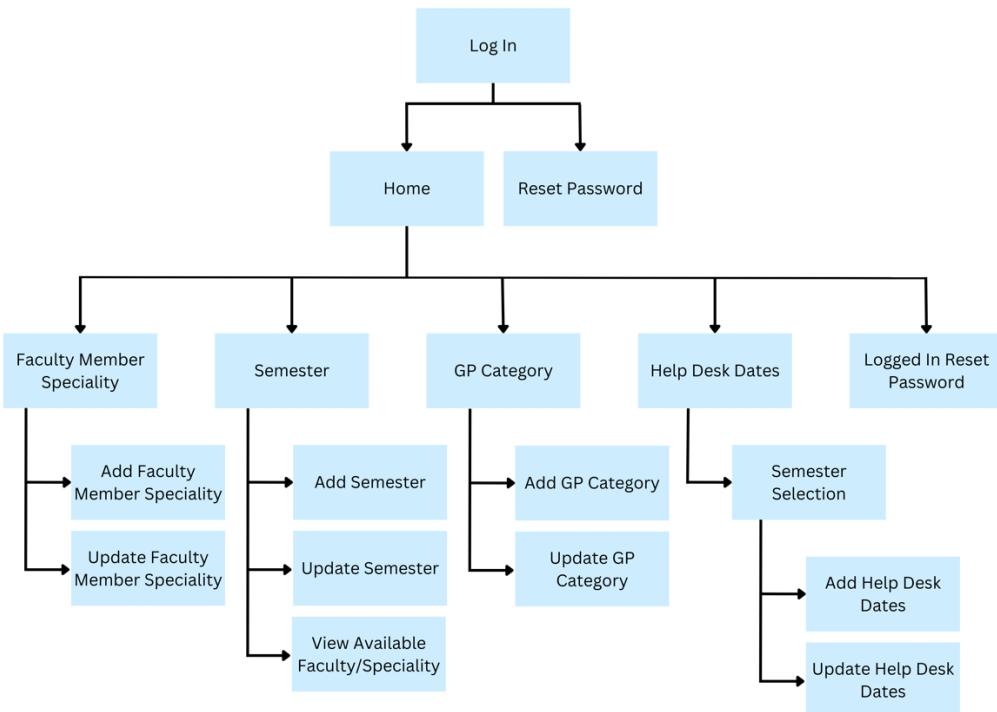


Figure 28 Admin Navigation Diagram

#### 4.5.1.2 Faculty Navigation Diagram

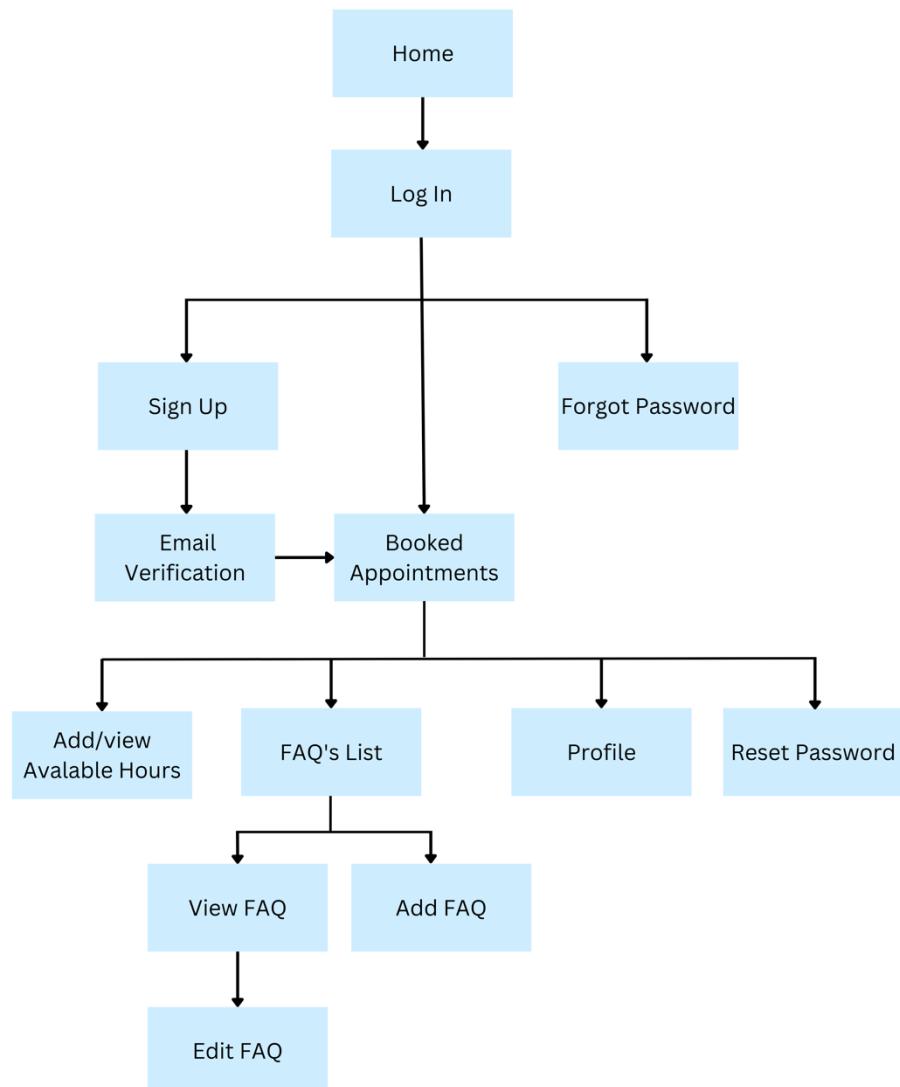


Figure 29 Faculty Navigation Diagram

#### 4.5.1.3 Student Navigation Diagram

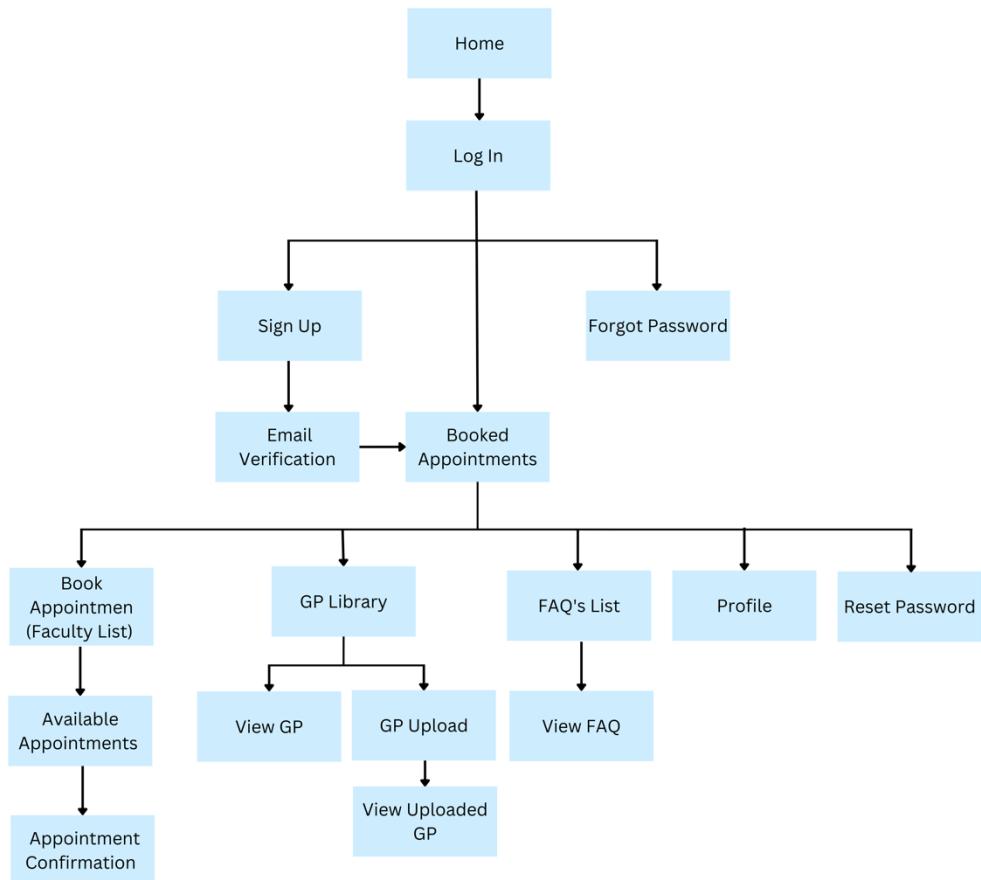


Figure 30 Student Navigation Diagram

#### 4.5.1.4 Graduate Navigation Diagram

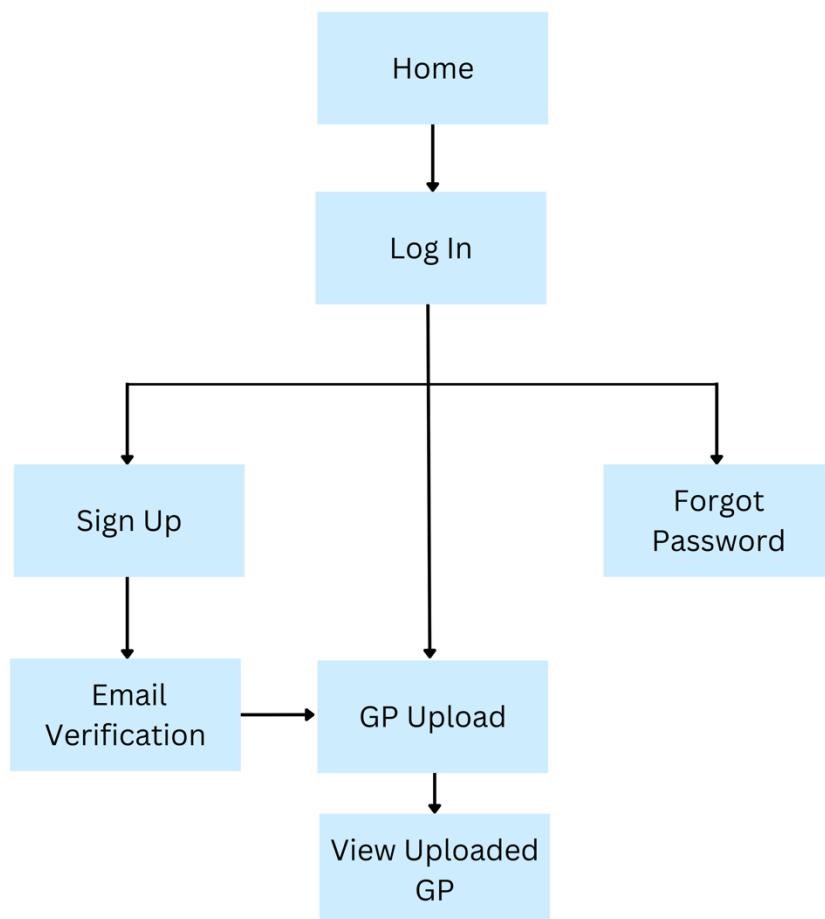


Figure 31 Graduate Navigation Diagram

#### 4.5.2 UX Guidelines

1. Predictability suggests a highly standard order for the website [21], and on our web portal, the admin can understand what she can accomplish by looking at the home page. And in our application the users can understand what they can accomplish by navigating between the pages.
2. Familiarity is defined as “the ability of an interactive system to allow a user to map prior experiences, either real world or gained from interaction with other systems” [22]. In eClinic web portal and application, we have icons that are relevant to the real world like logout icon and all the icons in the navigation bar. Also, log in page is similar to most log in pages in other websites and applications.
3. Synthesizability gives the user the ability to see the effect of past operations on the current state [23]. Our web portal and application give immediate honesty to the user as soon as they click add, update, or save by showing a green box indicating that the operation was successful.
4. Dialog initiative which has two types, one of them user preemptive which means that the user has the ability to move freely for resuming, abandoning and suspending any activity at any point [24] . Our system makes it possible for users to log out or reset their password whenever they wish by including a hamburger/profile icon that are always displayed on every page. Additionally, by enabling the user to switch between tasks at any time by using the navigation bar.
5. Error prevention (Recoverability) is one of Jakob Nielson's 10 Usability Heuristics for User Interface Design. This asserts the importance of warning users about their mistakes [25]. In eClinic system, the user will receive an informative message if they make any mistake in any input so they can fix it.
6. Observability (Reachability) the user can navigate from any page to any other page by using the navigation bar.
7. Task conformance (task adequacy), which refers to the user's ability to understand how to accomplish a task. It is achieved in our web portal by outlining the main functionality in the home page. And in our web portal and application, by giving the user hints that specifies what needs to be entered or selected in each input field and drop-down menu.

