



eClinic

IT 496: Graduation Project Report Product Release-1

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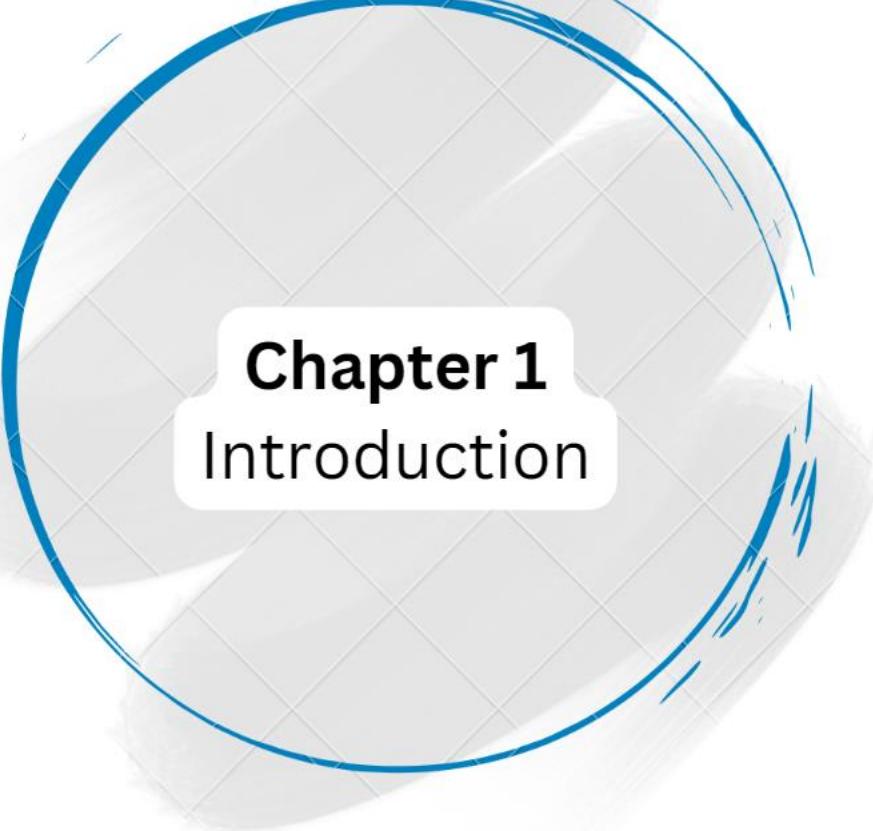
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Chapter 1

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.

Through our observations and student feedback, we identified a major challenge: GP students typically lack project management 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, our college 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.

Being able to view similar graduation projects and to communicate with their members can improve the quality of the overall 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. In addition, we will include features that go beyond just providing guidance to improve and simplify the graduation project experience.

Having a technological system that enhance the guidance process for both students and experts would resolve the graduation project issues more efficiently and effectively. In addition, we will include features that go beyond just providing guidance to improve and simplify the graduation project experience.

1.1 The Problem

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. Therefore, it might be difficult for students to schedule a consultation with faculty members within their available help desk hours because there is no standard method to do so. This causes confusion for the students and lengthens the scheduling process. Moreover, students frequently approach faculty members with similar issues, which wastes the faculty member's time and effort in addressing the same issue 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. All these reasons cause the students and faculty members to struggle. Having a system that connect GP students with faculty members and graduates will help to resolve the issues in graduation projects and make the process easier and smoother.

1.2 The Solution

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 graduation projects technical difficulties. eClinic system consists of a web portal and android mobile application. Our project will have three types of users: administrator, faculty members and students. 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 common issues section under a specific specialty where the faculty members can add their suggested solutions for some common issues and frequently asked questions by uploading documents or giving a textual answer to be shared with all students to save faculty member

time and effort for dealing with students' similar issues. This section can be viewed by the students for them to see whether their current issue have 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 to not wait for their consultation and help them move forward with their project much faster. In addition, eClinic will provide students with previous GPs section where the students can share their GPs after completion under a specific category to benefit upcoming GP students. Also, this section will include social media contact links for some of the students who worked on a shared project. This will create a specialized library for sharing graduation projects to help students learn from previous experiences by reviewing the previous GP documents and also being able to communication with the graduates.

1.3 Product

1.3.1 Product Vision

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** current help desk done by the collage, **our product** is solving technical issues in multiple ways rather than just to have a consultation with an expert.

1.3.2 Product Roadmap

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

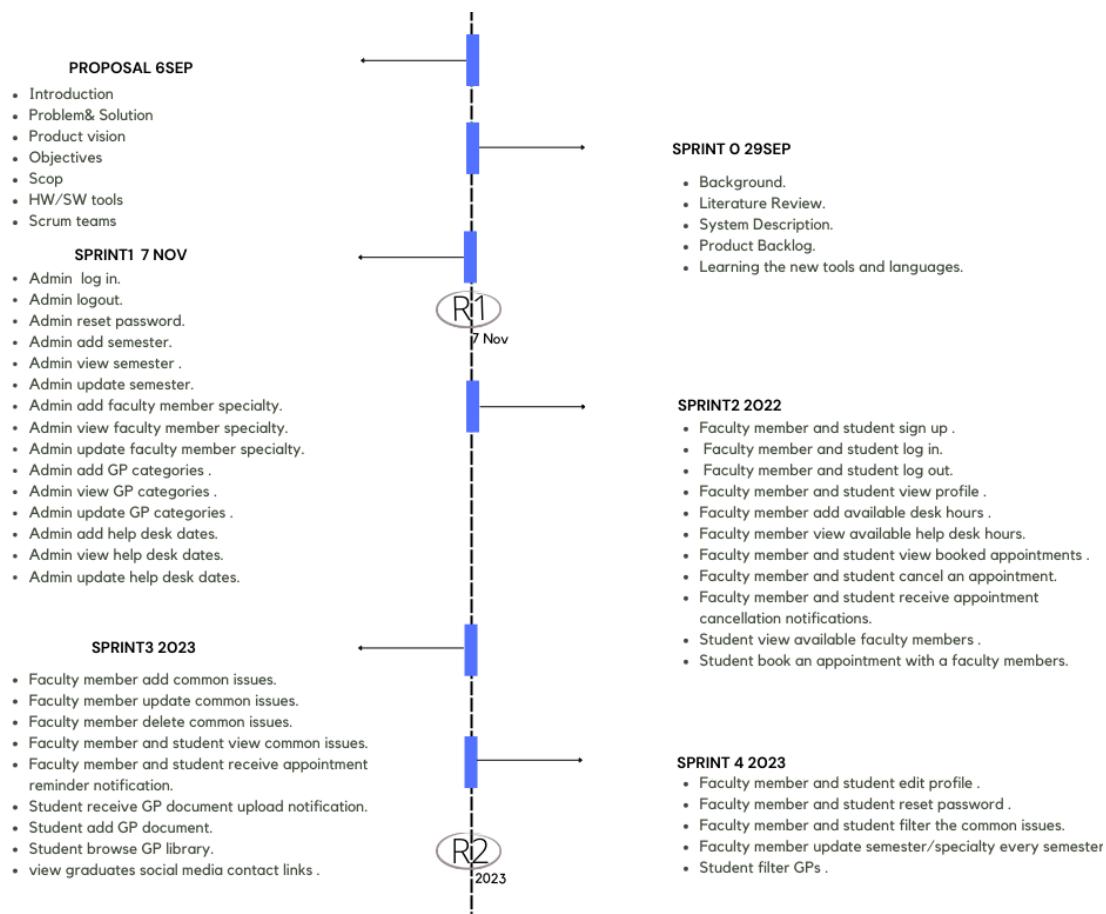


Figure 1 Product Roadmap

1.3.3 Objectives

- Product (customer focus-value):** The necessity for effective assistance from experts in the graduation project served as inspiration. We have seen that both students and faculty members experience significant difficulties with graduation projects. As the difficulty in scheduling a consultation, addressing the same problems and the challenge in reaching to previous GPs documents and graduates. The creation of eClinic will offer an effective means to assist faculty members and students in overcoming technical challenges associated with graduation projects. The system will be composed of web-portal and mobile application. The mobile application has two users, the faculty members who are responsible for helping the students with graduation projects and students who want to resolve an issue regarding their graduation project. The web-portal will be used by the admin who is the owner of the application.

eClinic will have the following features:

- Admin can log in/out
 - Admin can reset password
 - Admin can manage semesters, faculty members specialty, GPs categories and help desk dates.
 - Faculty members and students can sign up, log in/out.
 - Faculty members and students can view and edit their profile
 - Faculty members can add and view their available help desk hours.
 - Faculty members can add, update, delete common issues.
 - Faculty members and students can view common issues.
 - 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.
 - Faculty members and students can receive appointment reminder and appointment cancellation notifications.
 - Students can browse GP library.
 - Students can view graduates' social media contact links.
 - Students can add their GP document after completion.
 - Students can receive reminder notification for GP document upload.
-
- **Project (solution focus-plan):** To complete this project, we need to do domain analysis, requirements engineering by performing requirements elicitation, requirements specification and requirements validation to understand the user needs and complete the product backlog. We will also design the system architecture and we will learn about the new tools and programming languages that we will use in this

project. Once that has been done, we will start developing and designing some of the admin features in the web portal along with creating the database. After that, we will complete developing the rest of the admin features to be ready to manage the system. When that has been completed, we will start with the mobile application by designing and developing all features for faculty members. Finally, we will design and develop all features for student.

- **Learning (student focus):** Since mobile application development hasn't been covered in our curriculum and we don't have previous knowledge about it, we will learn about it through this project. We will learn a new programming language called Dart and use it with Flutter, which we have never used before. All the development will be done in Visual Studio, and we also haven't used it before.

1.3.4 Scope

The problem we have observed is related to students' graduation projects. eClinic system is a web portal and an android application that supports only English language. 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 will be created for the administrator to access the system to manage semesters, faculty member specialties, graduation projects categories and help desk dates.

The android mobile application will be created for students and faculty members using Dart language, and they will be able to register and use the application.

Faculty members will be able to add and view their available help desk hours and view booked appointment and can cancel them. Also, they can add, update, delete and view the common issues and frequently asked questions under specific specialty. Additionally ,faculty members will be able to receive notifications for appointment reminder and for appointment cancellation.

As for the students, they will be able to view the available faculty members and book a consultation appointment with them, browse graduation projects library and view graduates' social media contact links. Moreover, students can add their graduation project after completion. Additionally, student can view the common issues under certain specialty and view

and cancel booked appointments. Lastly, students will be able to receive a notification for appointment reminder, appointment cancellation and GP document upload reminder.

1.3.5 Hardware/Software Tools and Cost

Table 1 will show the hardware and software tools and cost to build the system.

Table 1 Hardware/Software Tools and Cost

Hardware Tools	
Name and Description	Cost
Laptops	-
Printer	-
Software Tools	
Name and Description	Cost
Visual Studio Code for all the development	-
Android Studio for mobile simulation	-
Flutter (software development kit)	-
Firebase (database)	-
Microsoft Word for writing and editing project document	-
Microsoft PowerPoint for making project presentations	-
GitHub for sharing development files between the team members	-
Jira for managing project work	-

1.4 Scrum Team

1.4.1 Skill Set Requirements

Table 2 will show the required technical skills and what is current level of the team

Table 2 Skill set requirement

Technical Skill Required	What is the current level of the team for each skill? How will the gap be bridged?
Dart programming language with Flutter skills	Beginner - we will take a course as our learning plan
Firestore data design, storage, and retrieval	Beginner - we will use Firebase documents.
HTML markup language skills	Advanced
CSS style sheet language skills	Intermediate
JavaScript programming language skills	Intermediate
User experience design skills	Intermediate
Visual studio code usage skills	Beginner - we will use YouTube for tutorials

1.4.1.1 Learning

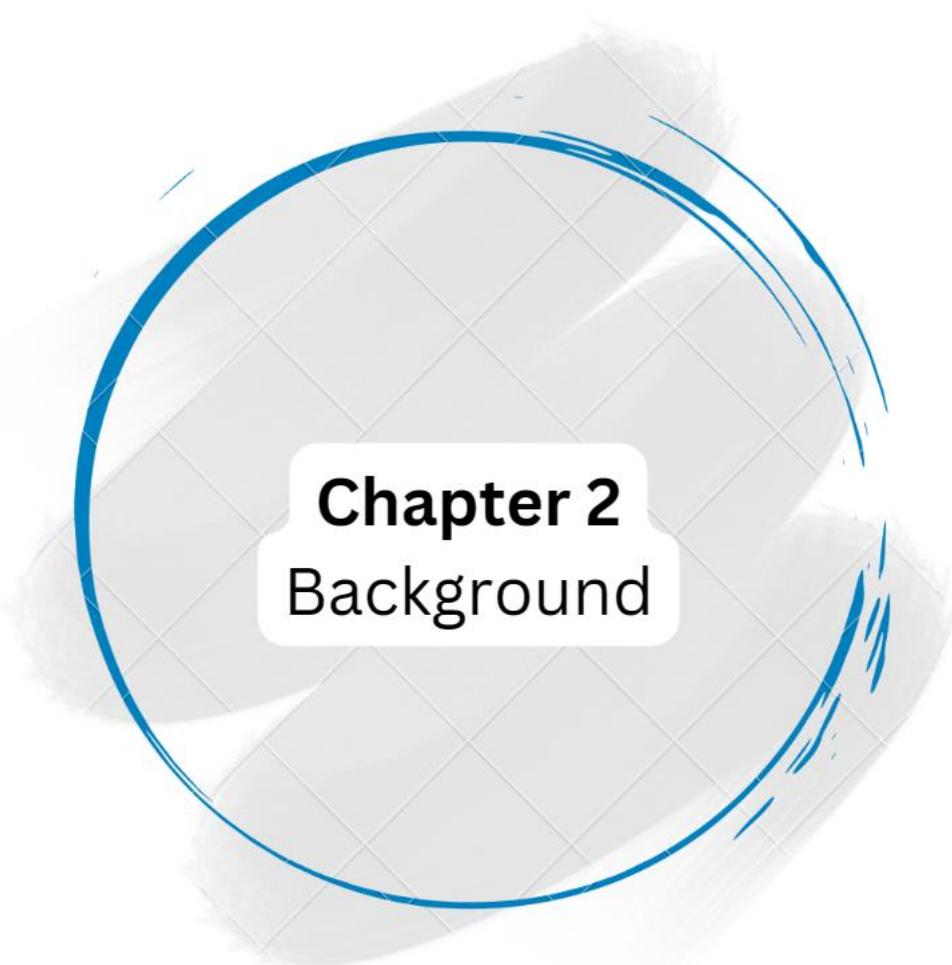
We began with learning how to use Firestore with JavaScript correctly in the code as the database is a NoSQL database which we haven't used before, by learning from the Firebase documents [3] that includes video explanation of many features related to storing and retrieving data. Moreover, we needed to learn how to use bootstrap to design our system [4]. As for Visual Studio Code we downloaded it and started exploring the environment to get familiar with it and followed a YouTube tutorial for that [5].

1.4.2 Roles and Responsibilities

Table 3 will show the roles and responsibilities of the scrum team.

Table 3 Roles and responsibilities

Scrum Team	
Product Owner:	prof. Ghadah Alhudhud Dr.Hind Alrasheed
Developers:	Demah Alhabdan Deem Altwaijri Albandri Alotaibi Alhanouf Alqahtani
Scrum Master (SM):	Dr. Rana Alkadi
Stakeholders:	Admin, faculty member, students



Chapter 2 Background

2 Background

In this section we provide knowledge and concepts in areas that are relevant to our project. this knowledge should help in understanding the problem and solution.

2.1 Consultations

Consultation history goes way back to ancient times. Indeed, consulting has always existed but in different ways such as simply it was sharing of thoughts of a wise person who usually was part in leadership of group of people where the group rely on that expert for guidance and consultation. [8]. But now we can define counseling as a meeting with a professional or subject matter expert (SME) for purposes of gaining information, or the act or process of formally discussing and collaborating on something [9] to solve a problem or make a decision . There are several kind of consultation, such as family, psychological, academic, technical, legal and health counseling.