## 4.6 Implementation

### 4.6.1 Challenges

In this section, we will explain the challenges we faced when developing eClinic application:

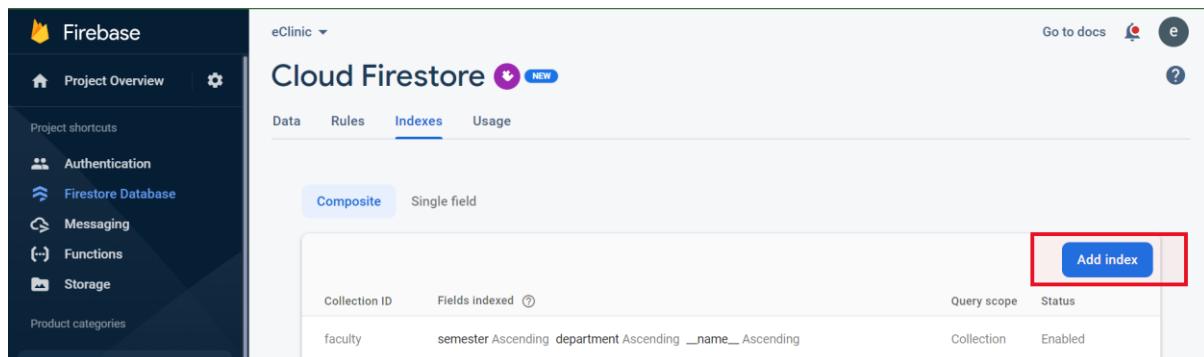
- We faced an issue during filtering faculty member list to show faculty member by semester and department, at first, we used to get all faculty members and filter them pragmatically within our code and that led to delay during data fetching. We solved this issue as shown in Figure 32, Figure 33 by using feature in Firebase store that allow us to make indexes to fetch data by two columns and the code became faster to load after that.

```

105 void initFaculty() async {
106   if (student?['department']?['ref'] == null) {
107     setState(() {
108       facultyLoading = false;
109     });
110     return;
111   }
112   var faculty = FirebaseFirestore.instance.collection('faculty');
113   var q = await faculty
114     .where('semester', isEqualTo: student?['semester']?['ref'])
115     .where('department', isEqualTo: student?['department']?['ref'])
116     .get(const GetOptions(source: Source.server));
117
118   facultyList = [];
119   for (var doc in q.docs) {
120     var faculty = doc.data();
121     faculty['id'] = doc.reference.id;
122   }

```

Figure 32 solve performance issue using Firestore indexes feature.



The screenshot shows the Firebase Cloud Firestore interface. On the left, there's a sidebar with project shortcuts: Authentication, Firestore Database, Messaging, Functions, and Storage. The main area is titled 'Cloud Firestore' and shows the 'Indexes' tab selected. It displays a table with one row for the 'faculty' collection. The row shows fields indexed: 'semester Ascending', 'department Ascending', and '\_name\_ Ascending'. The 'Add index' button is highlighted with a red box. The table also includes columns for 'Query scope' and 'Status'.

Collection ID	Fields indexed	Query scope	Status
faculty	semester Ascending department Ascending _name_ Ascending	Collection	Enabled

Figure 33 solve performance issue using Firestore indexes feature.

-We faced an issue during developing the notification because we have a scheduled notification that will be sent to the faculty member and student before the appointment time to remind them. We faced difficulties due to the lack of resources and no packages are working with these scheduled notifications. We solve this as shown in Figure 34,35, and 36 issue by subscription to the firebase blaze plan so we can build our own schedule notification function in the backend and run it using google server. In addition, we used this solution during developing the GP upload notification features [26] .

```

8   exports.appointmentreminder = functions.pubsub.schedule('0 5 * * *').onRun(async (context) => {
9     functions.logger.info("Hello logs", { structuredData: true });
10    //response.send("Hello Firebase");
11
12
13    //get the faculty collection Refrence
14    const facultyRef = await admin.firestore().collection('faculty');
15
16    //make a loop on faculty collection to get the appointments
17    const facultySnapshot = await admin.firestore().collection('faculty').get().then((querySnapshot) => {
18      querySnapshot.forEach(doc => { //loop on the faculty members
19        functions.logger.info("before calling appointment collection", { structuredData: true });
20        //faculty doc id
21        functions.logger.info(doc.id);
22
23        //get the appointment ref that are booked
24        const appointmentRef = facultyRef.doc(doc.id).collection('appointment').where("Booked", "==", true);
25        //chek if it has this collection
26        appointmentRef.get().then(async (sub) => {
27          if (sub.docs.length > 0) {//check if appointment doc exist
28            functions.logger.info('subcollection exists');
29            var numOfBookedAppointments = 0;
30            sub.forEach(async (subDoc) => { //loop on booked appointments only
31
32              //today date
33              var today = new Date();
34              //appointment start date and time
35              var appointmentDate = new Date(subDoc.data().starttime.toDate());
36              // To calculate the time difference of two dates
37              var Difference_In_Time = (appointmentDate.getTime() - today.getTime()) / 1000;
38              Difference_In_Time /= (60 * 60);
39              //get the time in hours
40              Diff_in_hours = Math.abs(Math.round(Difference_In_Time));
41              //if the appointment will start in the comming 24h then we will send a notification to the dr and students
42              if (Diff_in_hours <= 24 && Diff_in_hours > 0) {
43                // count the number of appointments a faculty have to send it later
44                numOfBookedAppointments = numOfBookedAppointments + 1;
45
46                //now we will send to the student the reminders
47                //first we will get the faculty member name
48                facultyName = doc.data().firstname + " " + doc.data().lastname;
49                // functions.logger.info('faculty Name');
50                // functions.logger.info(facultyName);
51
52                //now we will get the appointment time
53                let appointmentTime = subDoc.data().starttime.toDate().getTime();
54                let appointmentTimeAfter3 = new Date(appointmentTime + 3 * 60 * 60 * 1000); // add 3h bcz it on UTC time not saudi time
55

```

Figure 34 solve schedule notification issue

```

129 //sending notification to notify faculty about semester ending
130 const SemesterSnapshot = await admin.firestore().collection('semester').get().then((querySnapshot) => {
131   querySnapshot.forEach(async (doc) => {
132     var today = new Date();
133     var endDate = new Date(doc.data().enddate.toDate());
134     if (today.getDay() === endDate.getDay() && today.getMonth() === endDate.getMonth() && today.getFullYear() === endDate.getFullYear()) {
135       // check if there is faculty members
136       if (doc.data().facultymembers != null) {
137
138         const payload = {
139           notification: {
140             title: 'Thank you for your effort',
141             body: 'This semester has ended, but if you want to be a member of the help desk in the next semester, update the semester from your profile',
142             //icon: follower.photoURL
143           }
144         };
145         var facultyRef = doc.data().facultymembers;
146
147         for (let i = 0; i < facultyRef.length; i++) {
148           var oneS = facultyRef[i]['faculty'].get().then(async (onefacultytDoc) => {
149             var token = onefacultytDoc.data().token
150             // functions.logger.info(token);
151             if (token != null) {
152               // functions.logger.info("in if(token != null)");
153               const response = await admin.messaging().sendToDevice(token, payload);
154             }
155           });
156         }
157       }
158     }
159   }
160 }
161 //functions.logger.info("end of the loop");
162
163 })
164
165 })
166
167
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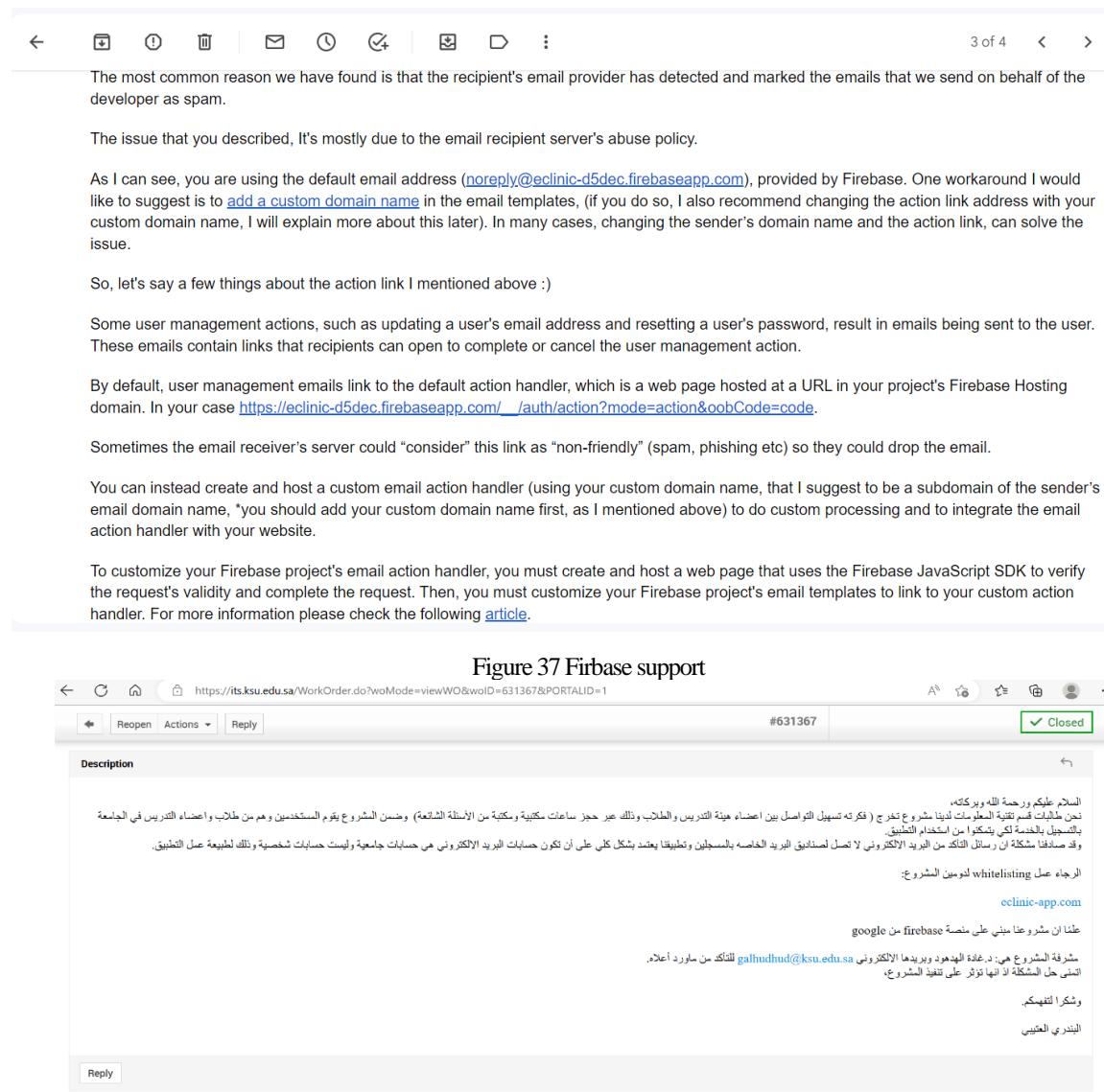
```

Figure 35 solve schedual notification issue

Function	Trigger	Version	Requests (24 hrs)	Min / Max Instances	Timeout
appointmentreminder us-central1	⌚ 0 5 * * *	v1	1	0 / 3000	1m
gpAndEndsemesterreminder us-central1	⌚ 0 21 * * *	v1	1	0 / 3000	1m

Figure 36 solve schedual notification issue

-We faced an issue during developing the verification function that verifies the user's email. We have been sending verification emails to different providers such as Gmail, Hotmail, Outlook, Ksu.edu.sa and Student.ksu.edu.sa all providers received the verification link except student.ksu.edu.sa provider. We contacted firebase support as shown in Figure 37 to know what is the problem to fix it, they told us the problem is the recipient's email provider has detected and marked the emails as spam, and the solution is to try to customize the domain name. We did all the steps to custom the domain name, but the problem still exists. After that, we found that the student.ksu.edu.sa provider put our eClinic domain on the blacklist that's why the verification link was not received. We solved the issue by contacting the KSU IT ticket system as shown in Figure 38 and asking them to transfer our domain to the whitelist to reach the students' inboxes, and they were very helpful and white-listed our eClinic domain.



The most common reason we have found is that the recipient's email provider has detected and marked the emails that we send on behalf of the developer as spam.

The issue that you described, It's mostly due to the email recipient server's abuse policy.

As I can see, you are using the default email address ([noreply@eclinic-d5dec.firebaseioapp.com](mailto:noreply@eclinic-d5dec.firebaseioapp.com)), provided by Firebase. One workaround I would like to suggest is to [add a custom domain name](#) in the email templates, (if you do so, I also recommend changing the action link address with your custom domain name, I will explain more about this later). In many cases, changing the sender's domain name and the action link, can solve the issue.

So, let's say a few things about the action link I mentioned above :)

Some user management actions, such as updating a user's email address and resetting a user's password, result in emails being sent to the user. These emails contain links that recipients can open to complete or cancel the user management action.

By default, user management emails link to the default action handler, which is a web page hosted at a URL in your project's Firebase Hosting domain. In your case [https://eclinic-d5dec.firebaseioapp.com/\\_auth/action?mode=action&oobCode=code](https://eclinic-d5dec.firebaseioapp.com/_auth/action?mode=action&oobCode=code).

Sometimes the email receiver's server could "consider" this link as "non-friendly" (spam, phishing etc) so they could drop the email.

You can instead create and host a custom email action handler (using your custom domain name, that I suggest to be a subdomain of the sender's email domain name, \*you should add your custom domain name first, as I mentioned above) to do custom processing and to integrate the email action handler with your website.

To customize your Firebase project's email action handler, you must create and host a web page that uses the Firebase JavaScript SDK to verify the request's validity and complete the request. Then, you must customize your Firebase project's email templates to link to your custom action handler. For more information please check the following [article](#).

Figure 37 Firebase support

Figure 38 KSU IT ticket system

#### 4.6.2 Major part of the system

A major part of our code is the search function that enables students and graduates to search about their group to join it:

```
List<ModelGroup> listAllGroupsForSearching = [];
searchGroup(String input) {
    print(input);
    if (input.trim() == '') {
        listAllGroupsForSearching = listAllGroups;
    } else {
        listAllGroupsForSearching = listAllGroups
            .where((element) =>
                (element.projectname.arabicEquatable().toUpperCase().trim())
                    .contains(input.arabicEquatable().toUpperCase().trim()))
            .toList();
    }
    emit(InitStateBlocGroupSelect());
}
String? errorWhenCreateGroupMessage;
errorWhenCreateNewGroup(String? input) {
    errorWhenCreateGroupMessage = input;
    emit(InitStateBlocGroupSelect());
}
abstract class StateBlocGroupSelect {}
class InitStateBlocGroupSelect extends StateBlocGroupSelect {}
class InitStateBlocGroupSelectSignUpDone extends StateBlocGroupSelect {}
class InitStateBlocGroupSelectAddGroupDone extends StateBlocGroupSelect {}
class InitStateBlocGroupSelectError extends StateBlocGroupSelect {
    final String error;
    InitStateBlocGroupSelectError(this.error);
}
```

Figure 39 Search function

Figure 40 Search function

#### 4.6.3 Software Implementation

In this section, we will discuss implementation steps, and software components and their configurations.

By following steps, we create and connect our system with our cloud firestore:

1. Download Visual Studio Code version 1.71.2.
2. Create an account in firebase and create a firestore database.
3. Create a web app in firestore and install firebase SDK.
4. Create a new project in Visual Studio Code.
5. Import SDK configuration in vs project to connect our project with our database.

After these steps, we were able to start implementing our system by using the software shown in Table 4 and using firebase services which we need to retrieve and store data. Also, the identification and authentication of a user are done by firebase authentication service which provides backend services, easy-to-use SDKs, and ready-made UI libraries to authenticate users to your app [27]. In addition, we use cloud firebase functions and messaging services which are serverless framework that lets you automatically run backend code on specific time or in response to events triggered by Firebase features and HTTPS requests, which we used to develop the notifications. Moreover, we used an indexes service to enhance the application performance [28]. In addition, we used the cloud storage for firebase to store and retrieve user-generated files like images, files, and videos without server-side code [29]. Also, we used security rules that stand between our data and malicious users, by writing flexible configuration languages to define what data our users can access [30]. In the end, we used a firebase hosting service by deploying web portal files from local directories on our computer to firebase hosting servers by [31]. using firebase CLI provides a variety of tools for managing, viewing, and deploying to firebase projects [32].

**Table 4 Software tools**

<b>Software name</b>	<b>version</b>	<b>Description</b>
Flutter	v3.58.0	Flutter is a mobile app development platform created by Google. It allows developers to create web, desktop, and cross-platform apps that run on Android and iOS devices [33].
Dart	v3.58.0	Dart is a client-optimized language for developing fast apps on for multi-platform development, paired with a flexible execution runtime platform for app frameworks [34].
Android	v2021.3.1	Android Studio is the official Integrated Development Environment (IDE) for Android app development. Android Studio offers even more features that enhance your productivity when building Android apps, such as gradle-based build system, rich emulator [35].
Visual Studio Code	v1.71.2.	Visual studio code which is a source code editor that runs on a desktop and is available for Windows, macOS, and Linux [36]This visual studio code is used to configure and connect our database to our project by inserting the required codes in it.
GitHub	v3.2.2	GitHub is a cloud-based service that helps developers store and manage their code, as well as track and control changes to their code and resolve any conflicts [37].



## System Evaluation

## 5 System Evaluation

In this chapter, we performed system testing to ensure that our web portal and application functions work as required. We tested the system by applying user acceptance testing and non-functional requirements testing.

### 5.1 User Acceptance Testing

User acceptance testing is a phase of software development in which the software is tested in the real world by the intended audience or business representative. This type of testing is performed to verify that the application will meet the needs of the end-users and to gather their suggestions in order to improve the application, with scenarios and tasks of actual usage in the field [38]. The test was done using computer device, Android mobile phone and Android Studio emulator.

The application was tested by 20 participants from the range of the application users. The testing consisted of the web portal and the mobile application, and the participants were asked to complete a variety of tasks before answering a questionnaire.

#### 5.1.1 Demographics of Participants

The test has been done with the target end users of the system. We had 20 participants of College of Computer and Information Sciences faculty members, students and graduates who meet a specified criteria as stated in 4.2.1. For the participants, four of them tested as admin, five tested as faculty members, nine tested as students and two tested as graduates. The questions that are related to the demographics of participants are (attached in Appendix C).

Starting with the admin test, as shown in Table 5, most of the participants are members of the GP help desk committee and one is the head of the committee. Most of them have been part of the committee for several semesters with the majority been part for over 4 semesters, and one other who is a new member to the committee who can bring a new perspective. As for the educational level of the admin participants, they were PhD or master's degree. All participants have different specialties.

As for the Faculty member test, as shown in Table 5, All the participants are members of the GP help desk committee. As for the educational level of the faculty member participants, they

were PhD or master's degree. The participants have different specialties and the majority of them have been part of the help desk for 3-4 semesters or over 4 semesters.

In student test, as shown in Table 5, Most of the participants major in Information Technology and the rest are from other College of Computer and Information Sciences majors. The majority of the participants are taking or just finished GP2 course. The participants' graduation projects fall under many different categories.

As for the Graduate test, as shown in Table 5, All participants have the same major and their graduation projects fall under different categories.

**Table 5 Demographics**

Type of user	Variable	Value	Total participants	Percentage of overall type of user	Percentage of overall participants
Admin	Role in the GP help desk committee	Head of GP help desk committee	1	75%	20%
	Educational level	Member of GP help desk committee	3	25%	
		PhD	2	50%	
		Master's degree	2	50%	
	Specialty	Bachelor's degree	0	0%	
		Data science	1	25%	
		Human-Computer Interaction	1	25%	
		Artificial intelligence	1	25%	
	Duration of membership in GP help desk committee	Natural language processing	1	25%	
		1-2 semesters	1	25%	
		3-4 semesters	1	25%	
		4 semesters >	2	50%	
Faculty member	Role in the GP help desk committee	Head of GP help desk committee	0	0%	25%
	Educational level	Member of GP help desk committee	5	100%	
		PhD	3	60%	
		Master's degree	2	40%	
	Specialty	Bachelor's degree	0	0%	
		Data science	1	20%	
		Human-Computer Interaction	1	20%	
		Artificial intelligence	2	40%	
	Duration of membership in GP help desk committee	Natural language processing	1	20%	
		1-2 semesters	1	20%	
		3-4 semesters	2	40%	
		4 semesters >	2	40%	
Student	Major	Information Technology	5	55.6%	45%
		Software Engineering	2	22.2%	
		Information System	2	22.2%	
		Computer Science	0	0%	
	Course status	Taking GP1	0	0%	
		Taking GP2	4	44.4%	
		Finished GP2	5	55.6%	
	Graduation project category	Artificial intelligence & Mobile application	3	33.3%	
		Mobile application	3	33.3%	
		Web application& Artificial intelligence & Natural language processing	1	11.1%	
		Mobile application & Web application	2	22.2%	
Graduate	Major	Information Technology	2	100%	10%
		Software Engineering	0	0%	
		Information System	0	0%	
		Computer Science	0	0%	
	Graduation project category	Security	1	50%	
		Mobile application	1	50%	

### 5.1.2 Questionnaire/Interview Results

In terms of questionnaire questions, we used the system usability scale (SUS) to assess the systems usability. It consists of ten questions with five response options ranging from 1 to 5, with 5 indicating that the responder strongly agrees and 1 indicating that the responder strongly disagrees. The following are the questions:

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system

**Table 6 Questionnaire Results**

Question	Response					Average response	Satisfaction score
	5	4	3	2	1		
Question#1	15	5				4.75	3.75
Question#2				2	18	1.1	3.9
Question#3	18	2				4.9	3.9
Question#4	1			1	18	1.15	3.85
Question#5	17	3				4.85	3.85
Question#6				2	18	1.1	3.9
Question#7	16	4				4.8	3.8
Question#8					20	1	4
Question#9	16	4				4.8	3.8
Question#10				6	14	1.3	3.7
Final satisfaction score:						96.125	

Table 6 displays the responses of participants to questions, the average response for each question, and the satisfaction score. The first, third, fifth, seventh, and ninth questions are of the positive type, intended for determining user satisfaction with the application, whereas the rest of the questions are of the negative type, indicating the extent of the users' dissatisfaction with the application. The final score of satisfaction for the application is 96.125 out of 100, which indicates that the users are very satisfied with the application. This percentage is higher than the average system usability scale score, which is 68, as it mentioned in [39]. Results are (attached in Appendix D).

#### 5.1.2.1 Additional questionnaire questions

In order to gather more information about the application, a few additional questions were also included. It gathers information on participants desire to get this system as well as their opinions on it. Results are shown in Table 7 and (attached in Appendix E).

For the participants that tested as admin the questions were as following:

1. Do you think that the application will make GP Help desk management easier for you?
2. Would you like to use the application when it is launched?

For the participants that tested as faculty member the questions were as following:

1. Do you think that the application will make the process of helping GP students easier for you?
2. Would you like to use the application when it is launched?

For the participants that tested as student the questions were as following:

1. Do you think that the application will make the process of getting help with your GP easier for you?
2. Would you like to use the application when it is launched?

For the participants that tested as graduate the questions were as following:

1. Do you think that the application would have helped you with your graduation project?
2. Would you like to use the application when it is launched?

**Table 7 Questionnaire Results**

Type of user	Question	Response				
		Strongly agrees	Agrees	Neutral	Disagrees	Strongly disagrees
Admin	Question#1	3 (75%)	1 (25%)	0	0	0
	Question#2	3 (75%)	1 (25%)	0	0	0
Faculty member	Question#1	4 (80%)	1 (20%)	0	0	0
	Question#2	4 (80%)	1 (20%)	0	0	0
Student	Question#1	8 (88.9%)	1 (11.1%)	0	0	0
	Question#2	7 (77.9%)	2 (22.2%)	0	0	0
Graduate	Question#1	2 (100%)	0	0	0	0
	Question#2	2 (100%)	0	0	0	0

By the end of the questionnaire, all participants were asked if they had any suggestions or comments about the system. The following are the responses:

- Change Naming of Common Issue to FAQ, Move Add Common Issue button to the top right, Add the name of the faculty who created/updated the Common Issue.
- Add common issue button location is a bit confusing, change the design of the icon for update common issue
- Change the start and end times restrictions of work hours.

#### 5.1.2.2 Testing Tasks

The tasks that the participants that tested as admin performed during the user testing are the following:

1. Login
2. Add semesters
3. Update semester
4. View available faculty members in a semester
5. Add faculty member specialty
6. Update faculty member specialty
7. Add GP category
8. Update GP category
9. Add help desk date
10. Update help desk date
11. Reset password
12. Logout
13. Forgot password

The tasks that the participants that tested as faculty member performed during the user testing are the following:

1. Sign up
2. Add available hours
3. View available hours
4. Edit meeting method
5. View booked appointments
6. Receive appointment reminder notification
7. Cancel an appointment
8. Receive appointment cancellation notification
9. Add frequently asked questions
10. View frequently asked questions list
11. View frequently asked questions details
12. Update frequently asked questions
13. Delete frequently asked questions
14. View profile
15. Edit profile
16. Reset password
17. Log out
18. Forgot password
19. Log in
20. Receive semester completion notification

The tasks that the participants that tested as student performed during the user testing are the following:

1. Sign up
2. view available faculty members
3. Book an appointment
4. view booked appointment
5. Receive appointment reminder notification.
6. Receive meeting method change notification.
7. cancel an appointment
8. Receive appointment cancellation notification
9. View frequently asked questions list
10. View frequently asked questions details
11. Browse graduation project library the
12. View graduation project details
13. Receive GP upload reminder notification.
14. Add own group graduation project
15. View own group graduation project
16. Delete own group graduation project
17. View profile
18. Edit profile
19. Reset password
20. Log out
21. Forgot password
22. Log in

The tasks that the participants that tested as graduate performed during the user testing are the following:

1. Sign up
2. Add own group graduation project
3. View own group graduation project
4. Delete own group graduation project
5. View profile
6. Edit profile
7. Reset password
8. Log out
9. Forgot password
10. Log in

## 5.2 Quality Attributes (NFR testing)

Table 8 shows the NFR testing results.

**Table 8 NFR testing**

User story	Quality Attribute	Measure	Results
As a user, I want to be able to quickly understand how to use the system, so that I won't get frustrated and confused.	Learnability: How fast is it for users to complete the main actions once they see the interface?	Compute the time it takes the users to use the system functions. Users need maximum 3-7 minutes to complete each of the system functions.	All of the 20 users completed each of the test steps in between 5 seconds and 4 minutes. The maximum completion time was in 4 minutes and the average completion time was in 2:02 minutes and the minimum completion time was in 5 seconds
As a user, I want the system to be able store my sensitive information securely in database, so that I can trust the system.	Security: How secure is the system in storing sensitive data in the Database?	All passwords must be hashed and securely stored in the database	Firebase Authentication hashes each account that successfully logs in using a password hashing algorithm and generates unique parameters for each Firebase project [40]
As a user, I want the system to be able to prove my identity, so	Security: How will is the system in verifying users' identity.	All the users' identity must be verified before they	All the 20 users received a verification link on their Emails to verify

that no one can impersonate me.		register to the system.	their identity before they can access the system.
As a user, I want the system to response for any operation within 3-25 seconds so that I can use the system without waiting so long.	Performance:  How responsive is the system and its components?	Compute the response time for all the functions in the system.  The response time should be between 3-25 second	All 20 users had response times that ranged from 1 to 4 seconds, depending on the functions.