2.2 Graduation project

To ensure that graduates are able to successfully apply the knowledge that they have acquired throughout their undergraduate study. The graduation project is mandatory to fulfill requirements for Bachelor degree. The student works on it in the last year and it is supervised by a faculty member of the department. Graduation project starts with ‘project proposal’ and is followed by many sprints contain detail about the project [2].

2.3 Android OS

Android is an open source operating system for mobile devices and a corresponding open source project led by Google. Google maintains the Android codebase and delivers modifications to the Android Open Source Project repository once a year [10]. The Android Open Source Project (AOSP) repository offer the information and source code needed to create custom variants of the Android OS, port devices and accessories to the Android platform, and ensure devices meet the compatibility requirements that keep the Android ecosystem a healthy and stable environment for millions of users [11]. Android operating system is one of the most well-known operating systems. It’s a powerful operating system that enables a wide variety of applications to run on smartphones, tablets, and other devices. According to statistics that shown in figure 2, during the second quarter of 2022, Android users were able to choose between 3.5 million apps, Android is the most used operating system and has the largest

number of apps among all operating systems [12]. Android applications use Java, c/c++, kotlin, Flutter ,python as a programming Language [13]. Users of Android-based smartphones and tablets can customize their devices the way they like, so they can make them fit their lifestyles.

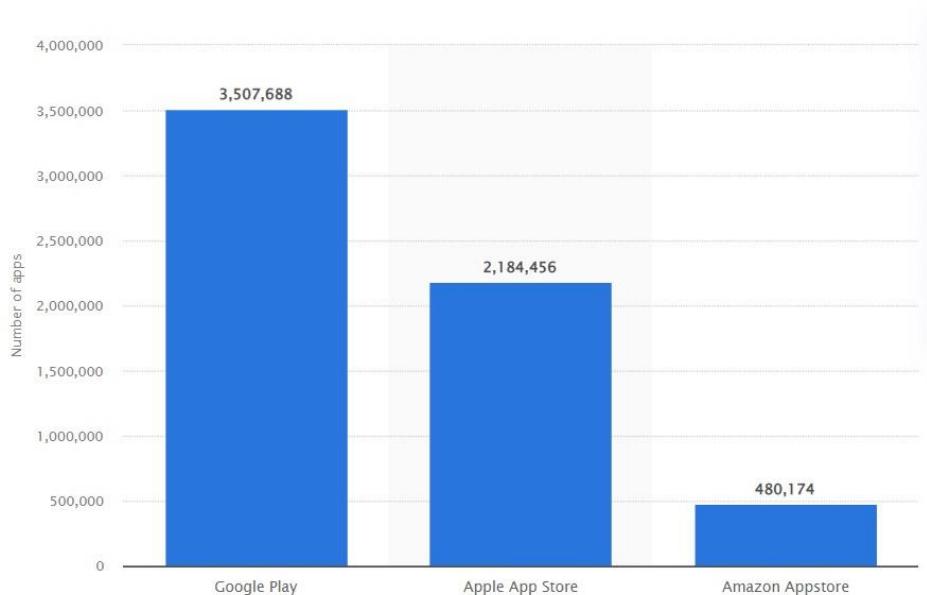


Figure 2 number of apps available in leading app stores Q2 2022

Android OS is competing against Apple and other popular Smartphone operating systems for several reasons. Android OS provides the users with ways that makes it easy to Integrate. They can integrate and tweak the mobile apps according to their business needs. Android is the best mobile platform between the applications and processes architectures. Most of the platforms allow background processes helping the user to integrate the apps. Moreover, the android have Multiple Sales Channels that enable the user to deploy their application in different ways. They do not have to rely on a single market to distribute their applications. They can use third-party application marketplace especially in Google Android Market, but they can also form their own distribution and sales channel like applications for vertical markets, to develop new application stores, and also place it on their website. They build it, they publish it. With their choice of promotional strategy, they can reach their end users through multiple channels [14]. Finally, Android applications rely on numerous layers of protection provided by the operating system instead of browser security as in hybrid apps. The official development kit is enough to build fully-functional and secure apps, so programmers don't have to integrate any third-party tools that can possibly damage the app architecture [15].

2.4 Web portal

A web portal is a web-based platform , is a customized private website, only members of the web portal having access can see the content of the web portal [16].

There are several types of web portals :

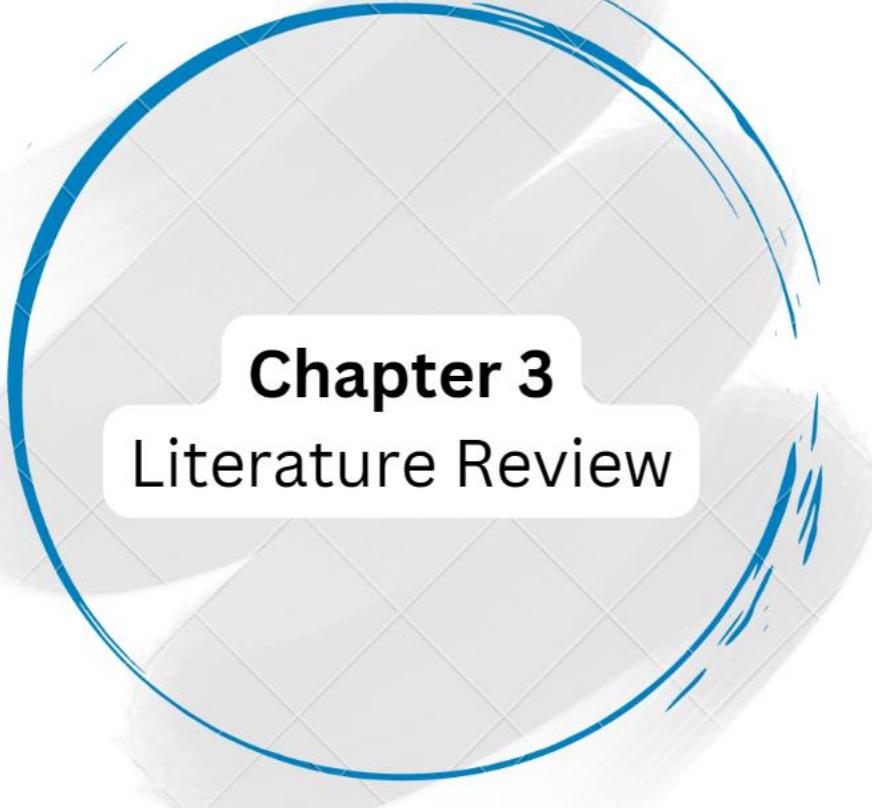
Intranet portal : Intranet portals serve as an entry point to access external apps or information employees within an organization may need. This aids organizations in managing data, information, and applications, and can be personalized to each individual employee's needs [17]. Example of Intranet portal "edugate system" [18].

Customer portal: A customer portal is an interface that provides customers with complete visibility into their history and interactions with the organization. Benefits of customer portals include tracking key metrics, requests, and sharing documents [17].Example of customer portal "Clinked" [19].

Sales portal: A sales portal is a digital interface that contains information and tools that are helpful to sales teams. The portal can be a repository of key information about a company's sales targets and active customers. This keeps sales representatives informed, and hence, more likely to close deals [17]. Example of sales portal "accent" [20].

Project management portal: A project management portal helps teams track all stages and tasks of a given project. Benefits of project management portal software include collaborating on tasks, sharing documents, and keeping all members of the project team informed of progress. [17]. Example of Project management portal "OneDesk" [21].

There are many advantages for using the web portal. It is designed for specific audiences to provide a customized experience, as well as advanced content management tools [16]. Also, the web portal provides security, as an admin, you can fully control who can view the content in your portal. You can decide on which parties to provide secure authenticated access to which data of your company. This secured access to different individual users or parties based on their roles or keeps your company's data secured [22]. Moreover, most web portals are often designed with Flexibility and User-Friendly extraordinary themes, offering brilliant and intuitive user-friendly web portals to utilize forever [23].



Chapter 3

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 3 shows Navigate Student [24] 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 [25].



Figure 3 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 4 shows the Navigate Student interface.

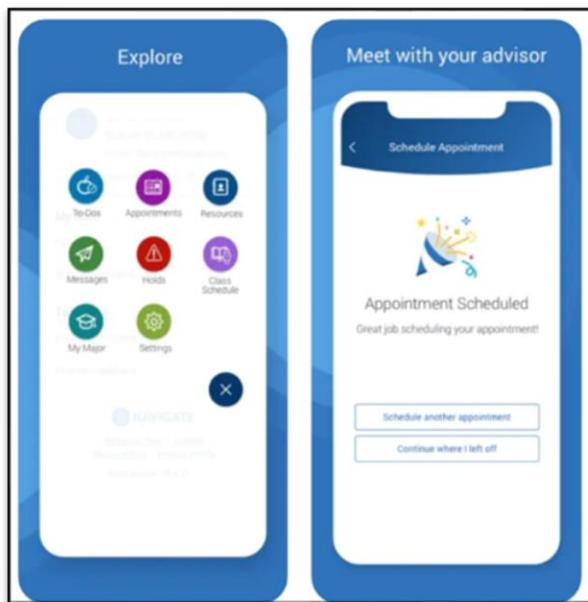


Figure 4 Navigate Student interface

3.1.2 Chegg platform

Figure 5 shows Chegg [26] 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 5 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 6 shows the Chegg interface.

A screenshot of the Chegg website homepage. The top navigation bar includes links for Books, Study, Career, Life, For educators, Help, and Sign in. The main banner features a woman sitting against a blue-tiled wall, with the text "Study help made for you" and "Expert help, textbook solutions & math support—tailored to your courses." Below the banner are search fields for "Find solutions to your homework" and "Search". A promotional offer for "Stay ahead of your classes" starting at SAR 56.99/mo. is shown with a "Sign up" button. The bottom section highlights "Study time, crunch time, anytime" and encourages exploring best study tools with 24/7 support.

Figure 6 Chegg interface

3.1.3 Calendly platform

Figure 7 shows Calendly [27] 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 7 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 8 shows the interface.

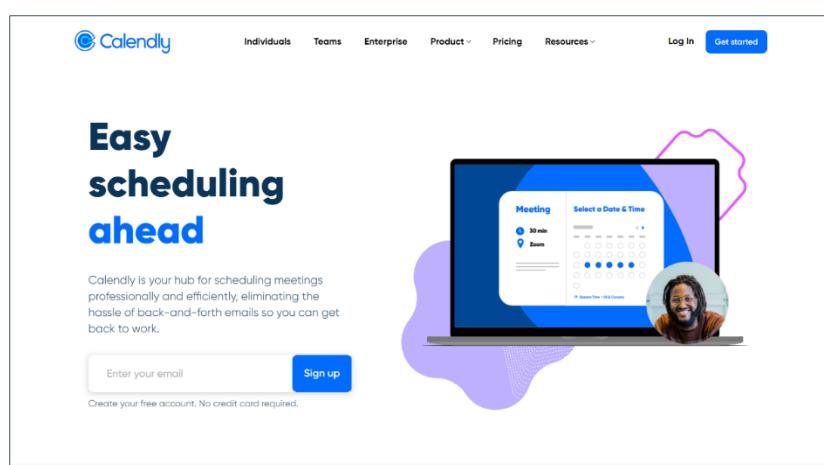


Figure 8 Calendly interface

3.1.4 Cambly platform

Figure 9 shows Cambly [28] 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 9 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 10 shows the Cambly interface.

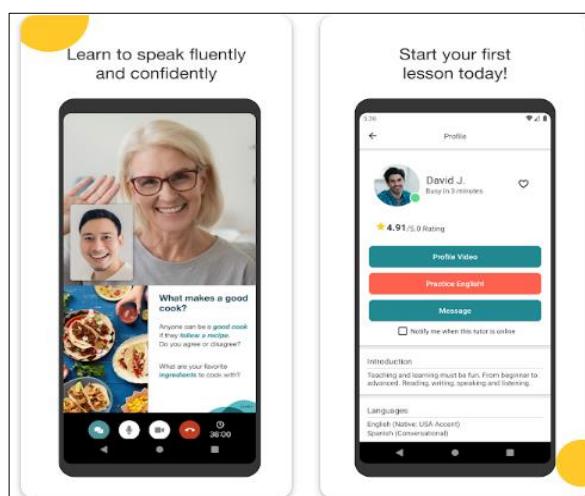


Figure 10 Cambly interface

3.1.5 Socrative

Figure 11 shows Socrative [29] 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.



Socrative main features:

Figure 11 Socrative 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 12 shows the Socrative interface.

The figure displays three screenshots of the Socrative mobile application interface:

- Ask any question:** Shows a search bar with the placeholder "What do you want to learn today?" and a camera icon. Below the search bar is a math equation $x^2 - 3x + 2 = 0$. At the bottom is a purple button with a white camera icon labeled "Hi Alex".
- Access step-by-step math explanation:** Shows a math problem $x^2 - 3x + 2 = 0$ and a "Steps to solve" section. The steps are:
 - Use the quadratic formula
 - Simplify
 - Separate the equations
 - Solve
 The final solution is $x = 2$ and $x = 1$.
- Get help on any subject:** Shows categories for different subjects: Biology, Chemistry, Algebra, Geometry, Fiction, and Non-fiction. Each category has a small thumbnail image.

Figure 12 Socrative interface

Table 4 illustrates a comparison between eClinic and all its competitors.

Table 4 Competitive analysis

	eClinic	Navigate Student	Chegg	Calendly	Camply	Socratic
Book an appointment for help	Yes	Yes	No	Yes	Yes	No
Online meeting (zoom, teams ...)	Yes	Yes	No	Yes	Yes	No
In person meeting	Yes	Yes	No	Yes	No	No
common issues answers	Yes	No	Yes	No	No	Yes
Technical Specialties Consultations	Yes	No	No	No	No	No
Free	Yes	Yes	No	No (it has a limited free plan)	No	Yes
Categorized specialties and expertise	Yes	No	No	No	Yes	Yes
Providing a way to communicate with graduates/experienced student	Yes	No	No	No	No	No
Previous GP library	Yes	No	No	No	No	No
language	English	English	English	Multiple languages	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, in our application we connect our current students with graduates to benefit from their experiences and transfer their knowledge. Moreover, we give the students the opportunity to browse previous GPs, and this advantage is not found in any other competitor. 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.

Chapter 4

System Requirements

4 System Requirements

4.1 System Users

There are 3 types of users that interact with eClinic system: student, 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 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.

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 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 [30]. 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 CISS graduates.

4.2.1 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, CCSI 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 do 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' common issues 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 common issues 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 common issues 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 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 10 Interview 3), Dr. Nora Abdulaziz Madi(attached in Appendix B, see Table 8 Interview 1), and Dr.Alaa Alhumaisan(attached in Appendix B, see Table 9 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 Common Issues section for a faculty member to attach her suggested solutions. There will also be numerous sections.

4.3 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 13 and Figure 14.