### 5.3 Discussion

In this section, we documented the discussion of the results of the user acceptance testing (UAT) and non-functional requirements (NFR) testing. Based on the results of the test, we have concluded that all users find the application easy to use and that most people will be able to learn how to use it with ease. The results showed that the system is giving users a good experience, and all users are looking forward to using the system in the future. However, there are some suggestions and comments. One of them is to change the naming of the common issue to FAQ because it's more familiar. Also, another suggestion was to display the faculty member who created and updated the FAQ to enable the student to know whom this FAQ belongs. Moreover, a suggestion was about changing the edit FAQ icon to make it clearer. Also, one of the participants mentioned that it's better to change the start and end times restrictions of work hours to give faculty members more flexibility to add their available hours at suitable times. In addition, we observed that some of the participants faced a little confusion because of the add FAQ button location. We considered all these suggestions and comments in our system to achieve our goal of making the system usable and easy for the users.



## Conclusions and Future Work

## 6 Conclusions and Future Work

This document represents steps that undertaken to produce eClinic system starting from the introduction chapter which explain the idea and discusses the problem, the solution, product vision, brief description of how we built the software, summary of how this report is organized. Introduction chapter followed by background chapter, which has an important role in preparing the reader to understand eClinic system. Continuing with the literature review chapter that compare eClinic to its competitors and analyzes their feature. Moreover, System Design and Development chapter which include Methodology section that present the general approach and methodology we used to develop the software, and system requirement section that contain system users which identify the target users of eClinic system and, requirements elicitation used to identify the business need, scope, assumptions, and risks of a project based on analyze interviews and questionnaires that was with users. Also, include the user interaction, product roadmap and backlog of function and non-function requirement.

Once we had a clear envisage of eClinic feature, we started with system design chapter which transform the features into a form used to facilitate the implementation of eClinic system and support the understanding the eClinic system component and how they connect with each other, it contains architecture diagram, class diagram, component level design, data design. Thereafter, interface design chapter that shows the application structure using a site map and lists the guidelines we incorporated while designing our interface. After that implementation chapter which explain the major and challenging parts of your code and key implementation steps. In addition , we start the developing a eClinic system and testing it to ensure its work as we designed it, also the system testing which include user acceptance testing, questionnaire analysis, and quality attributes NFR, as well as the demographics of the users. Finally, with the conclusion, future work and acknowledge.

### 6.1 Global and local impact

#### 6.1.1 Local impact

eClinic system provides a web portal that will improve the help desk management in CCIS at King Saud University and will enable the admin to manage the help desk in an easy and effective way. Moreover, having an application that enhances the guidance process for both students and faculty members would resolve the graduation project issues more efficiently.

### 6.1.2 Global impact

The eClinic system is an innovative idea that establishes a system that provides the possibility to manage guidance for graduation projects processes, which could be a good model to use for other universities.

## 6.2 Problems and challenges encountered during the software development

The obstacles that we faced during the development of the project appeared when we were researching and deciding what language and database that suitable for our project, and which the most appropriate editor will help us to develop the project. Moreover, when we were in the testing phase, we faced an issue which is about how to reach out to the eClinic system users because we have specific characteristics for our users. In addition, the limited time was a challenge for us, as we write the document and program at the same time and with the other university courses, but we have overcome these challenges and we will always strive to give our best, no matter the difficulties.

## 6.3 Limitations of the system

eClinic web portal is designed to help the admin to manage the eClinic system. The web portal only supports the English language. In addition, the web portal can be used only by one admin and there is no sign up for the admin. Moreover, the admin cannot delete anything in the web portal.

eClinic application is designed to help faculty members, students, and graduates to overcome graduation projects challenges. The application only support Android and English language. Moreover, a faculty member and a student cannot directly communicate with each other. Also, faculty members cannot update or delete their schedules. Moreover, graduate cannot browse the

## 6.4 The main contribution of the project

The main contribution of the eClinic system is to have a technological system that enhances the guidance process for both students and faculty members in CCIS at KSU to resolve the graduation project issues more efficiently and effectively. In addition, we provide services that will help the head of GP help desk committee to establish a structure of eClinic and manage eClinic system effectively and easily. Moreover, we enable the faculty members who have a

role in GP help desk committee to manage their scheduling in an efficient way. Also, the ability to address the FAQ to save their time and effort. For students, we enhance the help desk process to enable them to solve their issues and move forward with their graduation project. Finally, we enable graduate to add their graduation project to offer an open library of previous graduation projects for students to benefit from it.

## 6.5 Future work

Our future vision is to support iOS devices. Also, we may consider developing a private chat between the faculty member and student to make communication more easily. In addition, we will customize and upgrade our system to be available to other universities to enhance the graduation project process.



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## 7 Acknowledgements

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## Appendix

## 9 Appendix

### 9.1 Appendix A: Survey questions

The screenshot shows a Google Form titled "eClinic". The form contains the following text in Arabic:

eClinic هو تطبيق أكاديمي قائم على حل المشكلات التقنية التي تواجه طلاب كلية علوم الحاسوب والمعلومات من جامعة الملك سعود في مشاريع تخرجهم بمساعدة أعضاء هيئة التدريس والخريجين . حيث أتي تطبيقنا لتسهل وينظم عملية الحجز بين الطالب وعضو هيئة التدريس المناسب له، كما يوفر فرصة للإطلاع على مشاريع التخرج السابقة مع امكانية التواصل مع الطلاب الخريجين ذو الخبرة السابقة.

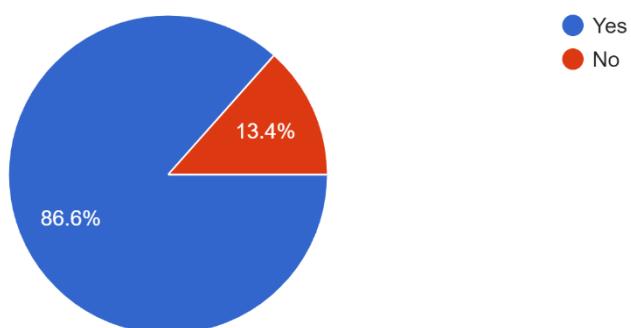
eClinic is an academic application based on solving technical problems facing students of the College of Computer and Information Sciences from King Saud University in their graduation projects with the help of faculty members and graduates. It facilitates the booking process between the student and the faculty member. It also provides an opportunity to view previous graduation projects and providing ways to communicate with graduates with previous experience.

Below the text, there is a user profile section showing "deem1016@gmail.com (not shared)" and "Switch accounts". At the bottom, there are buttons for "Next", "Page 1 of 4", and "Clear form". A note at the bottom says "Never submit passwords through Google Forms."

Figure 41 survey introduction

Did you need to use the clinic hours (GP help desk) with faculty member to solve a problem you faced in your graduation project?

67 responses



Based on your experience, do you consider the meeting with the faculty member is beneficial ?

58 responses

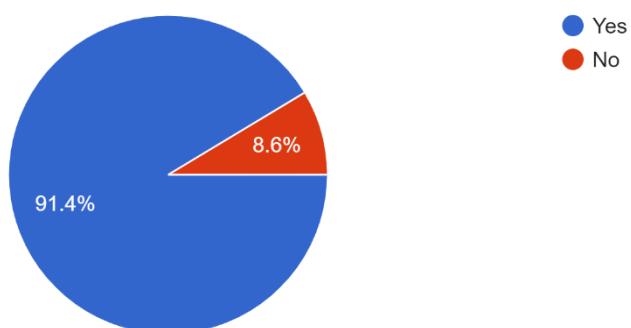
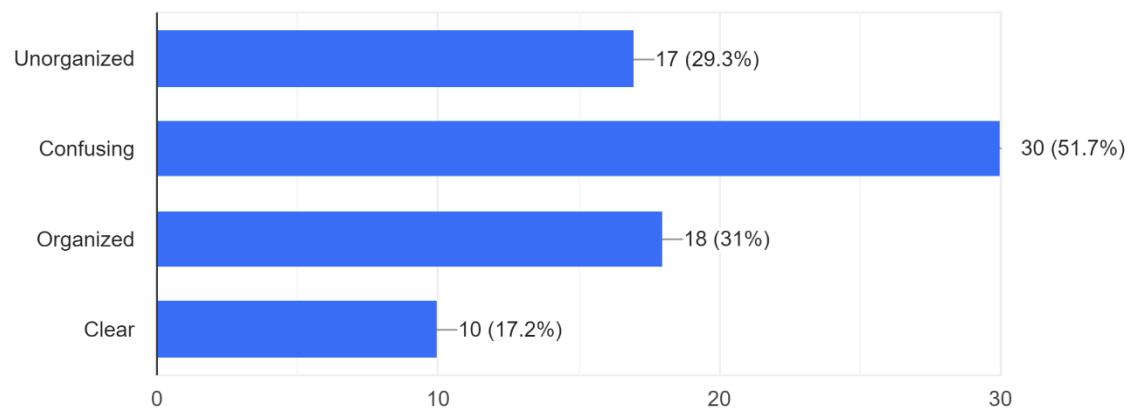


Figure 42 Survey Responses

What do you think of the current way for scheduling an appointments for the clinic(GP help desk)?  
58 responses



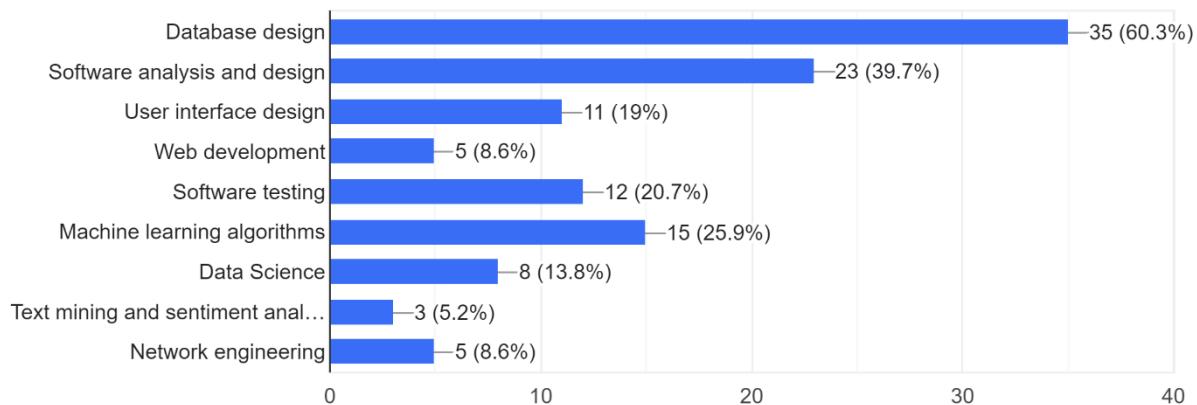
Did you face any issues while scheduling your appointments?(If yes please write it in the box)  
58 responses



Figure 43 Survey Responses

Under what specialty does the technical experience you faced fall into? (Ex. Database, Machine Learning, Testing, ...ext)

58 responses



Did you need to refer back to previous graduations project documents to help you with your graduation project?

67 responses

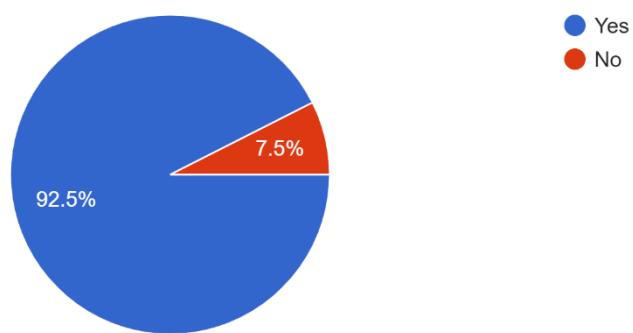
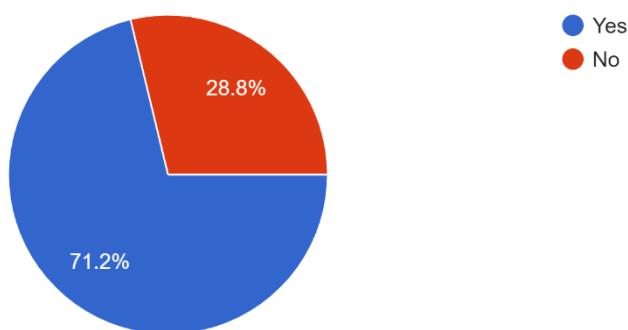


Figure 44 Survey Responses

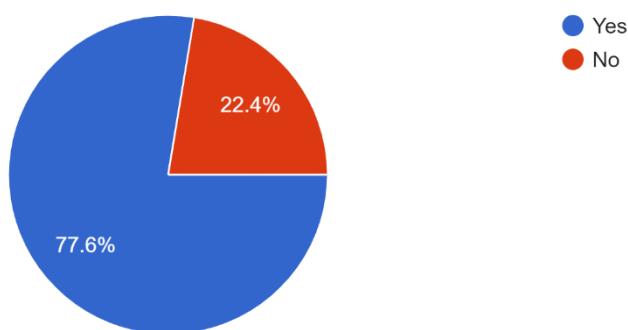
(If your answer to the previous question is Yes) , Did you have difficulty in finding previous graduation projects?

66 responses



Have you ever had to get in touch with graduates who worked on similar projects?

67 responses



(If your answer to the previous question is Yes) , Was it easy for you to find how to get in touch with graduates?

55 responses

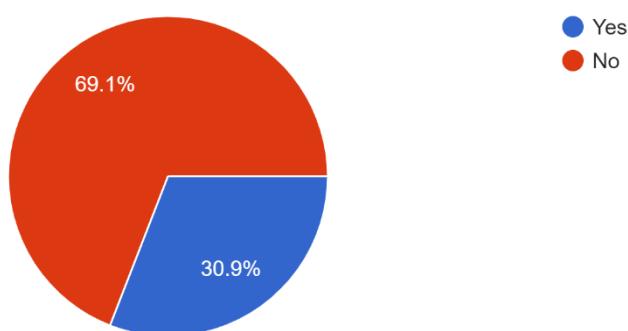
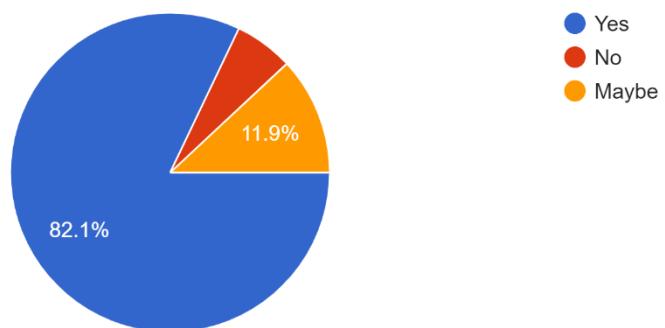


Figure 45 Survey Responses

Would you like to have an application on your phone allow you to access graduation projects for you to view?

67 responses



Would you like to have an application on your phone that offers different way to communicate with graduates?

67 responses

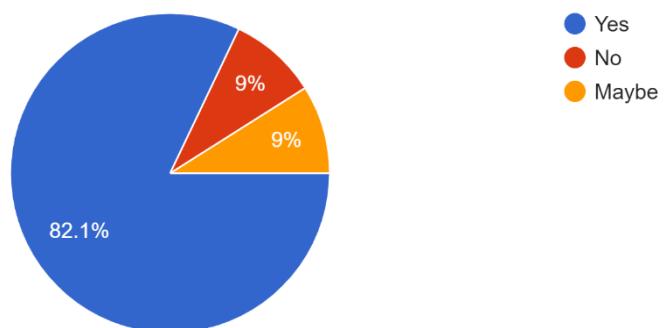
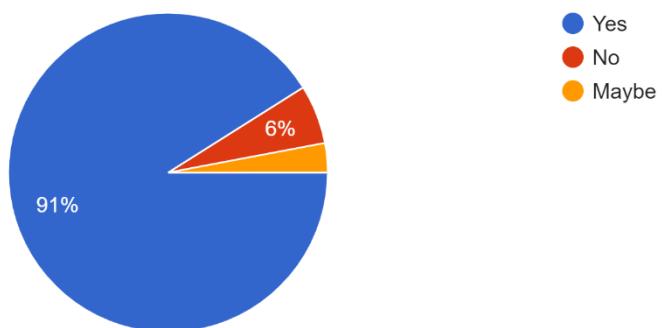


Figure 46 Survey Responses

Would you like to have an application on your phone that lets you directly schedule an appointment with a faculty member who is expert in specific filed?

67 responses



Would you like to have an application on your phone that displays the students' common issues in specific filed with a suggested solutions from an expert?

67 responses

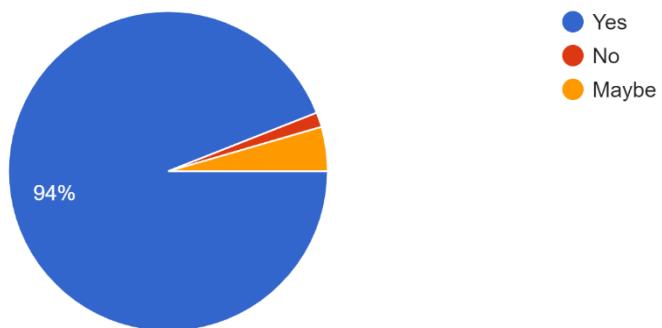


Figure 47 Survey Responses

## 9.2 Appendix B: Interviews

**Table 9 Interview 1**

Interview Outline	
<b>Interviewee:</b>  Dr.Nora Abdulaziz Madi	<b>Interviewer:</b>  Demah Alhabdan
<b>Location:</b>  Via KSU email	<b>Appointment Date:</b>  20 September 2022
<b>Objectives:</b>	
1- Gather information about the difficulties that faculty members faced 2-Figure out what facilities faculty member want 3- Discover how the faculty member solves problems 4-Get to Know the faculty member better	
<b>Reminders:</b>	
-The interviewees must have previous experience in GP help desk -The interviewee should be from the College of Computer and Information Sciences - The interviewee should be from the King Saud University	
<b>Questions:</b>	<b>Answers:</b>

<p>Question 1: What are the challenges you face as a faculty member to manage your schedule in GP help desk ?</p>	<p>Two challenges that I face are:</p> <p>1- I have to keep opening the registration sheet to check whether or not a new team has booked an appointment. It would be more convenient to be notified when there is a new entry.</p> <p>2- remembering all my appointments. I would have to manually record appointments in my personal calendar every time there's a new entry by constantly checking the registration sheet. This is very time and effort consuming. It would be best if my personal mobile calendar was automatically updated.</p>
<p>Question 2: When you suggest a solution to the students issues, What are the different methods you follow? (example: document, links for tutorials or any kind of help)</p>	<p>It depends on the issue. I have previously shared both documents and links. However, I would have to either send them in the meeting chat, which would be deleted upon ending the meeting, or by email, which can be time consuming.</p>
<p>Question 3: When you receive the same issue multiple times from different students , Do you consider this a problem ? and why?</p>	<p>Of course! Because it means that there might be a common misunderstanding among students. This would show a lack of information, lack of awareness, or miscommunication about a certain thing. Also, some students might be shy to ask, which</p>

	<p>means that they might never be aware of that common misunderstanding thereby leading to mistakes in their work for example.</p> <p>Another problem is that it would take up much unnecessary time repeating the same things over and over again each time students ask a common question.</p> <p>In the courses I teach, I always try to announce any common misunderstandings or issues to all my students in an email or through blackboard announcements.</p>
--	---

**Table 10 Interview 2**

Interview Outline	
<b>Interviewee:</b>	<b>Interviewer:</b>
Dr.Alaa Alhumaisan	Demah Alhabdan
<b>Location:</b>	
Via KSU email	<b>Appointment Date:</b> 20 September 2022
<b>Objectives:</b> <ul style="list-style-type: none"> <li>1- Gather information about the difficulties that faculty members faced</li> <li>2-Figure out what facilities faculty member want</li> <li>3- Discover how the faculty member solves problems</li> <li>4-Get to Know the faculty member better</li> </ul>	
<b>Reminders:</b> <ul style="list-style-type: none"> <li>-The interviewees must have previous experience in GP help desk</li> <li>-The interviewee should be from the College of Computer and Information Sciences</li> <li>- The interviewee should be from the King Saud University</li> </ul>	
Questions:	
Question 1: What are the challenges you face as a faculty member to manage your schedule in GP help desk ?	
from my recent experience, there was not a real issue with managing the schedule as there was not much queries probably due to the relatively larger group of mentors.	

Question 2: When you suggest a solution to the students issues, What are the different methods you follow?(example: document, links for tutorials or any kind of help)	2-I usually like to give a short explanation for the solution with some links to detailed resources.
Question 3: When you receive the same issue multiple times from different students , Do you consider this a problem ? and why?	Not an issue to me, but raises the flag that there is some lack of communicating the task to students or could be a relatively new concept to them. This is usually reported to the scrum masters to circulate further general guidance to all the GP groups.

**Table 11 Interview 3**

<b>Interview Outline</b>	
<b>Interviewee:</b> prof. Ghada Alhudhud	<b>Interviewer:</b> Albandri Alotaibi
<b>Location:</b> Via KSU email	<b>Appointment Date:</b> 21 September 2022
<b>Objectives:</b> <ul style="list-style-type: none"> <li>1- Gather information about the difficulties that faculty members faced</li> <li>2-Figure out what facilities faculty member want</li> <li>3- Discover how the faculty member solves problems</li> <li>4-Get to Know the faculty member better</li> </ul>	
<b>Reminders:</b> <ul style="list-style-type: none"> <li>-The interviewees must have previous experience in GP help desk</li> <li>-The interviewee should be from the College of Computer and Information Sciences</li> <li>- The interviewee should be from the King Saud University</li> </ul>	
<b>Questions:</b>  Question 1: What are the challenges you face as a faculty member to manage your schedule in GP help desk ?	<b>Answers:</b>  Major issue is the multiple appointments at the same time, as I might forget that some other students booked an appointment with me at the same time slot  Another issue was the speciality, it is sometimes difficult to answer the students questions without referring to someone who is expert in the field

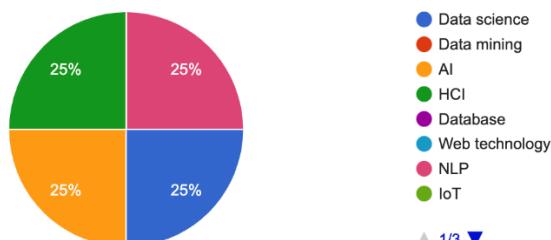
Question 2: When you suggest a solution to the students issues, What are the different methods you follow?(example: document, links for tutorials or any kind of help)	Yes, sure. I would suggest resources such as articles, documents of previous projects
Question 3: When you receive the same issue multiple times from different students , Do you consider this a problem ? and why?	Yes, it is a serious problem. Because, I need to repeat the answer every time I face the same question from different students.

## 9.3 Appendix C: Demographics

What is your speciality?

4 responses

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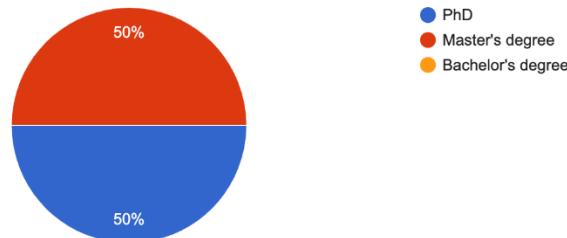
- Data science
- Data mining
- AI
- HCI
- Database
- Web technology
- NLP
- IoT

▲ 1/3 ▼

What is your educational level?

4 responses

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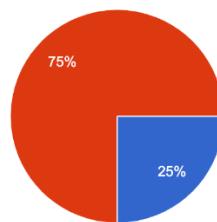


- PhD
- Master's degree
- Bachelor's degree

Role in the GP help desk committee

4 responses

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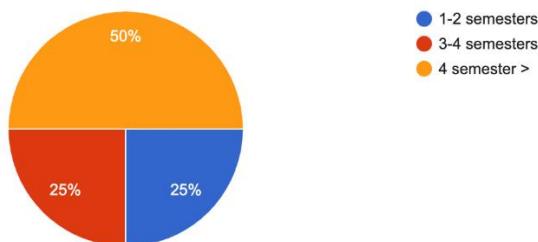


- Head of GP help desk committee
- Member GP help desk committee

How many semesters have you been part of the GP help desk?

4 responses

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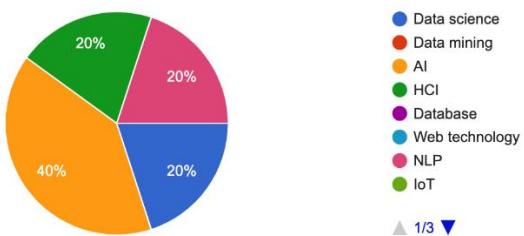
- 1-2 semesters
- 3-4 semesters
- 4 semester >

Figure 48 admin demographics

What is your speciality?

5 responses

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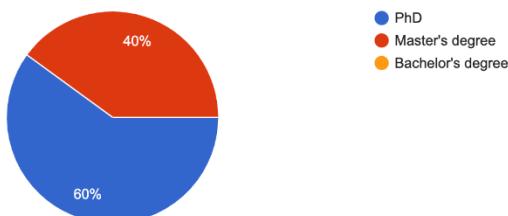
- Data science
- Data mining
- AI
- HCI
- Database
- Web technology
- NLP
- IoT

▲ 1/3 ▼

What is your educational level?

5 responses

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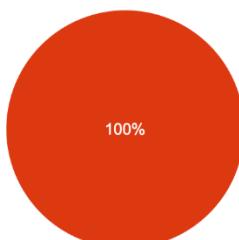


- PhD
- Master's degree
- Bachelor's degree

Role in the GP help desk committee

5 responses

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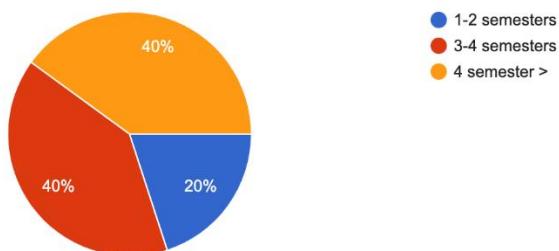


- Head of GP help desk committee
- Member GP help desk committee

How many semesters have you been part of the GP help desk?

5 responses

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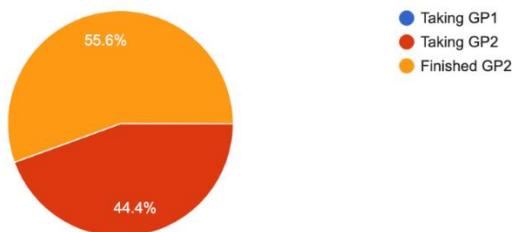
- 1-2 semesters
- 3-4 semesters
- 4 semesters >

Figure 49 faculty member demographic

What course are you taking?