4.3.1 Admin Use Case Diagram

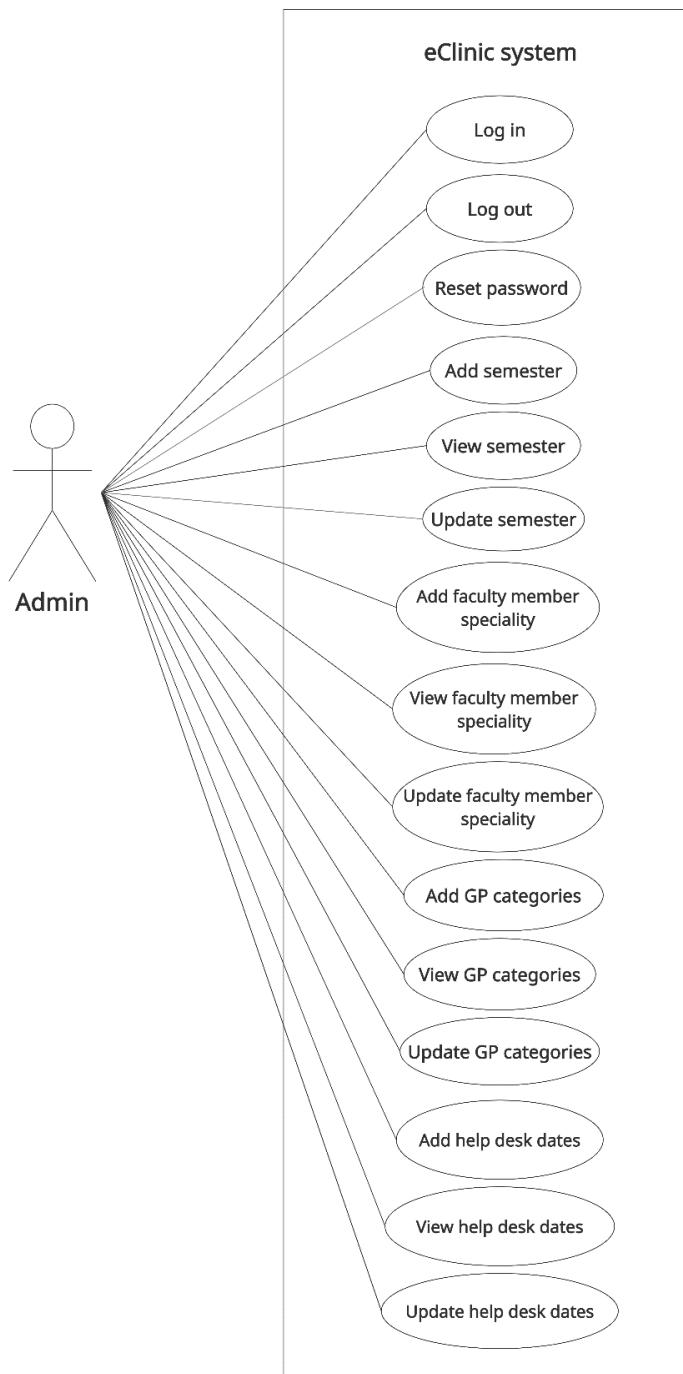


Figure 13 Admin Use Case Diagram

4.3.2 Faculty member and Student Use Case Diagram

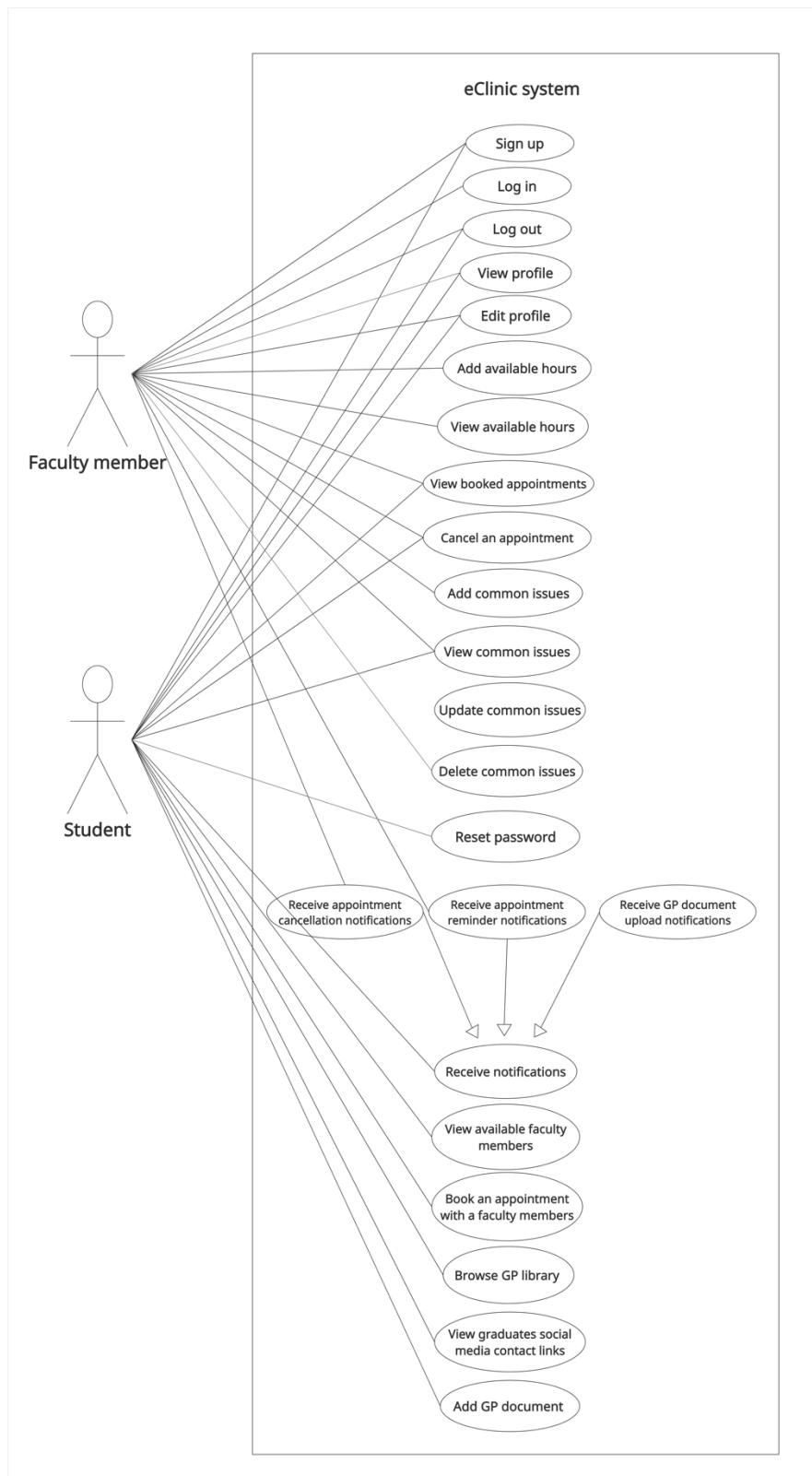


Figure 14 Faculty member and Student Use Case Diagram

4.4 Product Backlog

Table 5 shows all the product backlog items for eClinic System.

Table 5 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"> - 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. - 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. - 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.
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"> - As an admin, If I click on the "Log Out" button from the profile icon, then a conformation message will appear. - As an admin, If I conform, then the system will navigate to the login page. - 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"> - 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. - As an admin, If I leave the email field empty and click on "SEND" button an error message will appear. -As an admin, If I enter invalid email and click on "SEND" button an error message will appear. - 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.
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"> - 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. - 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 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 that is added previously, and 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 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 choose a semester, and choose the second year before choosing the first year and click on 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 second year before choosing the first year and click on 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 then choose the second year and 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 and then 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 don't choose the second year and I choose a semester and the first year are not already added and click on the "ADD" button, then a message will appear indicating that the addition has been posted successfully.</p> <p>-As an admin, If I go Add New Semester section and click on "CANCEL" button ,then a</p>
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					<p>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</p>

					<p>section will appear in the same page.</p> <ul style="list-style-type: none">- As an admin, If I don't change anything and I click on the "UPDATE" button, then the updating fails with an error message.- 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.-As an admin, if I choose a semester and choose the first year that is not already added, without choosing the second year, and click on the " UPDATE " button, then a message will appear indicating that the updating has been posted successfully.-As an admin, If I choose a semester and choose the first year that is added previously and click on the " UPDATE " button, then the updating fails with an error message.- As an admin, If I choose a semester, and I choose the first
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					<p>year and the second year that are added previously and I click the "UPDATE" button, then the updating fails with an error message.</p> <p>-As an admin, If I go update semester section and I click on "CANCEL" button, then a conformation message will appear.</p> <p>- As an admin, If I confirm, then the update semester section will be hidden.</p> <p>- As an admin, If I don't confirm, then I will stay in update semester section in the same page .</p>
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</p>

					<p>faculty member specialty section, then the addition fails with an error message.</p> <ul style="list-style-type: none">- 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.- 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.- 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.- 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
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					<p>that the addition has been posted successfully.</p> <p>-As an admin, If I click on "CANCEL" button in the add faculty member specialty section, then a conformation message will appear.</p> <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 member specialty so that I can review what categories are currently available on my system.	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</p>

					massage will appear indicating no specialty added yet.
10	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	<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 update button next to a specialty name, then the update faculty member specialty section will appear.</p> <p>- 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.</p> <p>- 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.</p> <p>- 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.</p>

					<ul style="list-style-type: none">- 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.- 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.- 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.- 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.
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					<p>-As an admin, If I click on "CANCEL" button in the update faculty member specialty 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 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 update faculty member specialty section in the same page .</p>
11	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	<p>- 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.</p> <p>- 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.</p> <p>- As an admin, If I leave the category name empty and click on the "ADD" button in the add graduation project category</p>

					<p>section, then the addition fails with an error message.</p> <ul style="list-style-type: none">- 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.- As an admin, If I enter only digits and/or special characters in the category name and click on the "ADD" button in the add graduation project category section, then the addition fails with an error message.- 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.- 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.
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					<p>-As an admin, If I click on "CANCEL" button in the add graduation project category section, then a conformation 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> <p>- As an admin, If I don't confirm, then I will stay in add graduation project category section in the same page .</p>
12	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	<p>-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.</p> <p>-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.</p> <p>-As an admin, If I go to graduation projects category page and there is no graduation projects category added yet, then the massage will</p>

					appear indicating no graduation projects category added yet
13	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"> - 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. - As an admin, If I click on update button next to a category name, then the update graduation projects category section will appear. - 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. - 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. - As an admin, If I enter the category name in Arabic and click on the "UPDATE" button in the update graduation projects

					<p>category section, then the updating fails with an error message.</p> <p>- 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.</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 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</p>
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					<p>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>
14	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"> - 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. - As an admin, If I go to help desk dates page, then a list of the added semesters will be displayed. - As an admin, If I don't choose a semester from the list and click "NEXT" button, then an error message will appear.

					<ul style="list-style-type: none">- 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.- As an admin, If I go to add help desk dates section, then I can choose dates for that semester.- As an admin, If I don't choose dates and click "ADD" button, then an error message will appear.-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.- As an admin, If I choose dates that are in the past and click "ADD" button, then an error message will appear.-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.- 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.
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					<ul style="list-style-type: none"> - 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. -As an admin, If I click on "CANCEL" button in the add help desk dates section, then a confirmation message will appear. -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. - As an admin, If I don't confirm, then I will stay in add help desk dates section in the same page .
15	As an admin, I want to be able to view GP help desk dates so that I can know the help desk duration for a semester.	3	Feature	Done	<ul style="list-style-type: none"> -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 help desk dates section.

					<p>-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.</p> <p>-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.</p>
16	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	<p>-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.</p> <p>-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 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>

					<ul style="list-style-type: none">-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.- 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.- As an admin, If I change the start date that has been reached and click "UPDATE" button, then an error message will appear.- As an admin, If I did not change the start or end date and click "UPDATE" button, then an error message will appear.- 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.-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.
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					<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>
17	As a faculty member, I want to be able to sign up, so that I can gain access to the system.	5	Feature	To Do	<p>- As a faculty member, If I go to the main page and click on "sign up" button, then the system will navigate to sign up page.</p> <p>- 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, year, college, department, specialty, preferred meeting method).</p> <p>- 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 sign up fails and an error message will appear</p>

						<ul style="list-style-type: none"> - 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. - 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. - 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. - 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. - As a faculty member, If I click on "sign up" button with fill all field and satisfied all condition, then the system should send a verification message to KSU email.
18	As a faculty member, I want to be able to log in with email, password so	3	Feature	To Do		<ul style="list-style-type: none"> - As a faculty member, If I am in the main page and click on "log

	that I can access the system and use all features.				<p>in” button, then the system should navigate to log in page</p> <ul style="list-style-type: none"> - 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. - 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. - 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 homepage.
19	As a faculty member, I want to be able to log out so that I can protect my account from unauthorized users.	3	Feature	To Do	<ul style="list-style-type: none"> - As a faculty member, If I click on my profile icon, then the system will display my profile section. - As a faculty member, If I click on "log out" button from profile section, then a confirmation message will appear. - If I confirm, then the system will navigate to log in page. - As a faculty member, If I don't confirm, then I will stay logged in.

20	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	To Do	<ul style="list-style-type: none"> - As a faculty member, If I click on my profile icon, then the system will display my profile information which are first name, last name , email , semester/year, collage , department, specialty, preferred meeting method.
21	As a student, I want to be able to sign up so that I can gain the access to the system.	5	Feature	To Do	<ul style="list-style-type: none"> - As a student, If I go to the main page and click on “sign up” button, then the system should navigate to sign up page. - As a student, If I go to sign up page, then I will be able to see a form with the fields (email, name, password, department, college, project title, project category, graduation month/year and social media link). - As a student, If I leave any of the filed except social media links empty and click on “sign up” button, then sign up fails with an error message. - As a student, If I enter an existing email and click on “sign up” button, then sign up fails with an error message. - As a student, If I enter an email that is not form KSU and click on

					"sign up" button, then sign up fails with an error message. - 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 "sign up" button, then sign up fails with an error message. - As a student, If I click on "sign up" button with fill all field and satisfied all condition, then the system should send a verification message to KSU email.
22	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.	3	Feature	To Do	<ul style="list-style-type: none"> -As a student, If I go to the main page and click on "log in" button, then the system should navigate to log in page. -As a student, If I enter invalid KSU email or password and click on "Log in", then the log in fails with an error message. - 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. - As a student, If I enter my KSU email and password correctly, and click on "Log in", then the system will navigate to homepage.

23	As a student, I want to be able to log out so that I can access the system again at my own convenience.	3	Feature	To Do	<ul style="list-style-type: none"> -As a student, If I click on my profile icon, then the system will display my profile section. -As a student, If click on “log out” button from my profile section, then a confirmation message will appear. -As a student, If I confirm, then the system will navigate to log in page. -As a student, If I don't confirm, then I will stay logged in.
24	As a student, I want to be able to view my profile so that I can ensure that all of my information is accurate.	5	Feature	To Do	<ul style="list-style-type: none"> -As a student, If I click on my profile icon, then the system will display my profile information which are name, email, college, department, social media, project title, project category, graduation month/year in one page.
25	As a faculty member, I want to be able to add my available help desk days and hours so that students can know when I am available.	8	Feature	To Do	<ul style="list-style-type: none"> - As a faculty member,If I click on " help desk hours button from " homepage the system will .navigate to help desk hours page -As a faculty member,If I am in help desk hours page and I don't choose a day or time and I click on "done" button, then an error message will appear. - As a faculty member,If I am in the help desk hours page and

					<p>choose a day and time, then click on "done" button, then a confirmation message will appear .</p> <ul style="list-style-type: none"> - As a faculty member, If I confirm then the time will be added . - As a faculty member, If I don't confirm the time will not be added.
26	As a faculty member, I want to be able to view available help desk hours so that I know what hours I provided my student with.	3	Feature	To Do	<ul style="list-style-type: none"> - As a faculty member, If I click on "help desk hours" from homepage, then the system will navigate to help desk hours page and my available help desk time will be displayed.
27	As a faculty member, I want to be able to view booked appointments so that I can know exactly when my booked appointments are.	8	Feature	To Do	<ul style="list-style-type: none"> - As a faculty member, If I click on "view booked appointments" button from the homepage, then the system will navigate to booked appointments page - As a faculty member, If I am in booked appointments page, then I can view upcoming appointments details (project title, student name, student email, appointment time). - As a faculty member If I am in booked appointments page and there is no booked appointments, then a message will appear

					indicating that I don't have any upcoming appointments.
28	As a faculty member, I want to be able to cancel my appointments so that I can control any sudden change.	5	Feature	To Do	<ul style="list-style-type: none"> - As a faculty member, If I click on "view booked appointments" button from homepage, 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 next to any appointment from booked appointments page, then a message will appear to confirm the cancellation. - As a faculty member, If I confirm the cancellation, then the booked appointments will be canceled. - As a faculty member, If I don't confirm the cancellation, then the booked appointments will not be canceled.
29	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.	8	Feature	To Do	<ul style="list-style-type: none"> - 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.
30	As a student, I want to be able to view available	8	Feature	To Do	<ul style="list-style-type: none"> - As a student, If I click on "schedule consultation" button in

	faculty members so that I can see who is available this semester.				<p>the home page, then the system will navigate to faculty members specialty page</p> <ul style="list-style-type: none"> - As a student, If I go to faculty members specialty page, then a list of available specialties will be displayed. - As a student, If I don't choose any specialty from the list and click "Next" button, then an error message will appear. - As a student, If I choose any specialty from the list and click "Next" button, then the system will navigate to available faculty members page, a list of available faculty members will be displayed
31	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	To Do	<ul style="list-style-type: none"> - As a student, If I click on "schedule consultation" button in the home page and go to faculty members specialty page and choose any specialty from the list, then the system will navigate to available faculty members page. - As a student, If I click on any faculty member name in available faculty members page, then the system will navigate to available appointment page.

					<ul style="list-style-type: none">- As a student, If I am in available appointment page, then I will be able to see the upcoming available appointment.- As a student, If I don't choose specific appointment and click "next" button in available appointment page, then an error message will appear.- As a student, If I choose specific appointment and click "next" button in available appointment page, then the system will navigate to appointment confirmation page.- As a student, If I am in appointment confirmation page, then I can see the faculty member name, office number/Zoom link, appointment time.- As a student, If I click on "confirm" button in confirm appointment page, then the appointment will be confirmed.- As a student, If I don't confirm, then the appointment will not be booked.
32	As a student, I want to be able to view appointments that I booked or one of my	5	Feature	To Do	<ul style="list-style-type: none">- As a student, If I click on "booked appointment" button in the home page, then the system

	group members so that I can know exactly when my booked appointments are.				will navigate to booked appointment page. - 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 with details (name of the faculty member, office number/Zoom link, appointment time). - As a student, If I am in booked appointment page and I don't have any upcoming appointment, then a message will appear indicating that I don't have any upcoming appointment.
33	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.	5	Feature	To Do	-As a student, If I go to home page and click on “view booked appointment”, then the system will navigate to view booked appointment page I can see upcoming appointment if I have any. -As a student, If click on “cancel” button next to any appointment within less than 24 hours to the appointment, then an error message and the appointment will not be cancelled.

					-As a student, If I click "cancel" button next to any appointment before more than 24 hours, then the appointment will be canceled for me and my group members.
34	As a student, I want to be able to receive a notification when the faculty member cancels an appointment so that I can book replacement appointment.	8	Feature	To Do	-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.
35	As a faculty member, I want to be able to add common issues so that I can save my time and effort by circulating solutions to all students.	8	Feature	To Do	<ul style="list-style-type: none"> - As a faculty member, If I click on "common issue" button from homepage, then the system will navigate to issue category page. - As a faculty member, If I am in issue category page, then I can choose from my specialty. - As a faculty member, If I don't choose specialty and click on "next" button, then an error message will appear. - As a faculty member, If I choose specialty and click on "next" button, then the system will navigate to the common issue page.

					<ul style="list-style-type: none"> - As a faculty member, If I go to common issue page and click on "Add" button, then the system will navigate to add common issue page. -As a faculty member,If I go to add common issue page, then I can add issue details (the issue title, problem, suggested solution, upload document). and if I click on "submit" button a meassage will appear indicating that the added has been done successfully. - As a faculty member,If I enter the issue title that already exist an error message will appear. - As a faculty member,If I leave any field empty, then an error massage will appear.
36	As a faculty member, I want to be able to update common issues so that I can improve the suggested solution.	5	Feature	To Do	<ul style="list-style-type: none"> -As a faculty member,If I click on "common issue" button from homepage the system will navigate to issue category page to choose the specialty and click on "next" button, then the system will navigate to common issue page and the common issues will be displayed.

					<ul style="list-style-type: none"> - As a faculty member, If I go to common issue page and click on "update" button that next to specific common issue, then the system will navigate to update common issue page. - As faculty member, If I go to update common issue, then I will be able to update (issue title , problem ,suggested solution, upload document) and click on "submit" button, then a message will appear indicating that the updated has been done successfully. - As a faculty member, If I enter the issue title that already exist an error message will appear. - As a faculty member, If I leave any field empty, then an error message will appear.
37	As a faculty member, I want to be able to view common issues so that I can avoid adding an already existing issues solution.	5	Feature	To Do	<ul style="list-style-type: none"> - As a faculty member, If I click on "common issue" button from homepage the system will navigate to issue category page to choose the specialty and click on "next" button, then the system will navigate to common issue page and the common issues will be displayed.

					<p>-As a faculty member, If I am in common issues page and click on any issue the system will navigate to issue details page.</p> <p>-As a faculty member, If I am in issue details page , then I will be able to see issue details such as problem description, solution and a PDF file if it was added.</p>
38	As a faculty member, I want to be able to delete common issue so that I can remove unwanted issues		To Do		<p>- As a faculty member, If I click on "common issue" button from homepage the system will navigate to issue category page to choose the specialty and click on "next" button, then the system will navigate to common issue page and the common issues will be displayed.</p> <p>-As a faculty member, If I am in common issues page and click on any issue the system will navigate to issue details page.</p> <p>- As a faculty member, If I am in common issues details page and click on "delete" button 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>

					<ul style="list-style-type: none"> - As a faculty member, if I don't confirm, then the common issue will not be deleted.
39	As a faculty member, I want to be able to receive a notification a day in advance of an appointment so that I can remember to attend.	8	Feature	To Do	<ul style="list-style-type: none"> -As a faculty member, If I have an appointment, then the system will send a notification to me before one day of the appointment.
40	As a student, I want to be able to view common issues so that I can find a similar issue to mine and move forward my project.	5	Feature	To Do	<ul style="list-style-type: none"> - As a student, If I click on "Common issues" button in the home page, then the system will navigate to issue category page - As a student, If I am in issue category page, then a list of the issue category will be displayed. - As a student ,If I don't choose any category from list and click "Next" button, then an error message will appear. - As a student, If I choose any category from list and click "Next" button, then the system will navigate to common issues list page - As a student ,If I am in the common issues list page and I click on any issue, then the system will navigate to issue details page .

					<p>- As a student, if I am in issue details page , then I will be able to see issue details such as problem description, solution and a PDF file if it was added.</p>
41	As a student, I want to be able to receive a notification a day in advance of an appointment so that I don't forget my appointment.	8	Feature	To Do	<p>-As a student, If I booked an appointment with a faculty member, then I will receive a notification one day before the appointment.</p>
42	As a student, I want to receive a notification to upload my GP document so that it reminds me that its to share my full experience.	8	Feature	To Do	<p>-As a student, If I enter the date of my graduation project, then I will receive a notification when its time to add my project</p>
43	As a student, I want to be able to add my GP document after completion so that I can benefit others from my experience.	5	Feature	To Do	<p>-As a student, If I click on "previous graduation project" button in the home page and choose from GP category, 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 "add" button before the specified graduation date, an error message will appear.</p> <p>-As a student, If I am in the GP library page and click on the "add" button after the specified</p>

					<p>graduation date then the system will navigate to semester selection page.</p> <p>-As a student, If I am in semester selection page, then the system displayed all available semester.</p> <p>-As a student, If I am in semester selection page and choose any semester and click "next" button, then the system will navigate to upload GP page .</p> <p>-As a student, If I am in semester/year selection page and I don't choose any semester and click next button, then an error message will appear.</p> <p>-As a student, If I am in upload GP page and I click on "upload a file" button and I choose file and I click "Add" button, then a message will appear indicating that the adding has been posted successfully.</p> <p>- As a student, If I am in upload GP page and I click on "upload a file" button and I don't choose file and click "Add" button , then an error message will appear.</p>
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					-As a student, If I have previously added a document and click "Add" button , then an error message will appear.
44	As a student, I want to be able to browse the GP library so that I can benefit from the experiences of graduates.	5	Feature	To Do	<p>-As a student, If I choose any category from the list and click “Next” button, then the system will navigate to GP library page.</p> <p>-As a student, If I don't choose any category from the list and click “Next” button, then an error message will appear .</p> <p>-As a student, If I am in GP library page, then the system will displayed list of GPs</p> <p>-As a student, If I am in the GP library page and I click on any GP , then the system will navigate GP details page and PDF file and social media contact links for that GP member will be displayed.</p> <p>-As a student, If I am in GP details page and I click on PDF file , a new page will be displayed and I could browse it .</p>
45	As a student, I want to be able to can view graduates social media contact links so that I can benefit from	3	Feature	To Do	-As a student, If I click on "previous graduation project" button in the home page and I choose from GP category page,

	their experience and get my questions answered.				then the system will navigate to GP library page. -As a student, If I am in the GP library page and I click on any GP , then the system will navigate GP details page and PDF file and social media contact links for that GP member will be displayed . -As a student, If I am in GP details page and I click on social media links then the app or the web page will be opened.
46	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	To Do	<ul style="list-style-type: none"> - As a faculty member, If I click on my profile icon and I click on "edit profile" button, then the system will navigate to edit profile page. - As a faculty member, If I am in edit profile page, then I should be able to edit my information (first name, last name, preferred meeting method) - As a faculty member, If I leave the first name, last name empty and click on "update" button, then the update fails with an error message. - As a faculty member, If I enter first name , last name, Preferred meeting method and click on

					"update" button, then a message will appear indicating that updating has been done successfully.
47	As a faculty member, I want to be able to reset my password so that I can set new password if I forget the old one.	8	Feature	To Do	<p>-As a faculty member, If I am in log in page and click on "forget my password" link, then the system will navigate to forget password page.</p> <p>-As a faculty member, If I am in forget password page and enter email that doesn't exist and click on "send" button, then an error message will appear.</p> <p>-As a faculty member, If I enter an existent email and click on "send" button , the the system will send a link to my email that I can reset my password through it.</p> <p>-As a faculty member, If I click on the link in the email, then the system will navigate to reset page.</p> <p>-As a faculty member, If I am in reset password and enter password that is less than 8 characters or does not have small and capital or does not have an number and click on "reset" button, then an error message will appear .</p>

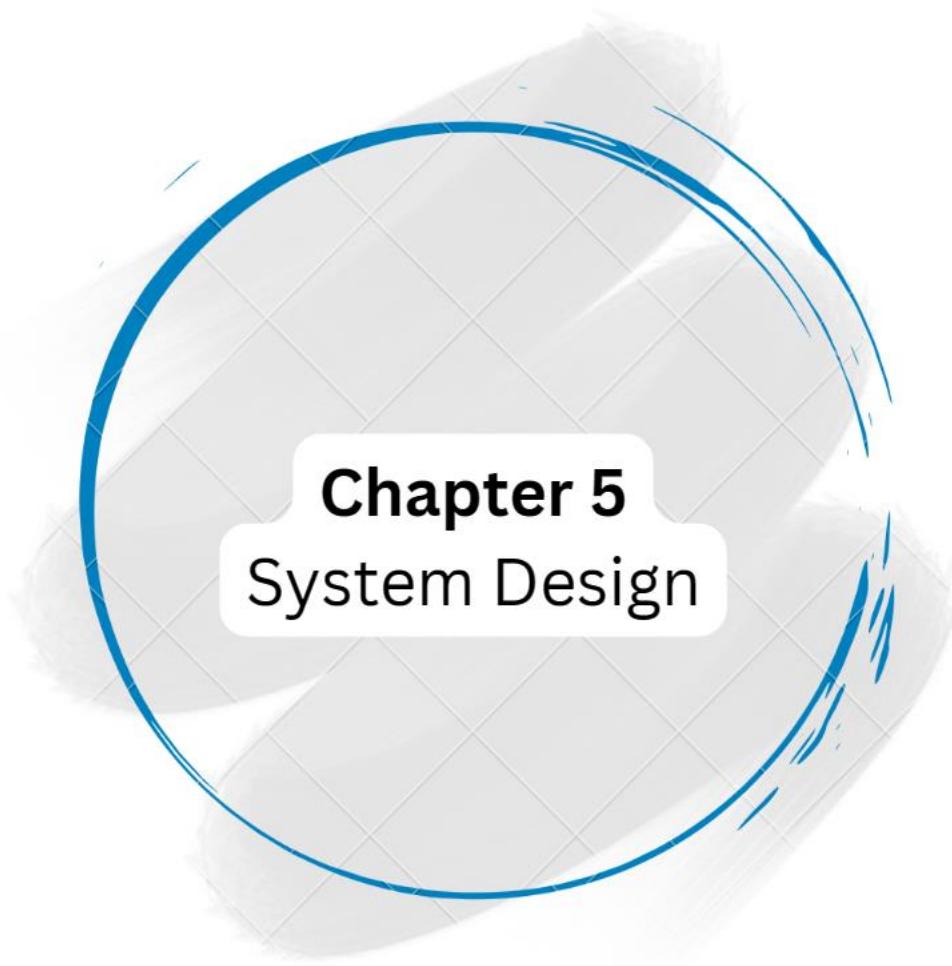
					<p>- As a faculty member, If I am in reset password page and enter password that satisfied all condition and click on "reset" button, then a message will appear indicating that the reset has been done successfully.</p>
48	As a faculty member, I want to filter common issues by semester so that I can get the latest proposed solution quickly.	5	Feature	To Do	<p>-As a faculty member, If I click on "common issue" button from homepage the system will navigate to issue category page to choose the specialty and click on "next" button, then the system will navigate to common issue page.</p> <p>-As a faculty member, If I am in common issue page, and click on filter and choose specific semester, then the system will display common issues that spotted in this semester.</p>
49	As a faculty member, I want to be able to update the semester and specialty so that I can be a member in GP help desk in this semester.	3	Feature	To Do	<p>- As a faculty member, If a new semester comes and I have a previous role in GP help desk, then the system will appear an alert message that enables to update semester, specialty mandatory.</p>
50	As a student, I want to be able to edit my profile so	5	Feature	To Do	<p>- As a student, If I click on my profile icon and click "edit" button in my profile section, then</p>

	<p>that I can keep my information up-to-date.</p>				<p>the system will navigate to edit profile page.</p> <ul style="list-style-type: none">- As a student, If I leave the project title field empty and click “update” button in edit profile page, then the update fails with an error message.- As a student, If I enter project title and project category and click “update” button in edit profile page, then message will appear indicating that the updating has been done successfully.- As a student, If I change or delete my social media link and click “update” button in edit profile page, then message will appear indicating that the updating has been done successfully.
51	<p>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.</p>	8	Feature	To Do	<ul style="list-style-type: none">-As a student, If I go to log in page and click on "forget my password" label, then the system will navigate to forget password page.-As a student, If I am in forget password page and enter email that doesn't exist and click on "send" button, then an error message will appear.-As a student, If I enter an existent email and click on “send” button,

					<p>then the system will be able to send a link to my email that I can reset my password through it.</p> <p>-As a student, If I click on the link in the email, then the system will navigate to reset page.</p> <p>-As a student, If I am in reset page and I enter my new password that is less than 8 characters or does not have small and capital or does not have a number and click on "reset" button, then an error message will appear.</p> <p>-As a student, If am in reset page and I enter my new password that satisfied all conditions and click on "reset" button, then a message will appear indicating that the reset has been done successfully.</p>
52	As a student, I want to be able to use filter for common issues so that I can get the latest proposed solution quickly.	5	Feature	To Do	<p>-As a student, If I click on "Common issues" button in the home page and choose any category from list, then the system will navigate to common issues list page.</p> <p>-As a student, If I am in the common issues list page and click on the filter to choose specific semester, then the system will</p>

					display common issues that spotted in this semester.
53	As a student, I want to be able to filter GP so that I can get the latest GPs quickly.	5	Feature	To Do	<p>-As a student, If I click on "previous graduation project" button in the home page and choose from GP category page, then the system will navigate to GP library page, and I can see a list of GP.</p> <p>-As a student, If I am in GP library page and click on the filter to choose specific semester, then the system will display GPs that spotted in this semester.</p>
54	As a user , I want the system to be available 95% of the time, so that I can access it anytime when I need it.	-	Feature	To Do	<p>- As a user , If there were more than 20 users on the application then the application should be running.</p>
55	As a user, I want to be able to learn how to use the system within 20 minutes, so that I won't get frustrated and confused.	-	Feature	To Do	<p>- As a user , if I am using one of the system pages, then the page layout should be clear and organized.</p> <p>- As a user , if I see a message that the system displayed, then it shouldn't have an ambiguous meaning.</p> <p>- As a user , if I see a button or icon, then I should understand the</p>

					meaning and idea of it without any confusion.
56	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	To Do	- As a user , if I enter my password, then the system should be able to encrypt my password before storing it in the database.
57	As a user, I want the system to reconnect to the server within 15 second when the internet connection is dropped, so that I can complete browsing the system.	-	Feature	To Do	-As a user if my device disconnected from the internet and reconnected again then the system should rework within 15 second.
58	As a user, I want the system to be able to prove my identity, so that no one can impersonate me.	-	Feature	To Do	<ul style="list-style-type: none"> - 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 me email through the sent verification link. - As a user , If I try to login, then the system will be secured by authenticating my email and password.
59	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	To Do	- As a user , if I do any action, then the system should response with result and display the content within 3-25 seconds.