9 responses

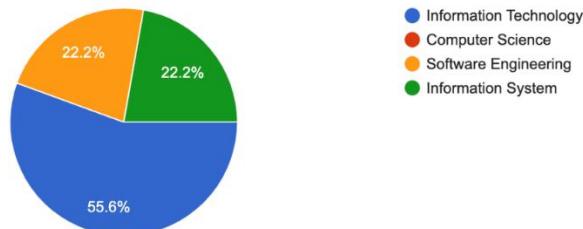
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What is your major?

9 responses

 Copy



What category does your graduation project fall into?

9 responses

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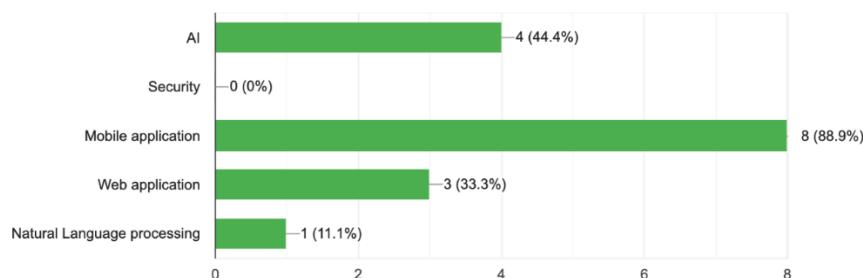
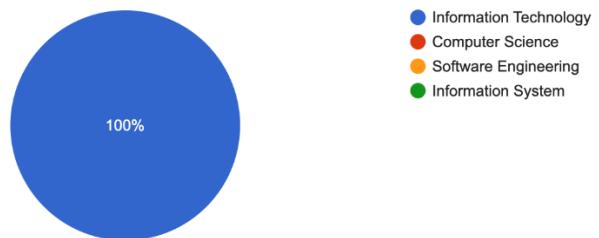


Figure 50 student demographics

What is your major?

2 responses

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What category does your graduation project fall into?

2 responses

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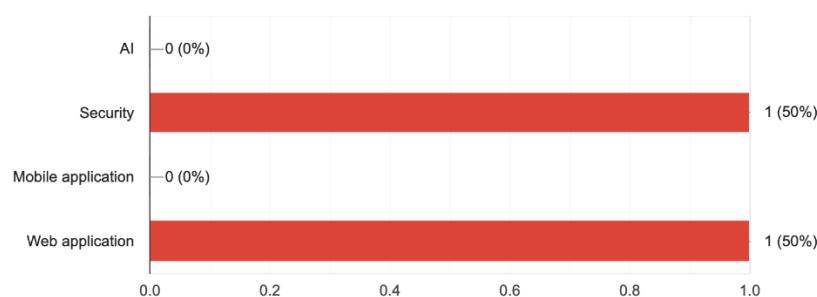


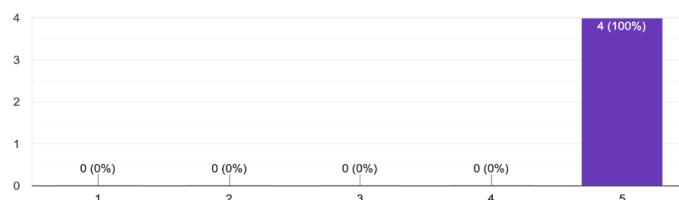
Figure 51 graduate demographics

## 9.4 Appendix D: Questionnaire

I would imagine that most people would learn to use this system very quickly.

4 responses

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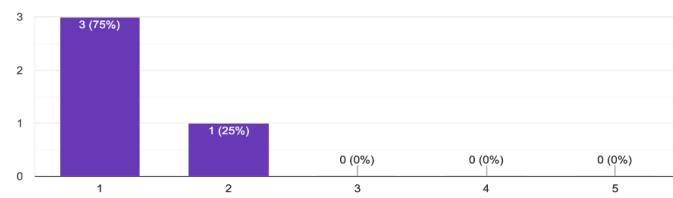


I thought there was too much inconsistency in this system.

4 responses

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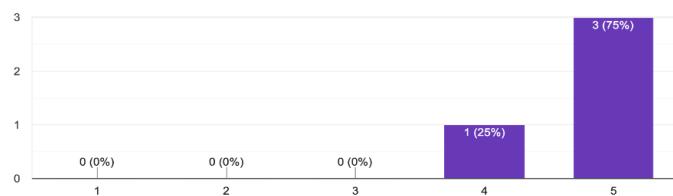
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I found the various functions in this system were well integrated.

4 responses

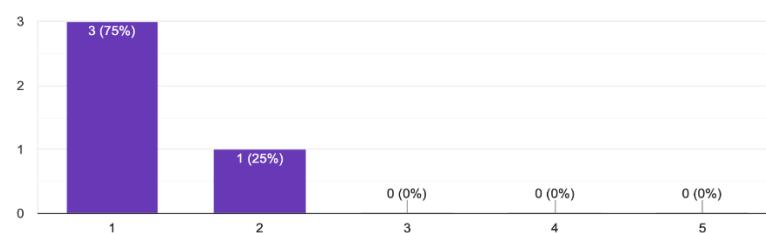
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I think that I would need the support of a technical person to be able to use this system.

4 responses

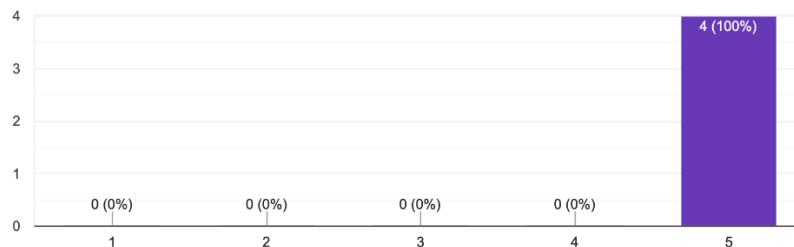
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I thought the system was easy to use.

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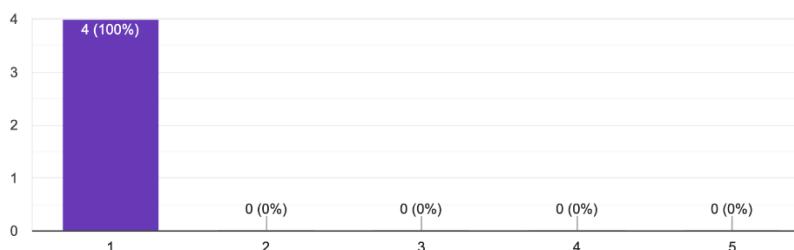
4 responses



I found the system unnecessarily complex.

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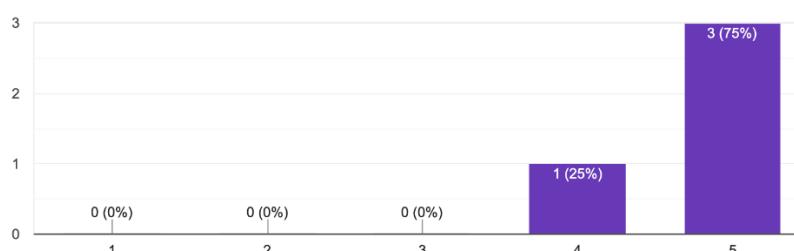
4 responses



I think that I would like to use this system frequently.

 Copy

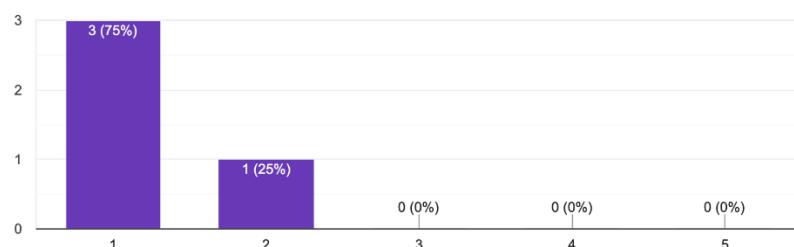
4 responses



I needed to learn a lot of things before I could get going with this system.

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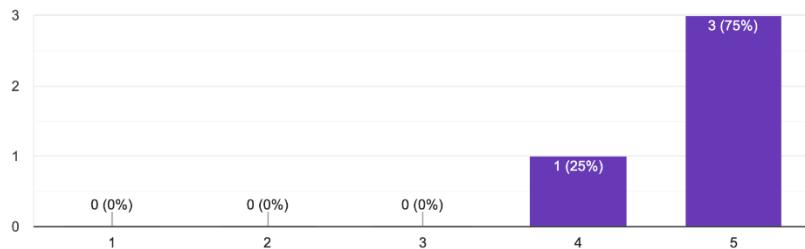
4 responses



I felt very confident using the system.

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4 responses



I found the system very cumbersome to use.

 Copy

4 responses

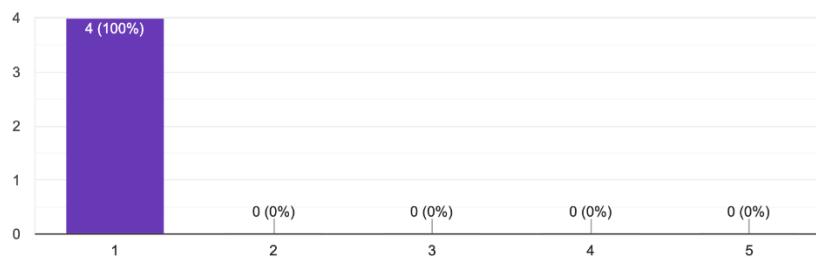
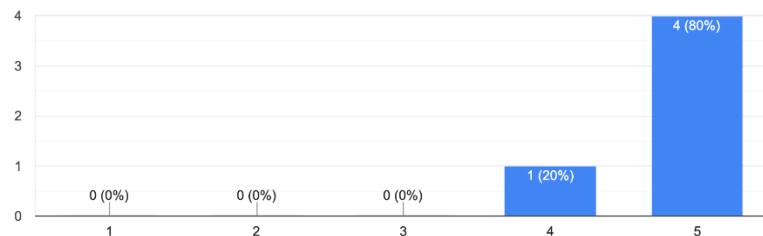


Figure 52 admin questionnaire

I felt very confident using the system.

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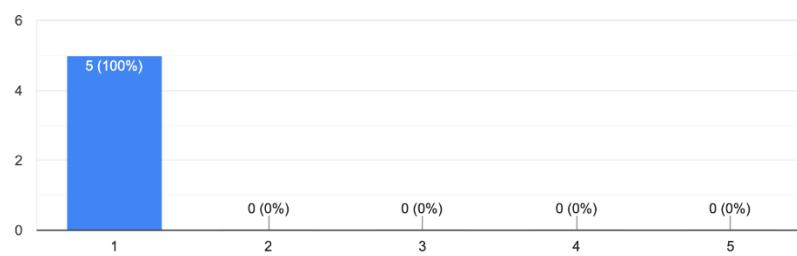
5 responses



I found the system very cumbersome to use.

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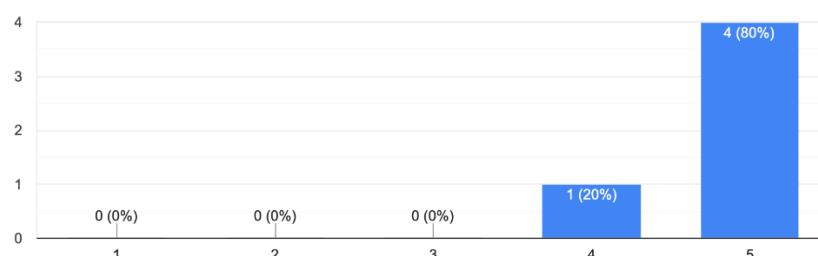
5 responses



I would imagine that most people would learn to use this system very quickly.

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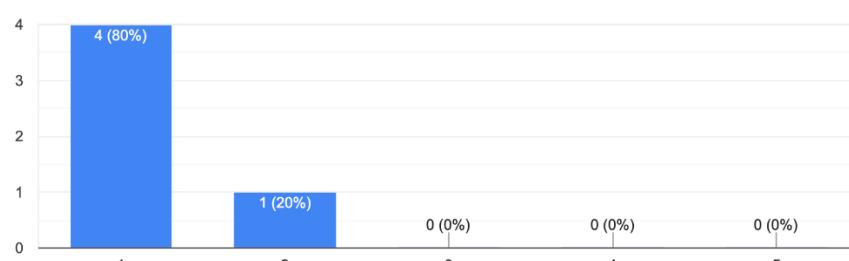
5 responses



I thought there was too much inconsistency in this system.

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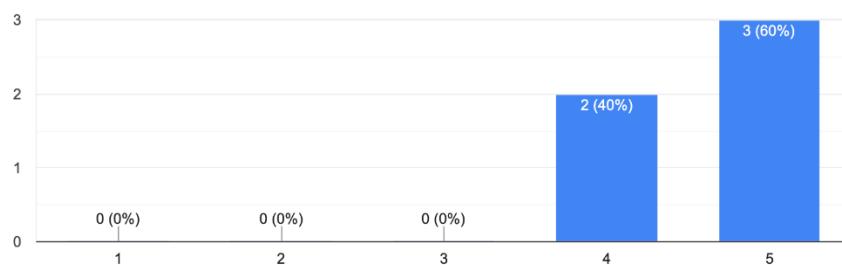
5 responses



I found the various functions in this system were well integrated.

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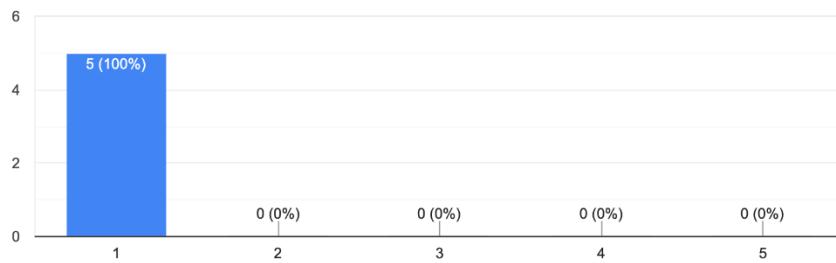
5 responses



I think that I would need the support of a technical person to be able to use this system.

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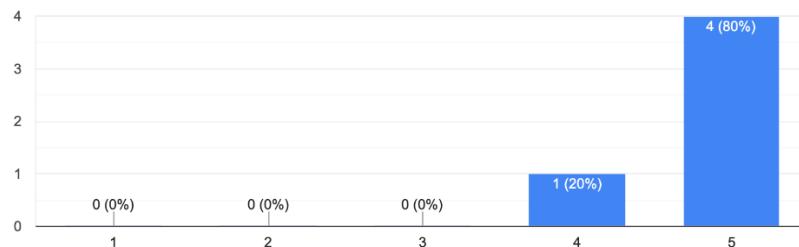
5 responses



I thought the system was easy to use.

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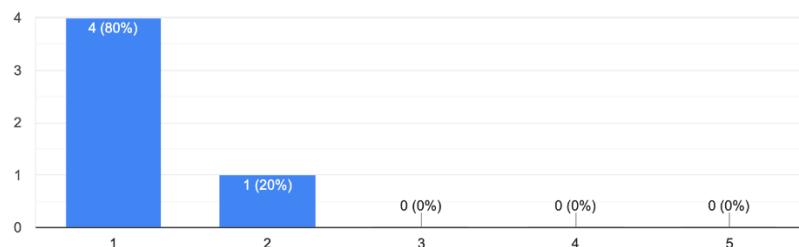
5 responses



I found the system unnecessarily complex.

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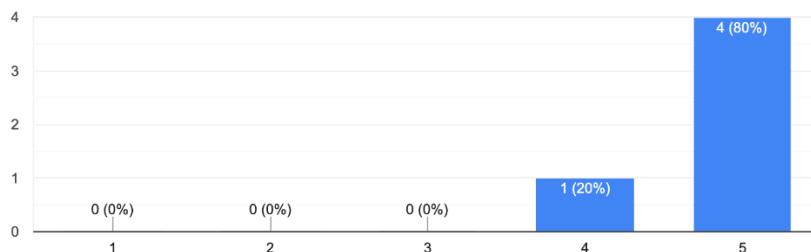
5 responses



I think that I would like to use this system frequently.

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5 responses



I needed to learn a lot of things before I could get going with this system.

 Copy

5 responses

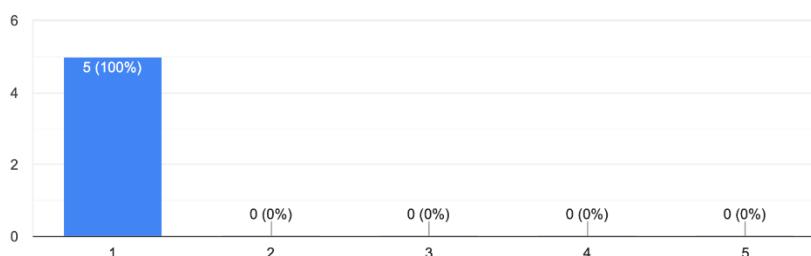
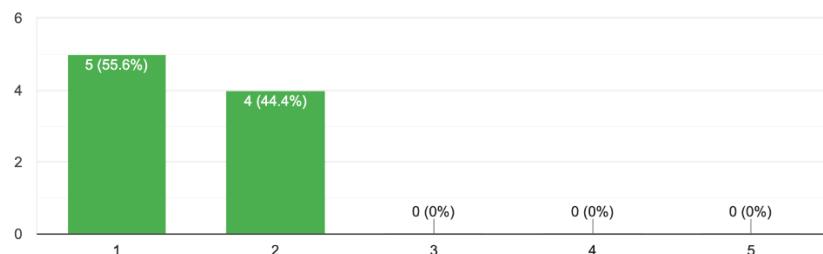


Figure 53 faculty member questionnaire

I needed to learn a lot of things before I could get going with this system.

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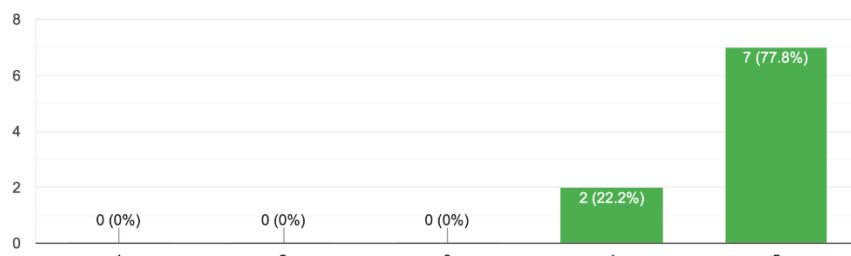
9 responses



I felt very confident using the system.

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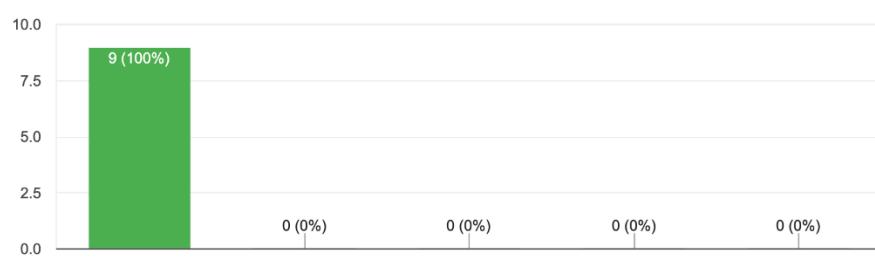
9 responses



I found the system very cumbersome to use.

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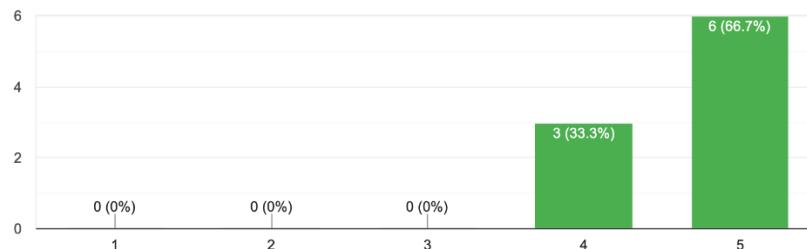
9 responses



I would imagine that most people would learn to use this system very quickly.

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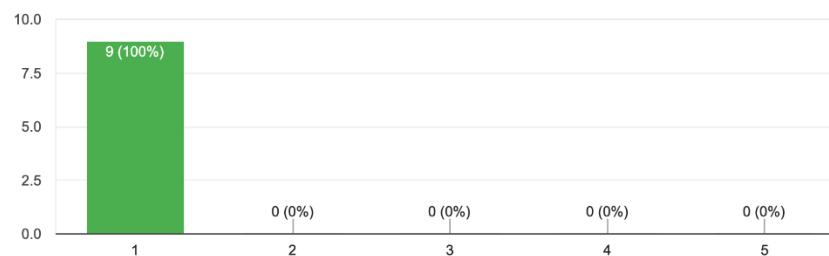
9 responses



I thought there was too much inconsistency in this system.

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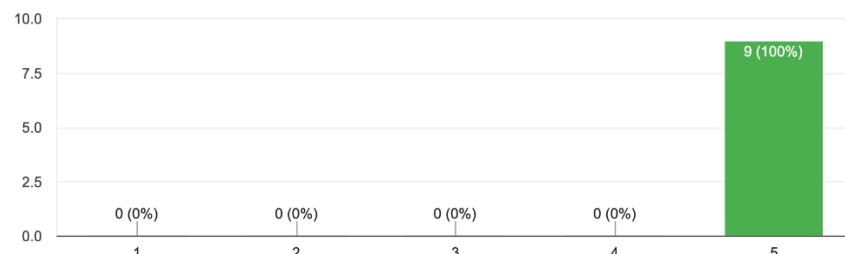
9 responses



I found the various functions in this system were well integrated.

 Copy

9 responses

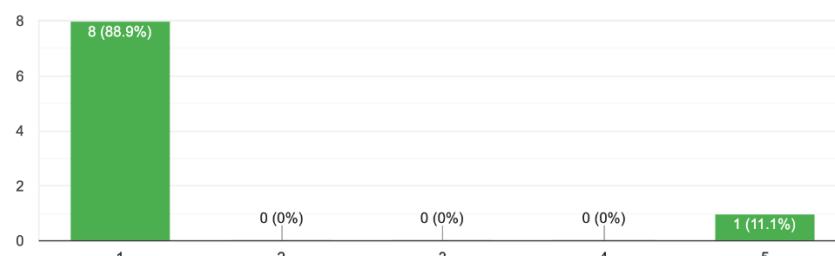


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I think that I would need the support of a technical person to be able to use this system.

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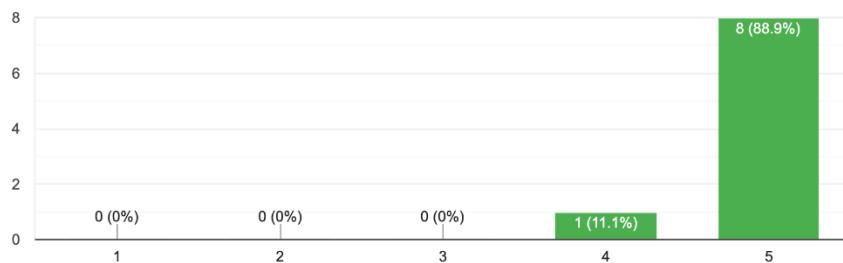
9 responses



I thought the system was easy to use.

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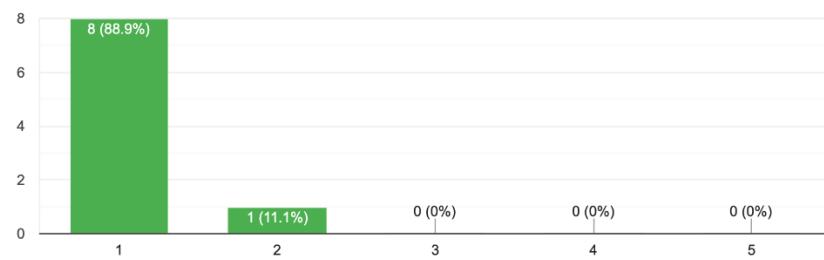
9 responses



I found the system unnecessarily complex.

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9 responses



I think that I would like to use this system frequently.

 Copy

9 responses

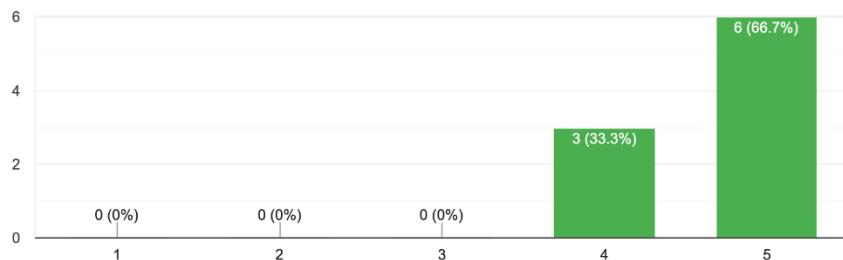
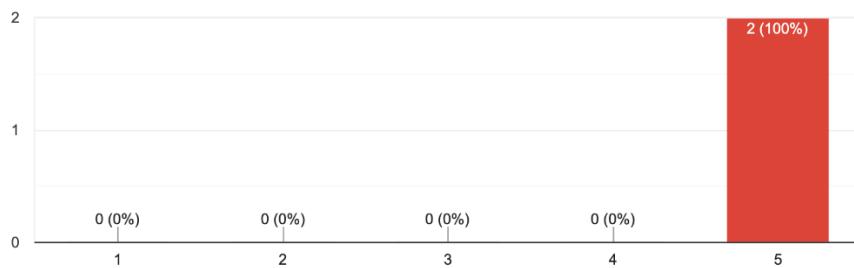


Figure 54 student questionnaire

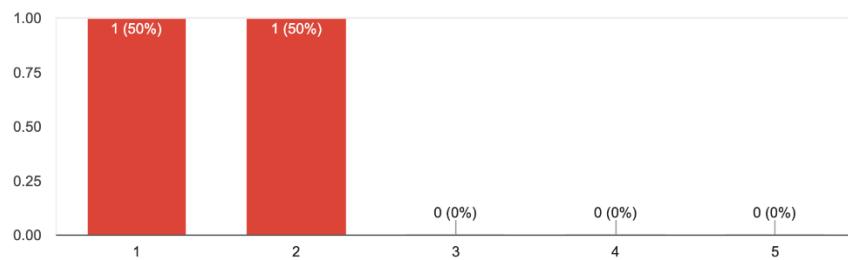
Do you think that the application will make the process of helping GP students easier for you? [Copy](#)

2 responses



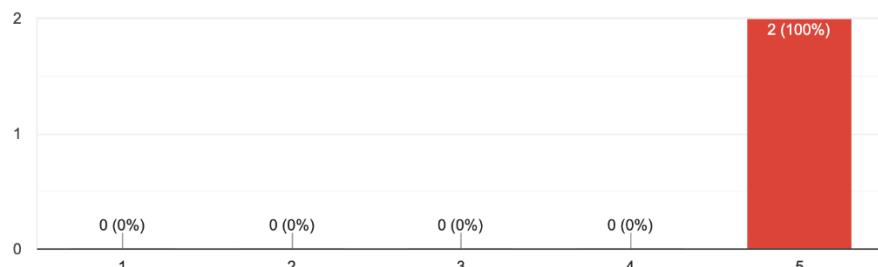
I needed to learn a lot of things before I could get going with this system. [Copy](#)

2 responses



I felt very confident using the system. [Copy](#)

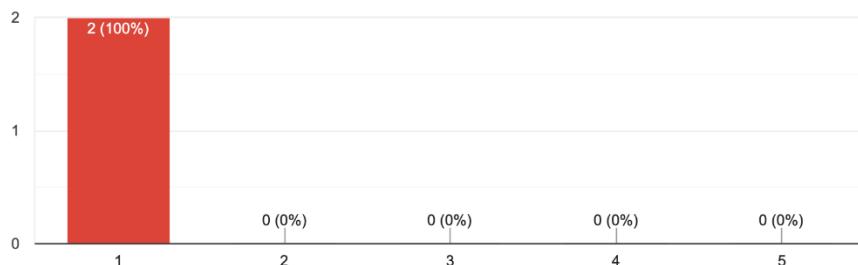
2 responses



I found the system very cumbersome to use.