Chapter 5

System Design

5 System Design

5.1 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 [31]. 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 [32].

As shown in Figure 15, eClinic is a Client- Server system architecture. The client side consists of the student's and faculty member's android mobile application, and the admin's 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.

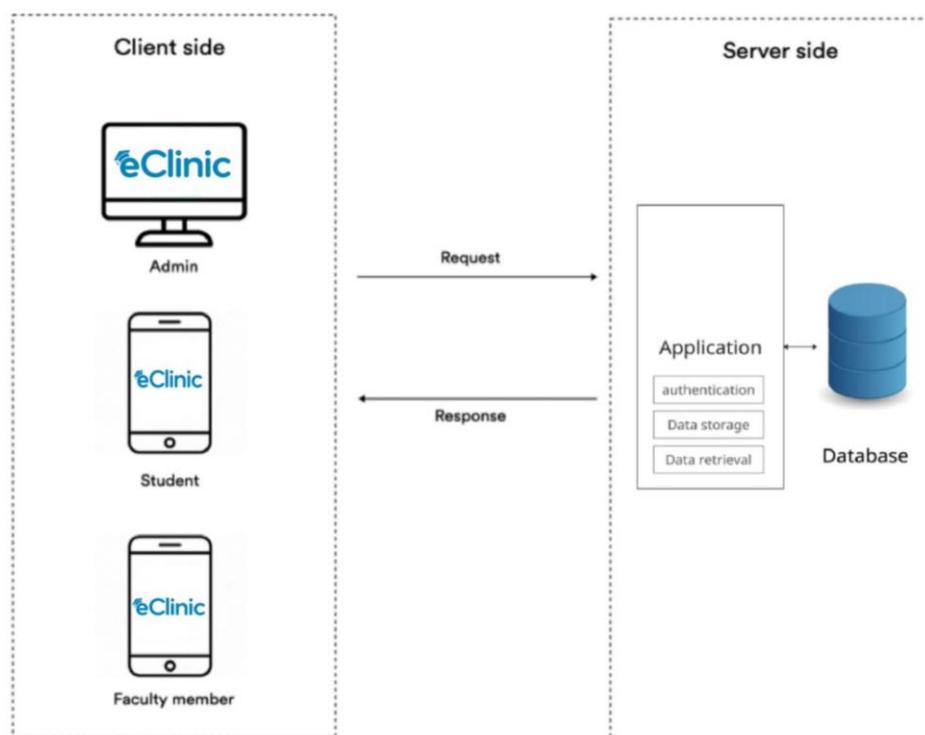


Figure 15 System Architecture

5.2 Class Diagram

eClinic web portal is decomposed into Admin, Faculty Member Specialty, GP Category, Semester and Dates classes as shown in Figure 16.

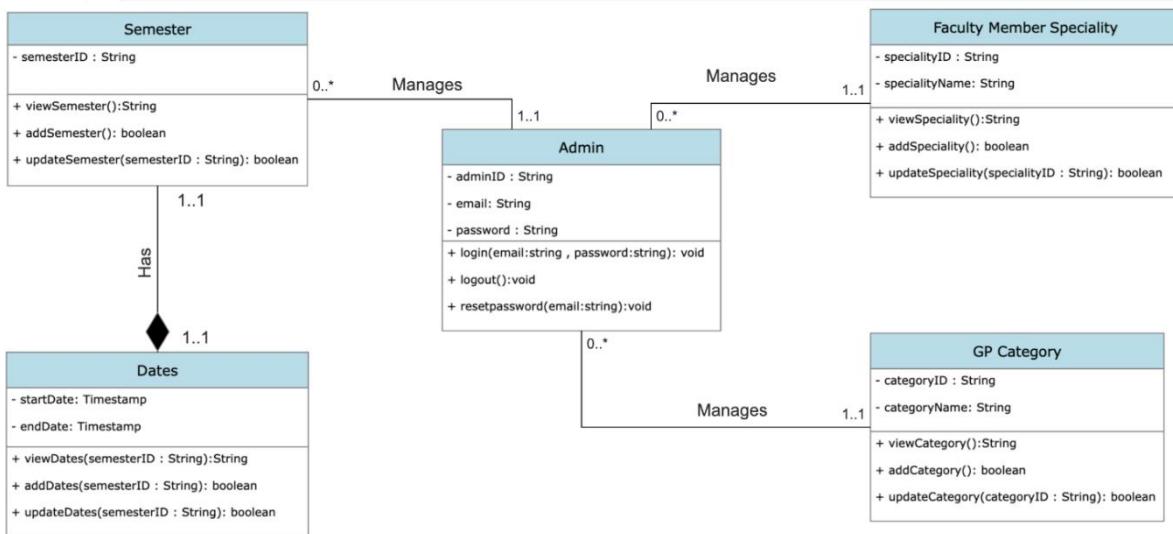


Figure 16 Class Diagram

5.3 Component Level Design

This section will include details of several components of eClinic web portal such as add semester, update faculty member specialty, login which are shown in Figure 17, Figure 18, Figure 19.

5.3.1 Add semester

Flowchart:

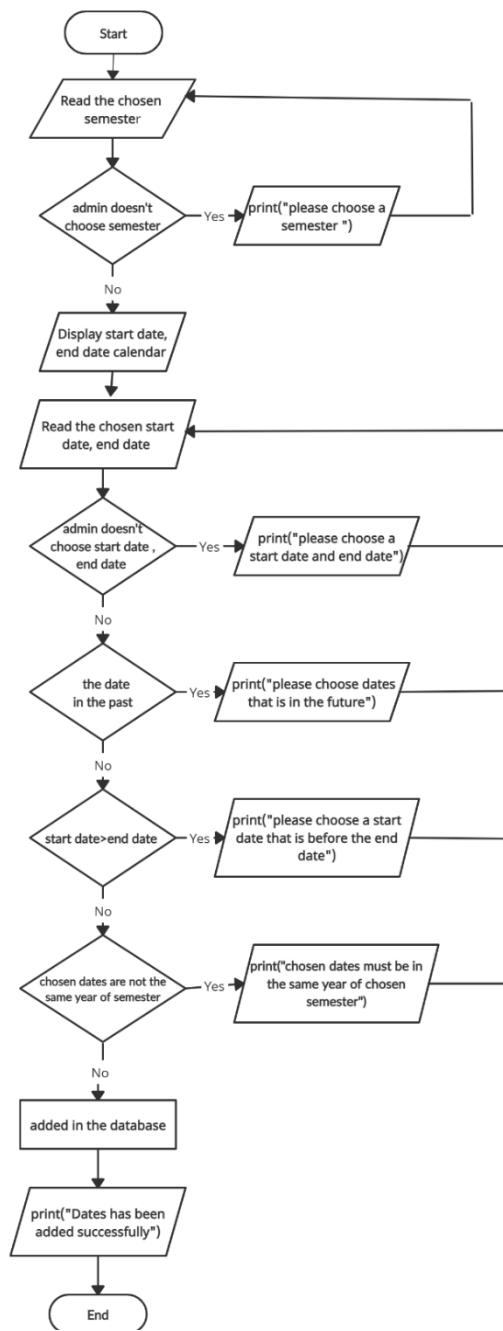


Figure 17 Add semester Flow chart

5.3.2 Update faculty member specialty

Activity Diagram:

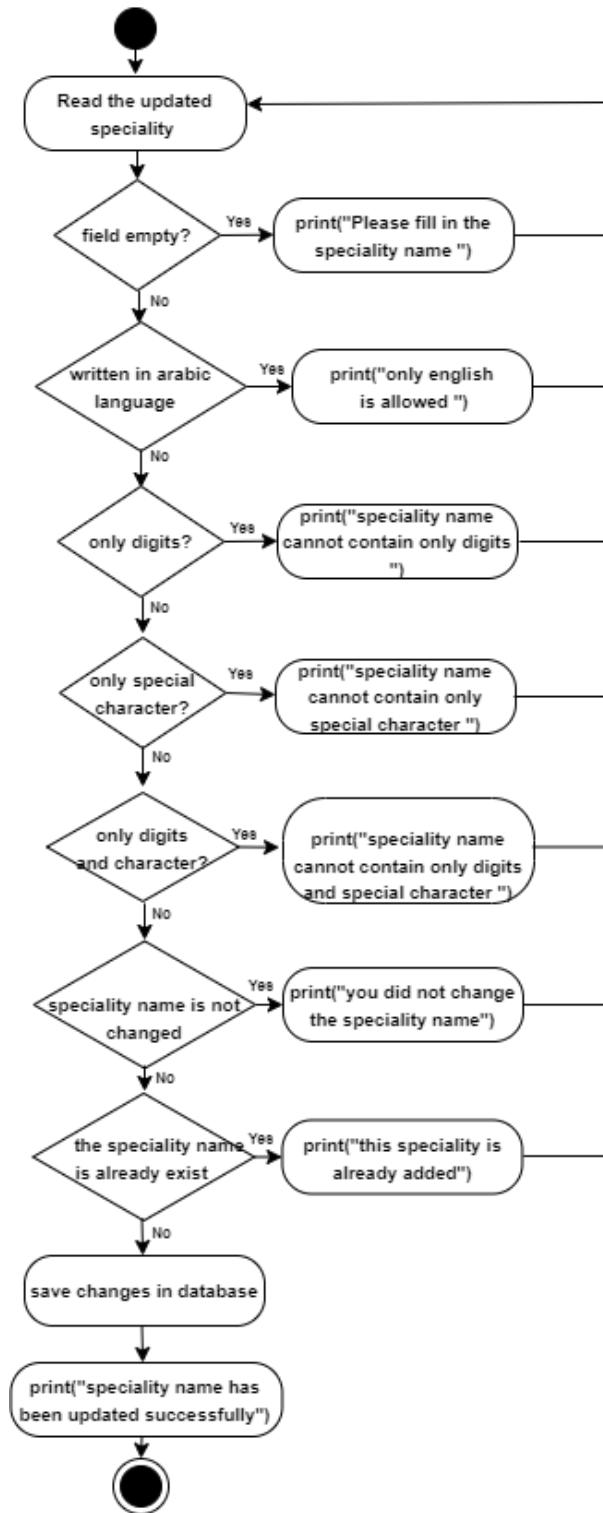


Figure 18 update faculty specialty Activity diagram

5.3.3 Login

Flowchart:

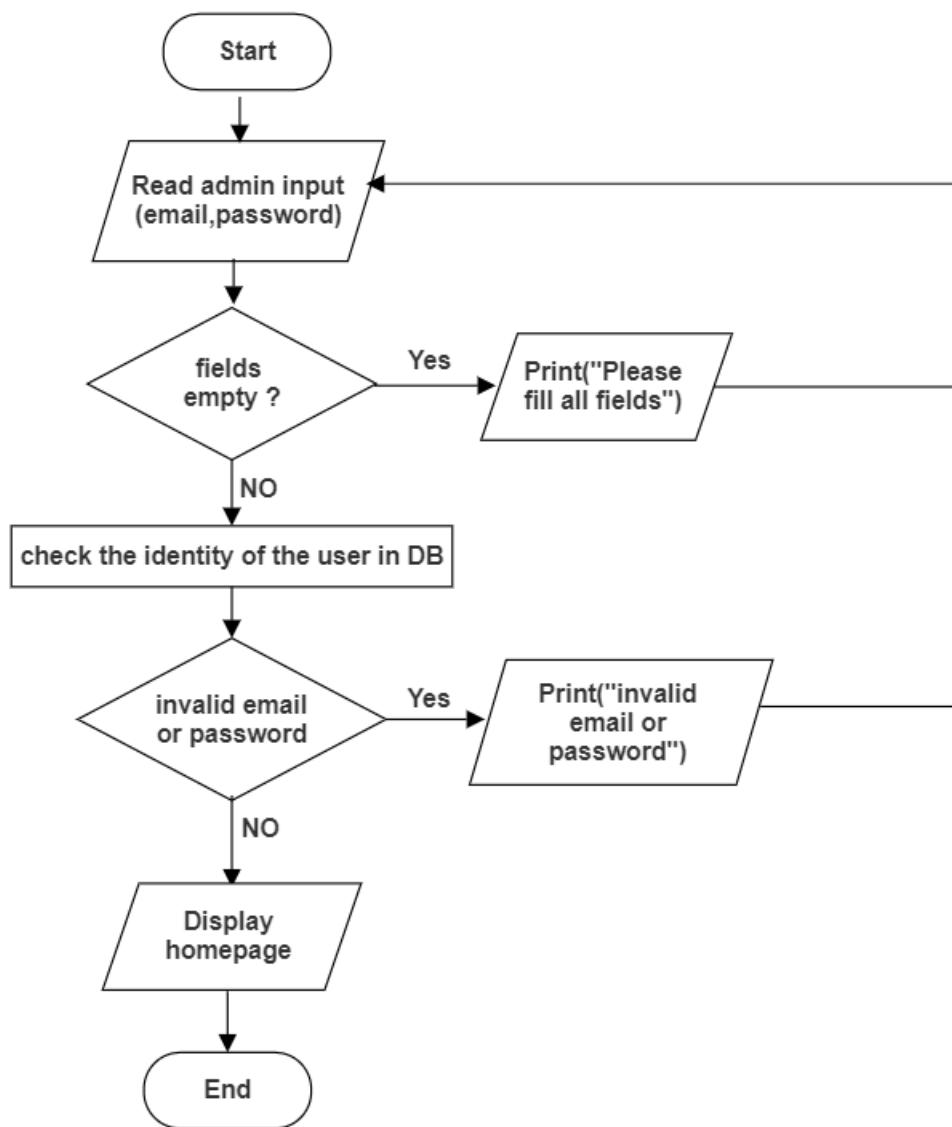


Figure 19 login Flow chart

5.4 Data Design

This section contains different representation of the system data. It includes entity relation diagram shown in Figure 20 and the non-relational data model shown in Figure 21 and Figure 22.

5.4.1 Data Models

5.4.1.1 ER Diagram

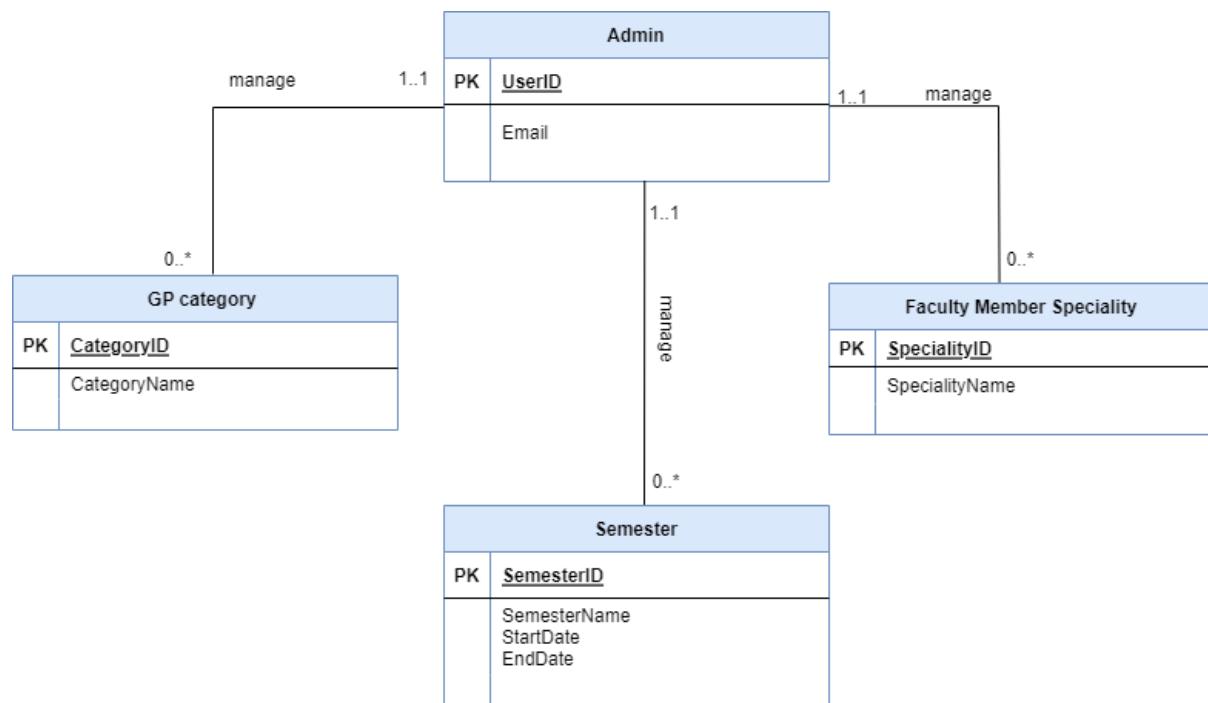


Figure 20 ER diagram

5.4.1.2 Non-Relational Data Model

In our system, the main document is "Admin" which includes the fields that identify the admin and sub documents that are embedded in it, which are Faculty member spatiality, GP category, and semester. According to [30] in G11, "avoid embedding a child document/object if it will be at one time accessed alone" and G12 in [30] " Use array of references for the many side of the relationship: when a relationship is one-to-many as in [31] 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 inside the admin document as shown in Figure 21 and Figure 22. Since the Faculty member spatiality, GP category, semester documents are needed to be accessed directly at one time.

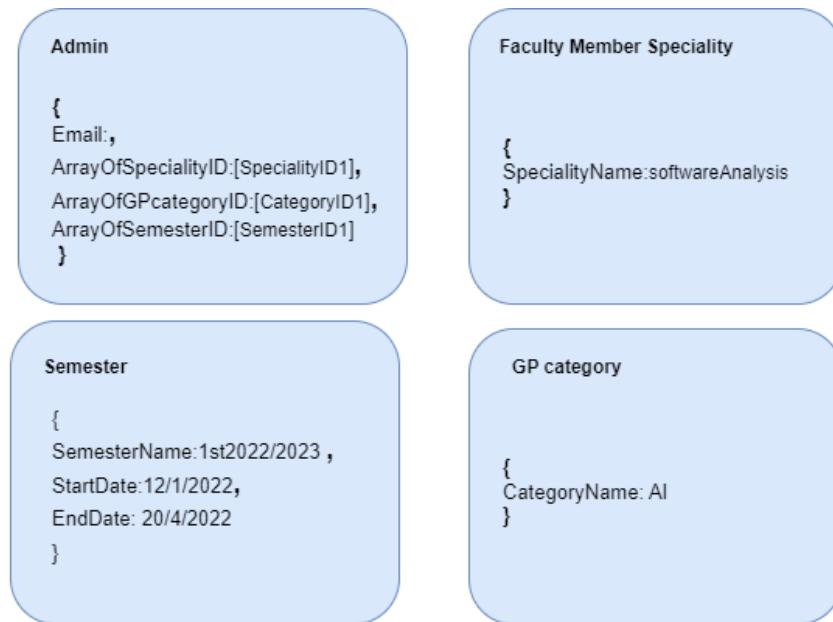


Figure 21 Data Model

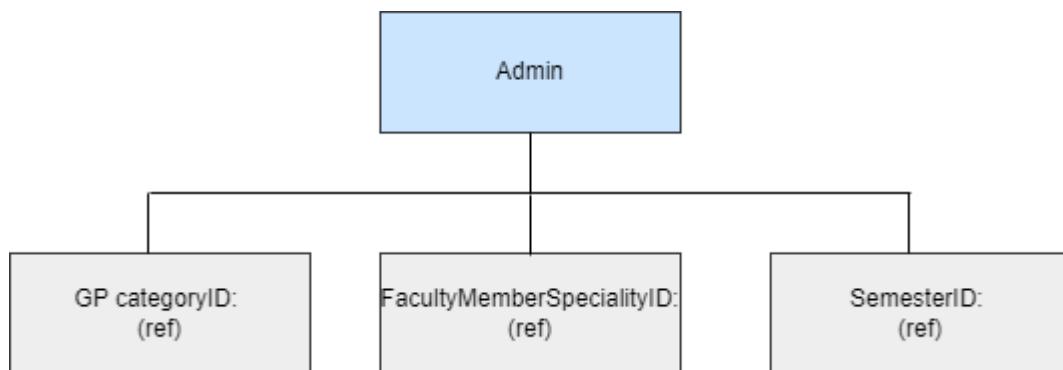


Figure 22 Hierarchical structure of the data model

5.5 Interface Design

This part will include the navigation diagram as shown in Figure 23, which shows how the user will move between the system interfaces. Additionally, we will outline seven UX guidelines that are applied to our system.

5.5.1 Navigation diagram

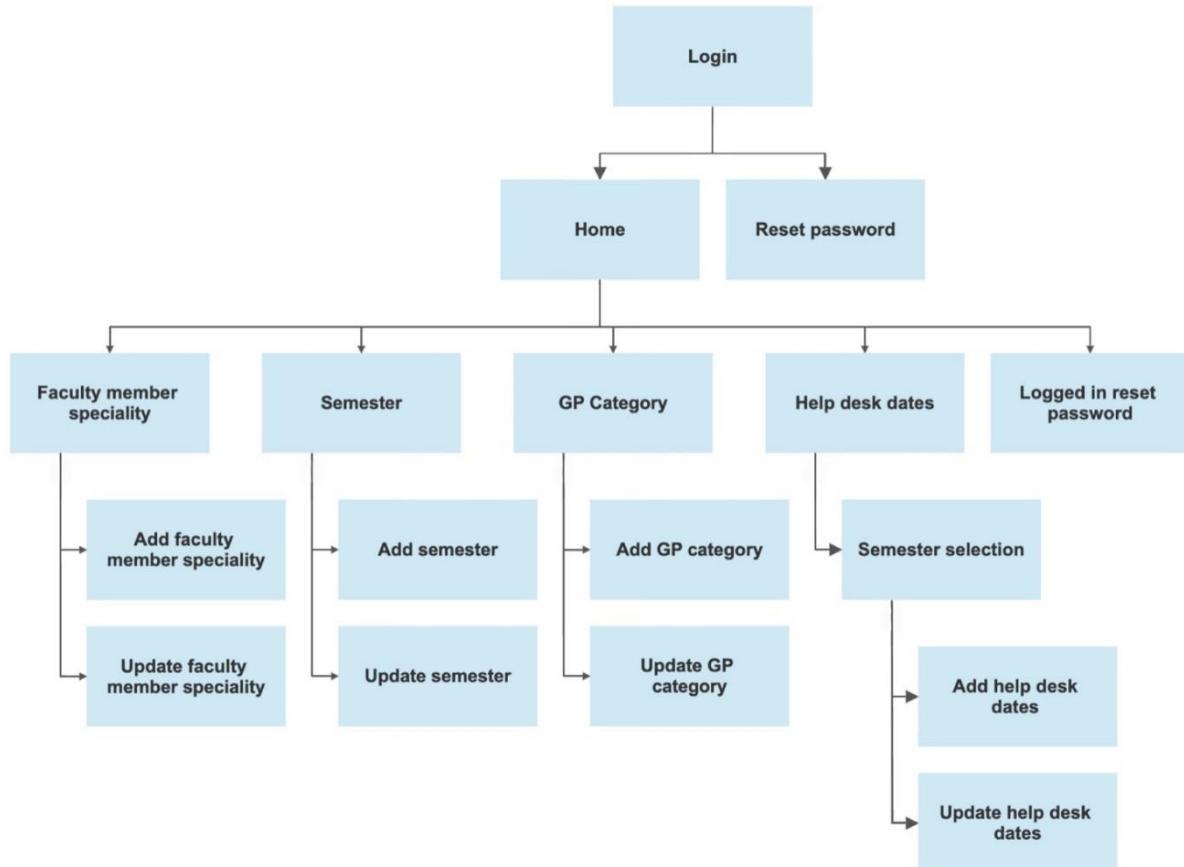
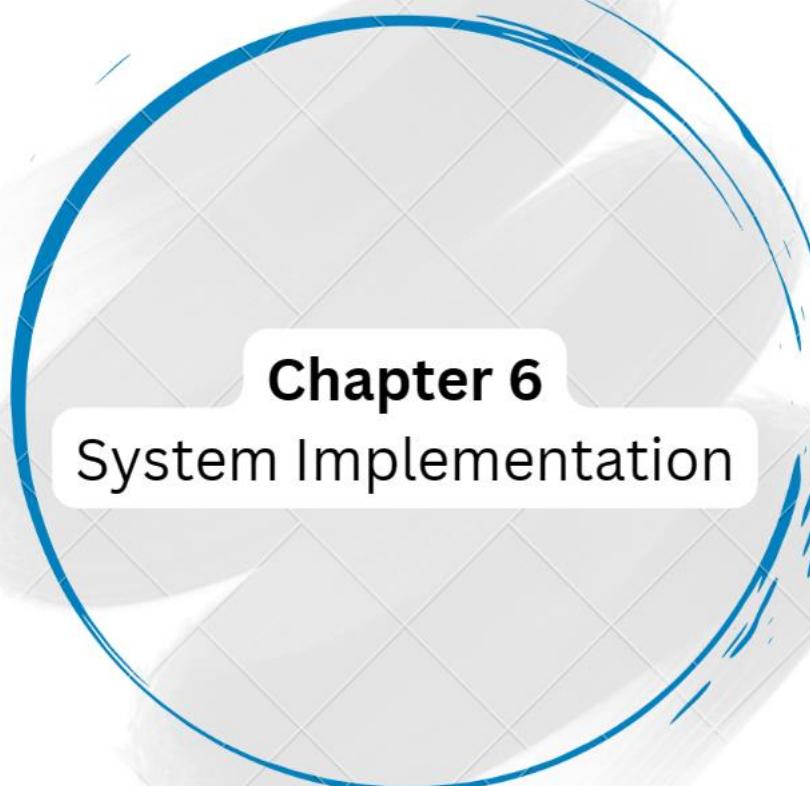


Figure 23 Navigation Diagram

5.5.2 UX Guidelines

1. Predictability suggests a highly standard order for the website [35], and on our web portal, the admin can understand what she can accomplish by looking at the home page.
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” [36]. In eClinic web portal, we have icons that are relevant to the real world like logout icon and all the icons in the side navigation bar. Also, log in page is similar to most log in pages in other websites.
3. Synthesizability gives the user the ability to see the effect of past operations on the current state [37]. Our web portal gives immediate honesty to the admin as soon as the admin click add or update by showing a green box indicating that the add/update was successful. Also, if the admin entered invalid inputs and clicks add/update the website show an alert indication the problem with the input entered by the admin.
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 [38] .In our web portal we achieved user preemptive in many ways like, the profile icon which is visible in any page at any point so that the admin can logout/reset password at any time she wants. Also, the admin can use the navigation bar at any time to move to another task.
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 [39]. In eClinic web portal, the admin will receive an informative message if the admin makes any mistake in any input so she can fix it.
6. Observability (Reachability) the admin 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 in two ways: first, by outlining the main functionality in the home page. Second, by giving the admin hints that specifies what needs to be entered or selected in each input field and drop-down menu.



Chapter 6

System Implementation

6 System Implementation

6.1 Challenges

In this section, we will explain the challenges we faced when developing eclinic web portal:

-We faced an issue regarding updating the information on pages without refreshing the page, we tried to solve this issue using an asynchronous function (await) that enabled us to update the information without refreshing the pages, it updates the data in the database but still not working without refreshing. As demonstrated in Figure 24, we resolved this issue by assigning a unique id for each element on the page that we want to update automatically without refreshing.

```

374     const docRef = await addDoc(collection(db, "semester"), {
375       semesteryearname,
376       enddate: null,
377       startdate: null
378       // timeframe: false
379     });
380
381     const myArray = semesteryearname.split(" ");
382
383     box.innerHTML += '<tr class="table-success">' + '<td><span id="semester-' + docRef.id + '">' + myArray[0] + '</span></td>' + '<td>
384       <td>
385         <input type="button" value="Logout" class="update logbut btn btn-primary btn-lg" style="padding-left: 0.5rem; padding-right: 0.5rem
386       </td>' + '</tr>';
387

```

Figure 24 solve refreshing issue

-We faced issues regarding the interface design because we are using the bootstrap framework for the first time, we faced difficulties due to conflicts between CSS codes and bootstrap classes, which caused errors and make the response of the page lagging. Moreover, it took a lot of time and effort to fix it, we tried to solve this issue by understanding each class when is it used, also delete or edit conflict CSS code to make it proportional with bootstrap vice versa depending on what we need.

6.2 Software Implementation

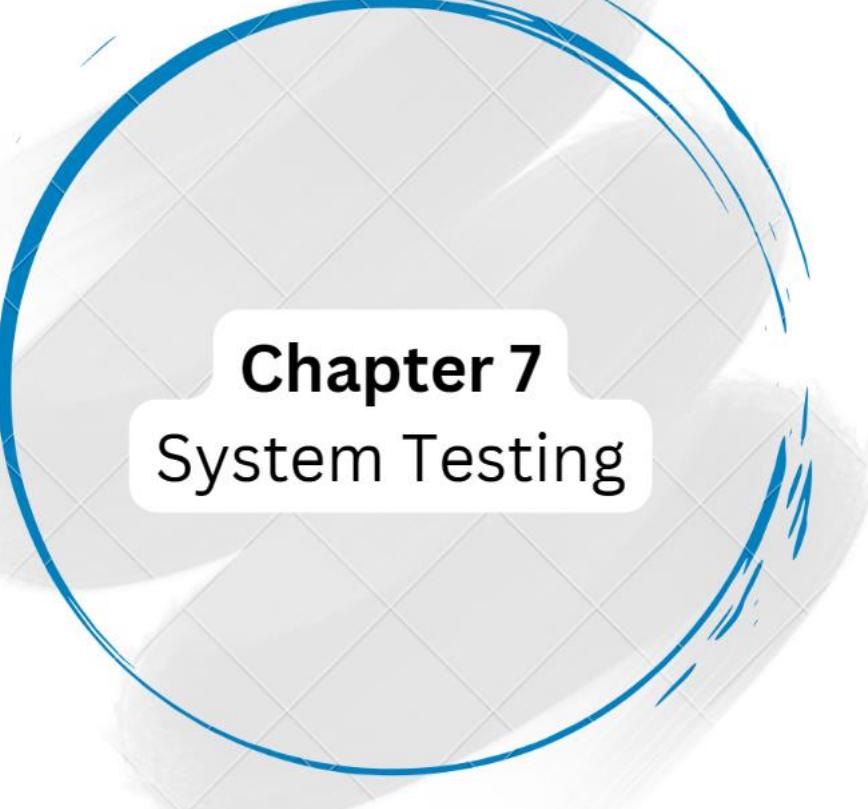
In this section, we will discuss implementation steps, and software components and their configurations.

eClinic web portal was done by creating a project in firebase which are cloud database services that are used to store data, and using Visual Studio Code which is a source code editor that runs on a desktop and is available for Windows, macOS, and Linux [40]. This visual studio code is used to configure and connect our database to our project by inserting the required codes in it. Moreover, we used GitHub as a collaboration hosting platform so that we can upload our code and commit new changes and resolve any conflicts.

By following steps we create and connect our web 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 web and use firebase services which we need to retrieve and store data, also the identification and authentication of a user are done by authentication service [41].



Chapter 7

System Testing

7 System Testing

In this chapter, we performed system testing to ensure that our web portal functions work as required. We tested by applying user acceptance testing.

7.1 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 [42].

We chose 5 faculty members for the testing, including the head of GP help desk committee, some of which have been part of the committee for several semesters, and others who are new members to the committee who can bring new perspectives. The participants were asked to complete a variety of tasks using a computer device before answering a questionnaire containing questions about usability and functionality tests.

7.1.1 Demographics of Participants

The test was conducted on 5 participants that are faculty members. As shown in Table 6, most of the participants are members of the GP help desk committee and one is the head of the committee. As for educational level of the participants, they were PhD or master's degree. All participants have different specialties and most of them have been part of the help desk for over 4 semesters. Appendix C shows the questions that are related to the demographics of participants.