 Copy

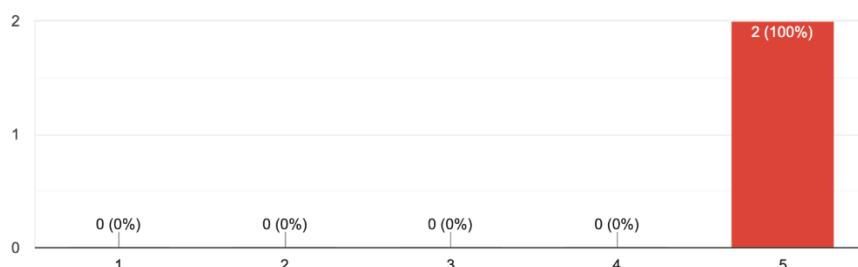
2 responses



I would imagine that most people would learn to use this system very quickly.

 Copy

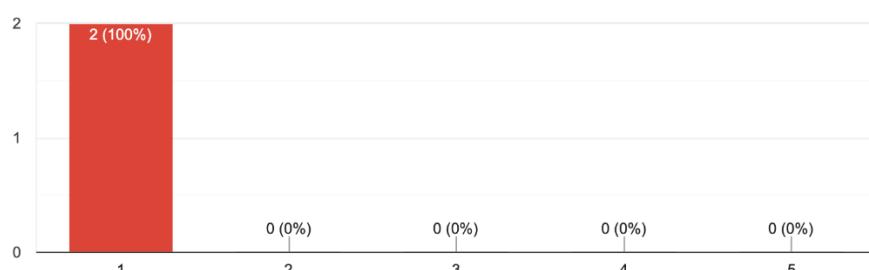
2 responses



I thought there was too much inconsistency in this system.

 Copy

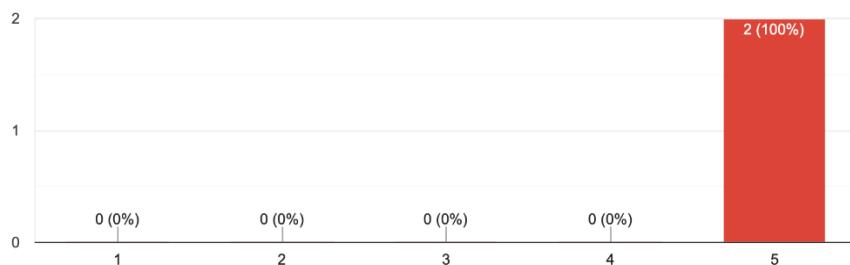
2 responses



I found the various functions in this system were well integrated.

 Copy

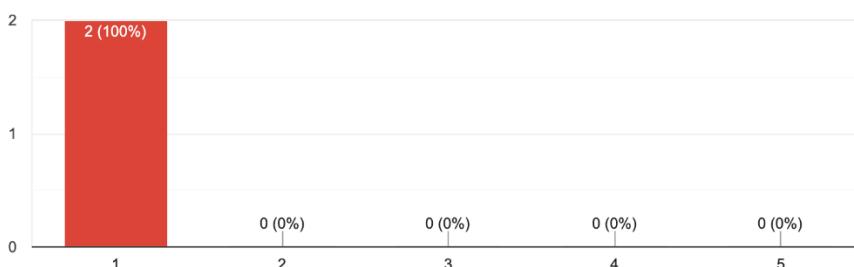
2 responses



I think that I would need the support of a technical person to be able to use this system.

 Copy

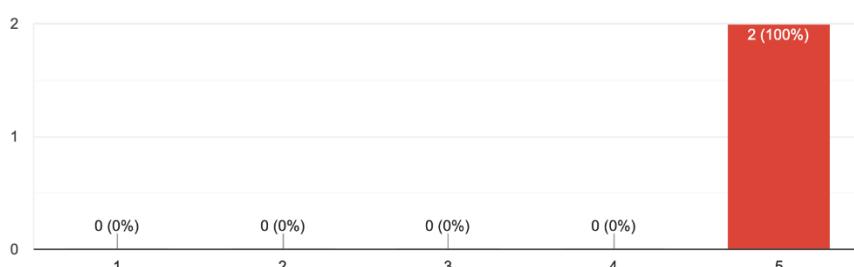
2 responses



I thought the system was easy to use.

 Copy

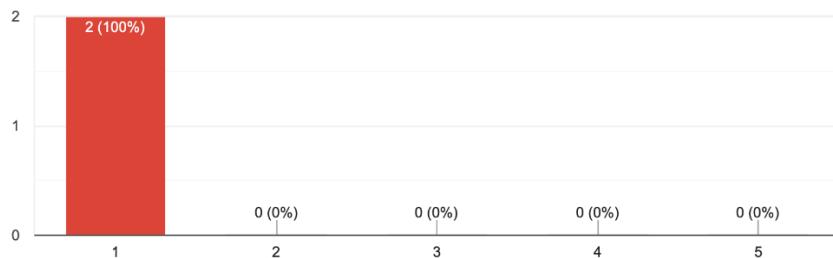
2 responses



I found the system unnecessarily complex.

 Copy

2 responses



I think that I would like to use this system frequently.

 Copy

2 responses

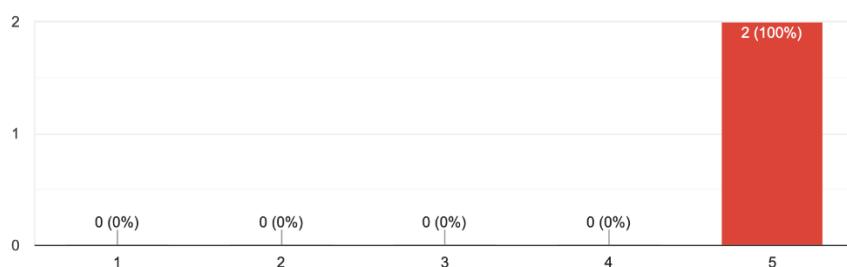


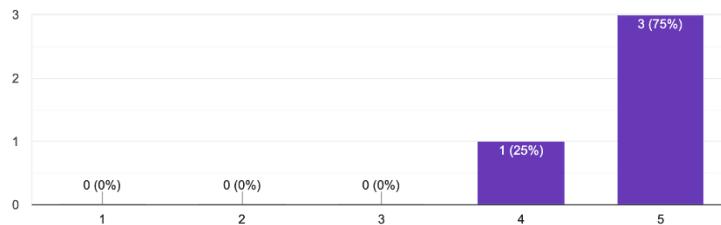
Figure 55 graduate questionnaire

## 9.5 Appendix E : Additional Questionnaire Questions

Would you like to use the application when it is launched?

 Copy

4 responses



Do you think that the application will make GP Help desk management easier for you?

 Copy

4 responses

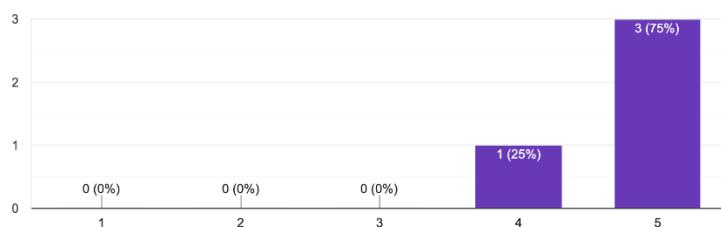
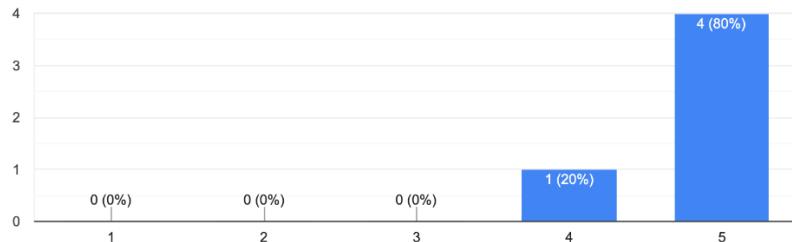


Figure 56 admin additional questions

Would you like to use the application when it is launched?

 Copy

5 responses



Do you think that the application will make the process of helping GP students easier for you?

 Copy

5 responses

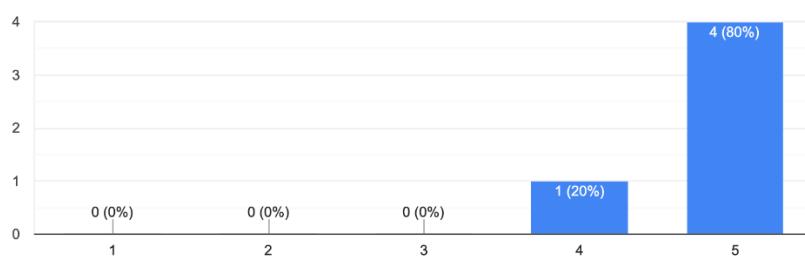
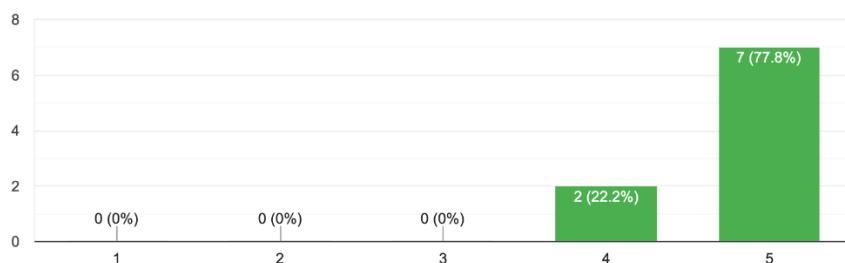


Figure 57 faculty member additional questions

Would you like to use the application when it is launched?

 Copy

9 responses



Do you think that the application will make the process of getting help with your GP easier for you?

 Copy

9 responses

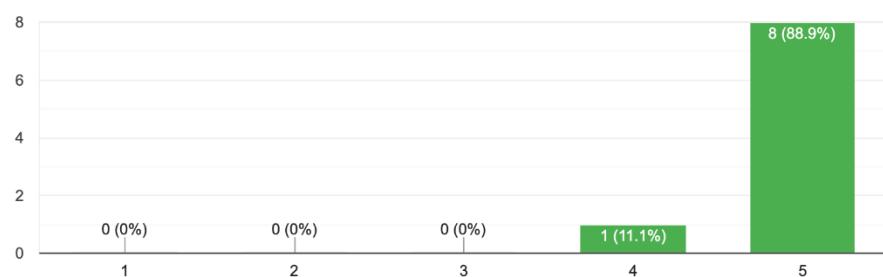
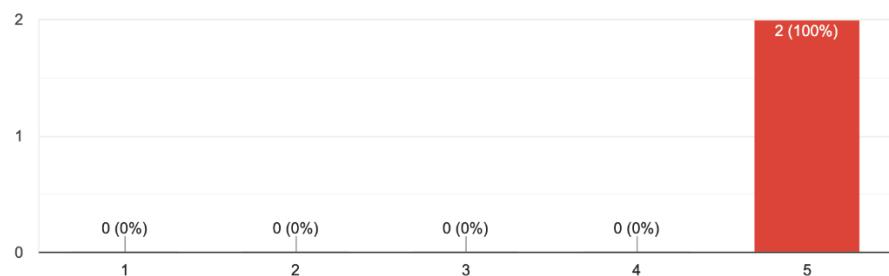


Figure 58 student additional questions

Would you like to use the application when it is launched?

 Copy

2 responses



Do you think that the application would have helped you with your graduation project?

 Copy

2 responses

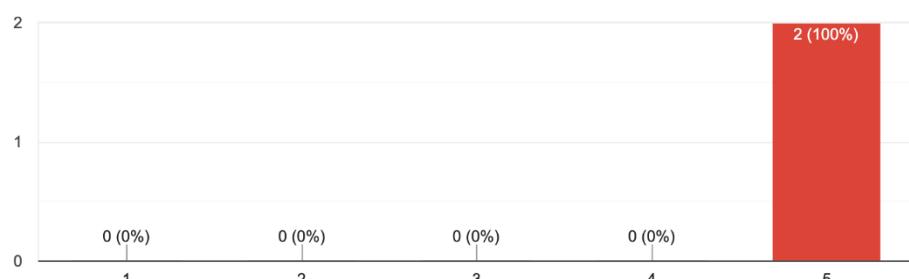


Figure 59 graduate additional questions