Table 6 Demographics of Participants

Variable	Value	Total participants (n=5)	Percentage
Role in the GP help desk committee	Head of GP help desk committee	1	80%
	Member of GP help desk committee	4	20%
Educational level	PhD	2	40%
	Master's degree	3	60%

	Bachelor's degree	0	0%
Specialty	Data science	1	20%
	Database	1	20%
	Machine learning	1	20%
	Software engineering	1	20%
	Deep Learning	1	20%
Duration of membership in GP help desk committee	1-2 semesters	1	20%
	3-4 semesters	1	20%
	4 semesters >	3	60%

7.1.2 Questionnaire Results

After participants have finished testing, we distributed a questionnaire that contains 7 questions. Some questions are intended to determine the user approval of the system, which are questions 1,2,4,6. Whilst questions 3,5 are intended to determine the user disapproval of the system. In order to learn more about their thoughts on the system and try to improve any drawbacks, we finalized by asking participants for their comments and suggestions.

Table 7 illustrates the questionnaire and responses, and appendix C shows the actual questionnaire.

Table 7 System Testing Questionnaire

Question #	Question	Response
1	I found the system to be easy to use	100% Strongly Agree
		0% Agree
		0% Neutral
		0% Disagree
		0% Strongly Disagree

		80% Strongly Agree
		20% Agree
		0% Neutral
		0% Disagree
		0% Strongly Disagree
2	I thought all functions worked as expected	0%Strongly Agree
		0% Agree
		0% Neutral
		40% Disagree
		60% Strongly Disagree
3	I thought the icons used were confusing and hard to understand.	80% Strongly Agree
		20% Agree
		0% Neutral
		0% Disagree
		0% Strongly Disagree
4	I thought the application's design matches its purpose	0% Strongly Agree
		0% Agree
		0% Neutral
		0% Disagree
		0% Strongly Disagree
5	I found the error messages were vague	0% Strongly Agree
		0% Agree
		0% Neutral
		0% Disagree
		100% Strongly Disagree
6	I think the system will make GP Help desk management easier	100% Strongly Agree
		0% Agree
		0% Neutral
		0% Disagree
		0% Strongly Disagree

There is also additional question in the questionnaire, which was asked to get suggestions or feedback about the system.

The following are the extra feedback:

1. The home page website services look like buttons, which they are not.
2. I had confusion when I add semester due to the design of the year selection

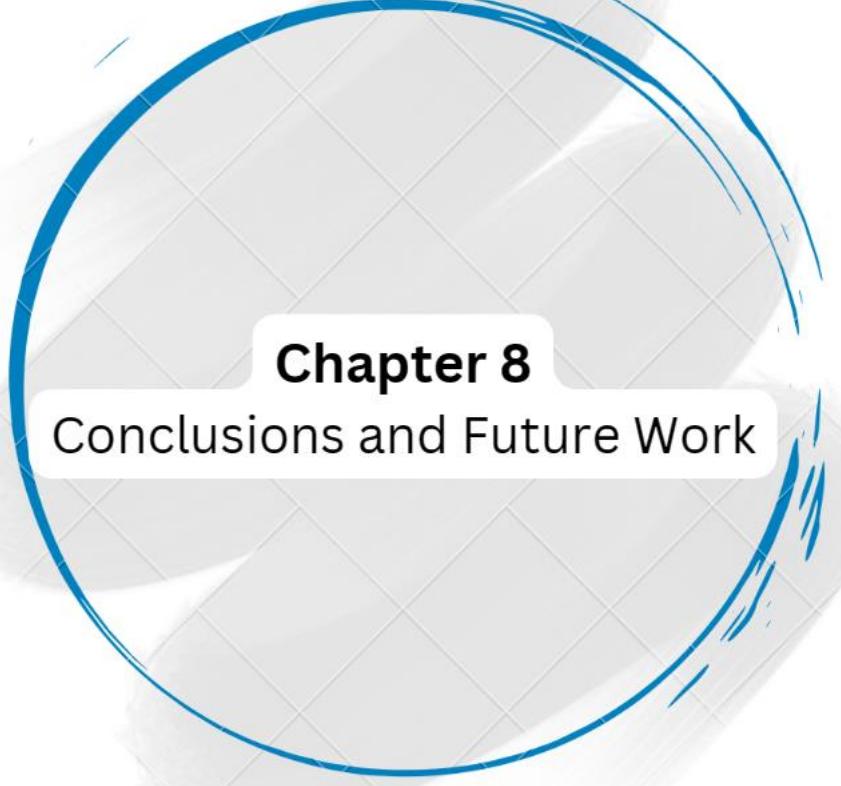
7.1.3 Testing Tasks

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

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

7.2 Discussion

Once the participants acceptance test was completed and the questionnaire results have been evaluated, we concluded that the system evaluation was great. The results showed that the UI design was good, as 100% of the participant strongly agreed that the system was easy for them to use, as well as all of them agreed and strongly agreed that the application's design matches its purpose and 100% of them disagreed and strongly disagreed that the icons used were confusing and hard to understand. In addition, the results showed that the system is working as it should , as all participants agreed and strongly agreed that all functions worked as expected. Furthermore, the results showed that the system is giving the users an informative error messages as 100% of the participant strongly disagreed that the error messages were vague. Moreover, all the participants strongly agreed that our system would make GP Help desk management easier. However, there are some improvements we made after testing. We observed that all participants faced a confusion as they thought that the services description on the home page are clickable button when they are not. Thus, we changed the design of the home page to avoid users trying to click the services. Moreover, during testing a participant mentioned that the design of the year selection when adding a semester is a bit confusing. As the second year drop down menu contains the same years options as the first one, so we improved this by making the second year drop down menu only display the year after the first year selected.



Chapter 8

Conclusions and Future Work

8 Conclusions and Future Work

This document represent steps that undertaken to produce the first release of eClinic system starting from the introduction chapter which explain the idea and discusses the problem, the solution, product vision, product roadmap, objectives, scope, hardware/software tools and cost, scrum teams. 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. Thereafter, system requirement chapter 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 packlog 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 contain architecture diagram, class diagram, component level design, data design. Finally we start the developing a web portal for the admin and testing it to ensure its work as we designed it, also the system testing which include user acceptance testing with questionnaire analysis, as well as the demographics of the users.

8.1 Global and local impact

8.1.1 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.

8.1.2 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.

8.2 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.

8.3 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 member and students 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.

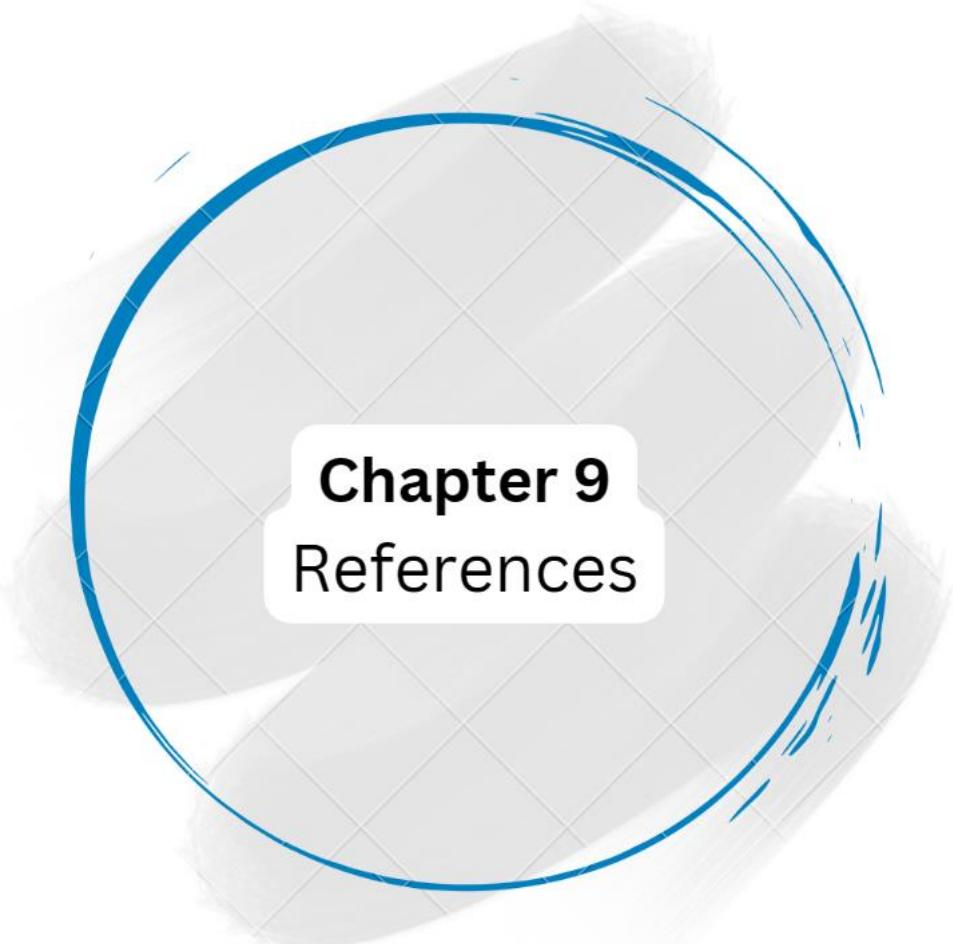
8.4 The main contribution of the project

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 common issues 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 offer an open library of previous graduation projects for students to benefit from it.

8.5 Future work

After the first release of the project, the upcoming procedures that we will complete the eClinic system with, is by developing an application for the rest of the users, who are faculty members and students to achieve the goal of the project, which is a guidance service that provides a convenient and efficient way to help students and faculty members to overcome graduation projects difficulties.

After the second release, 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.



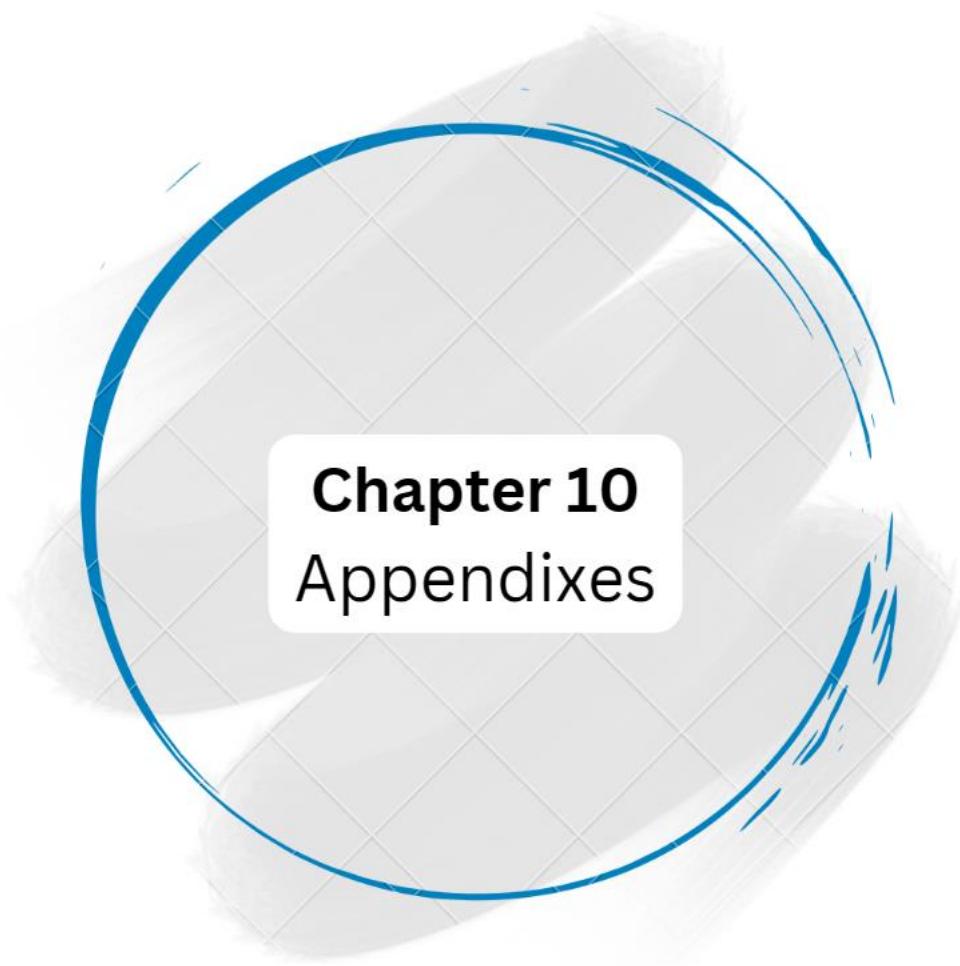
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Chapter 10
Appendices

10 Appendices

10.1 Appendix A: Survey questions

The screenshot shows a Google Form titled "eClinic". The introduction text in Arabic states: "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 ليسهل وينظم عملية الحجز بين الطالب وعضو هيئة التدريس المناسب له، كما يوفر فرصة الإطلاع على مشاريع التخرج السابقة مع امكانية التواصل مع الطالب الخريجين ذو الخبرة السابقة." Below this, the English translation continues: "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 introduction, there is an email field showing "deem1016@gmail.com (not shared)", a "Switch accounts" link, and a "Next" button. At the bottom, it says "Page 1 of 4" and "Clear form". A note at the very bottom reads: "Never submit passwords through Google Forms."

Figure 25 survey introduction

eClinic

 deem1016@gmail.com (not shared) [Switch accounts](#) 

*Required

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

Yes

No

[Back](#) [Next](#) Page 2 of 4 [Clear form](#)

Figure 26 Survey Questions

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

Yes

No

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

Unorganized

Confusing

Organized

Clear

Figure 27 Survey Questions

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

Yes

No

Other: _____

Figure 28 Survey Questions

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

Database design

Software analysis and design

User interface design

Web development

Software testing

Machine learning algorithms

Data Science

Text mining and sentiment analysis

Network engineering

Other: _____

[Back](#)

[Next](#)

Page 3 of 4

[Clear form](#)

Figure 29 Survey Questions

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

- Yes
- No

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

- Yes
- No

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

- Yes
- No

Figure 30 Survey Questions

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

- Yes
- No

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

- Yes
- No
- Maybe

Figure 31 Survey Questions

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

Yes

No

Maybe

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? *

Yes

No

Maybe

Figure 32 Survey Questions

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? *

Yes

No

Maybe

[Back](#) [Submit](#) Page 4 of 4 [Clear form](#)

Figure 33 Survey Questions

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

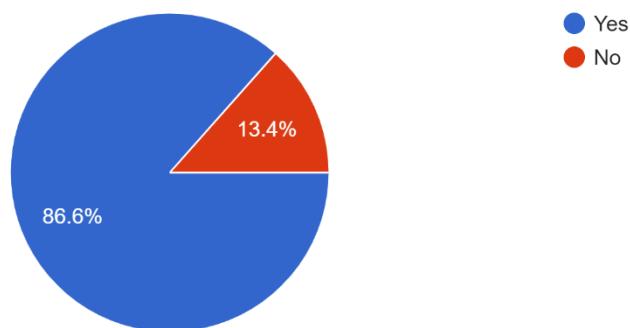


Figure 34 Survey Responses

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

58 responses

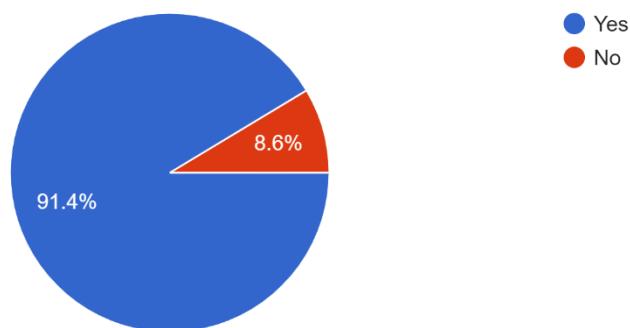


Figure 35 Survey Responses

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

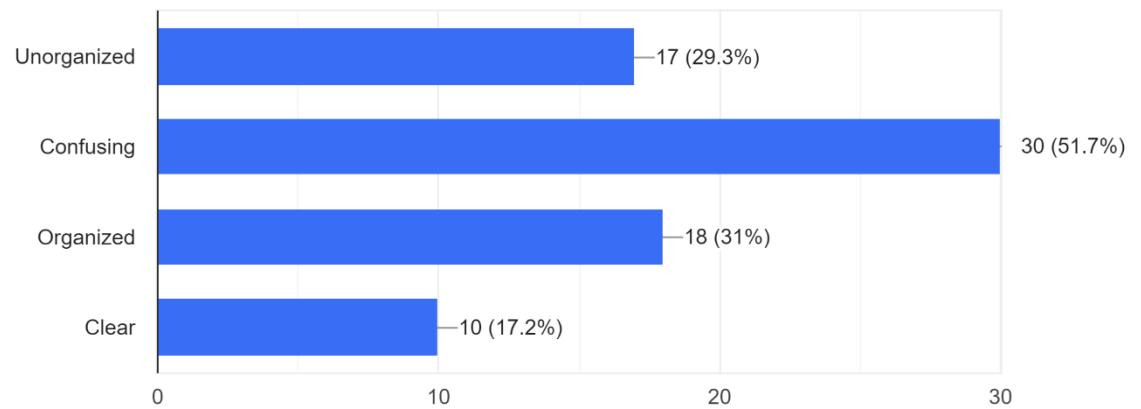


Figure 36 Survey Responses

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



Figure 37 Survey Responses

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

58 responses

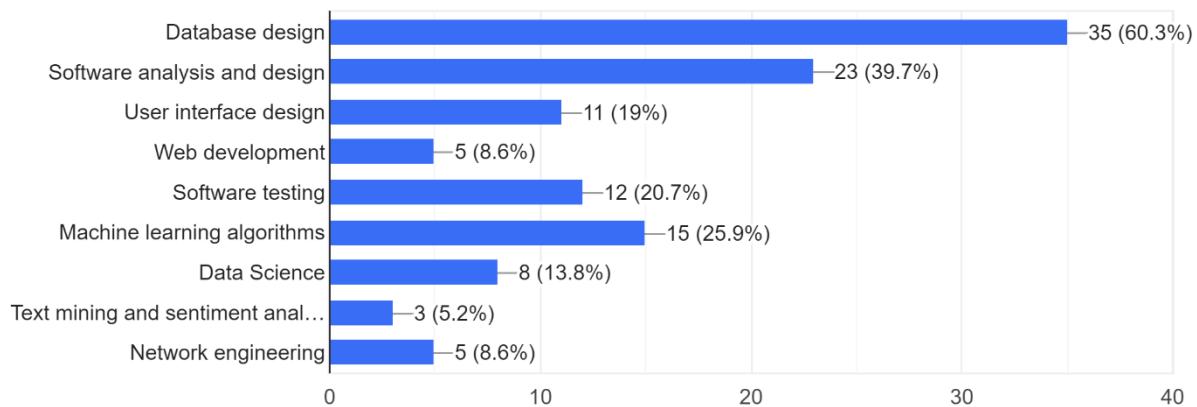


Figure 38 Survey Responses

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

67 responses

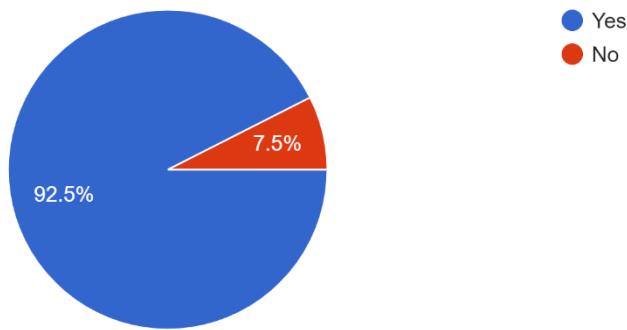


Figure 39 Survey Responses

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

66 responses

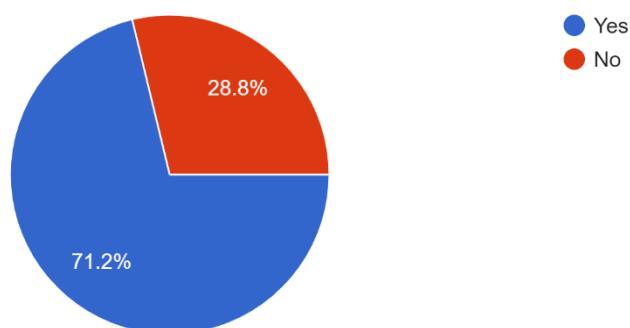


Figure 40 Survey Responses

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

67 responses

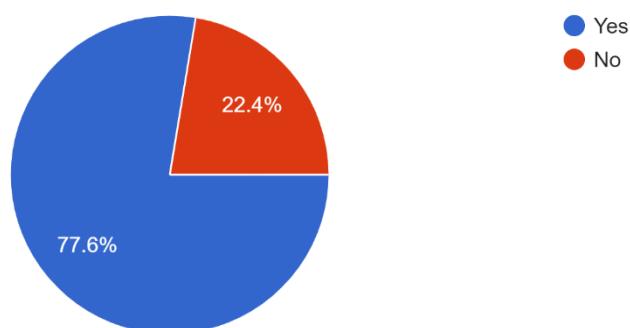


Figure 41 Survey Responses

(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

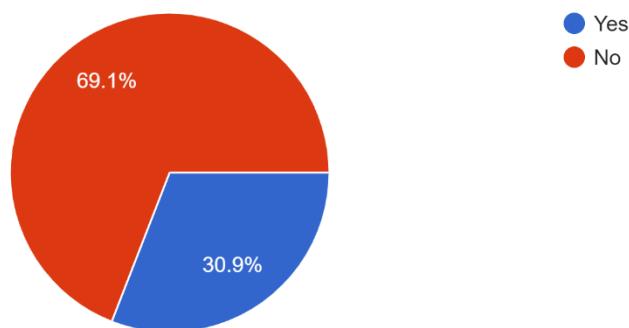


Figure 42 Survey Responses

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

67 responses

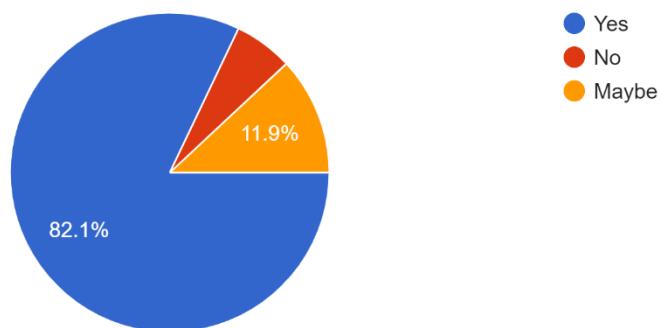


Figure 43 Survey Responses

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

67 responses

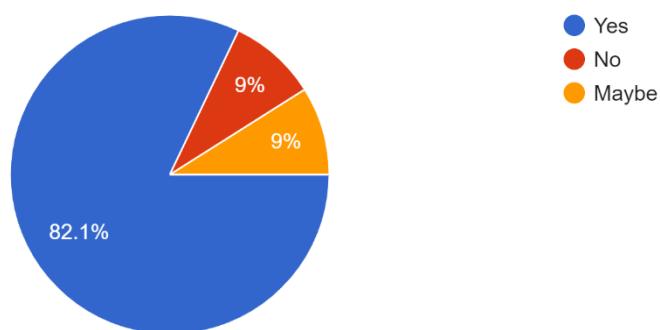


Figure 44 Survey Responses

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

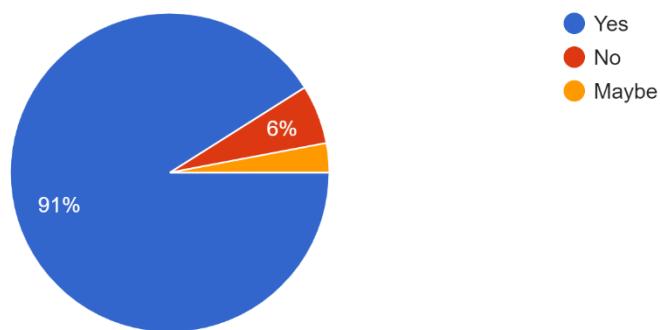


Figure 45 Survey Responses

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

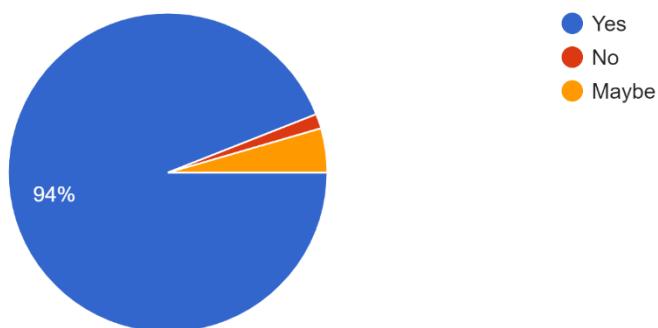


Figure 46 Survey Responses

10.2 Appendix B: Interviews

Table 8 Interview 1

Interview Outline	
Interviewee: Dr.Nora Abdulaziz Madi	Interviewer: Demah Alhabdan
Location: Via KSU email	Appointment Date: 20 September 2022
Objectives:	
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	
Reminders:	
-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	
Questions:	Answers:

<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 means that they might never be aware of that common misunderstanding thereby leading to mistakes in their work for example.</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.

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.

Table 9 Interview 2

Interview Outline	
Interviewee: Dr.Alaa Alhumaisan	Interviewer: Demah Alhabdan
Location: Via KSU email	Appointment Date: 20 September 2022
Objectives:	
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	
Reminders:	
-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	
Questions:	Answers:
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 10 Interview 3

Interview Outline	
Interviewee: prof. Ghada Alhudhud	Interviewer: Albandri Alotaibi
Location: Via KSU email	Appointment Date: 21 September 2022
Objectives:	
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	
Reminders:	
-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	
Questions:	Answers:
Question 1: What are the challenges you face as a faculty member to manage your schedule in GP help desk ?	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.

10.3 Appendix C: System testing questionnaire

10.3.1 Demographics questions

Role in the GP help desk committee *

Head of GP help desk committee

Member GP help desk committee

What is your educational level? *

PhD

Master's degree

Bachelor's degree

Figure 47 Demographics questions

What is your speciality? *

- Data science
- Data mining
- AI
- HCI
- Database
- Web technology
- NLP
- IoT
- Bioinformatics
- Cloud computing
- Cybersecurity
- Big data
- Image processing
- ML
- Network security
- Semantic Web
- Speech processing
- Software engineering
- Computer vision
- Wireless networking
- Networking
- Security
- Other...

Figure 48 Demographics questions

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

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

Figure 49 Demographics questions

10.3.2 Demographics response

Role in the GP help desk committee

 Copy

5 responses

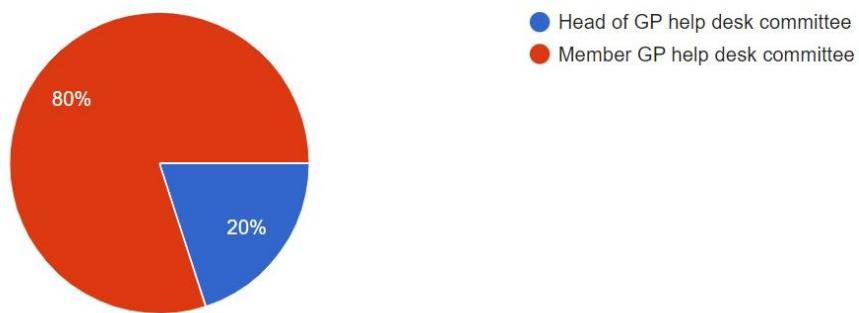


Figure 50 Demographics response

What is your educational level?

 Copy

5 responses

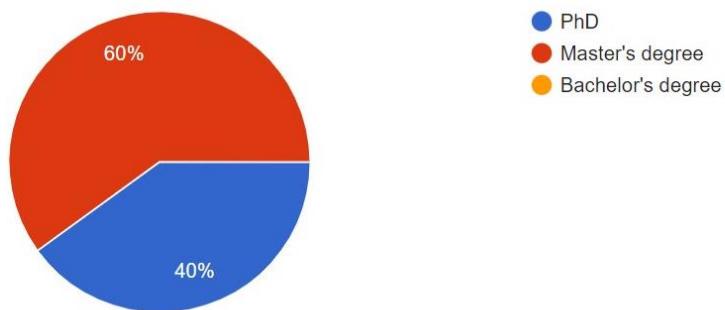


Figure 51 Demographics response

What is your speciality?

 Copy

5 responses

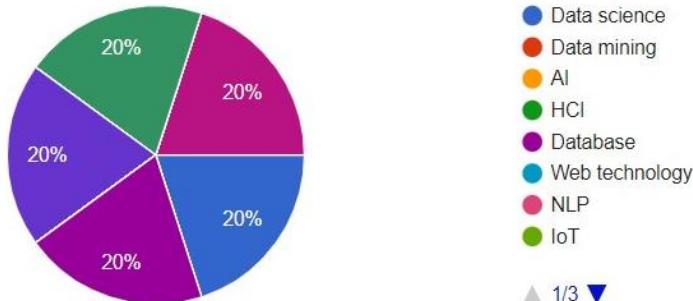


Figure 52 Demographics response

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

 Copy

5 responses

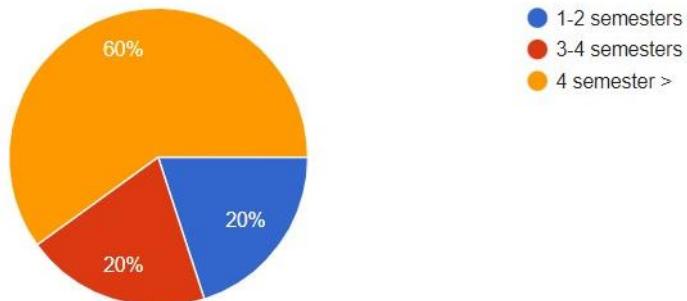


Figure 53 Demographics response

10.3.3 Testing Questionnaire

I found the system to be easy to use *

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Figure 54 Testing Question

I thought all functions worked as expected *

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Figure 55 Testing Question

I thought the application's design matches its purpose *

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Figure 56 Testing Question

I thought the icons used were confusing and hard to understand. *

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Figure 57 Testing Question

I found the error messages were vague *

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Figure 58 Testing Question

I think the system will make GP Help desk management easier *

Strongly agree

Agree

Neutral

Disagree

Strongly Disagree

Figure 59 Testing Question

Do you have any comments or suggestion? (optional)

Long answer text

Figure 60 Testing Question

10.3.4 Testing Questionnaire Responses

I found the system to be easy to use

 Copy

5 responses



Figure 61 Testing Question Response

I thought all functions worked as expected

 Copy

5 responses

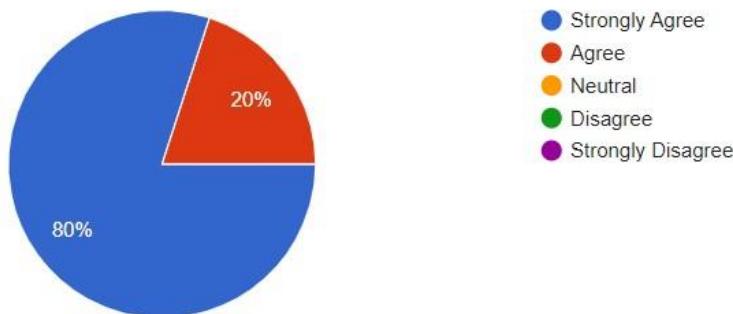


Figure 62 Testing Question Response

I thought the application's design matches its purpose

 Copy

5 responses

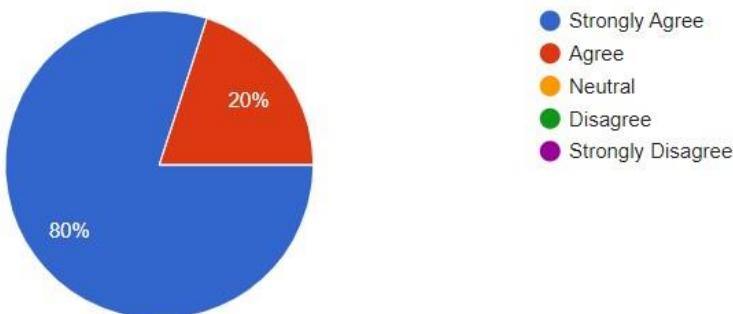


Figure 63 Testing Question Response

I thought the icons used were confusing and hard to understand.

 Copy

5 responses

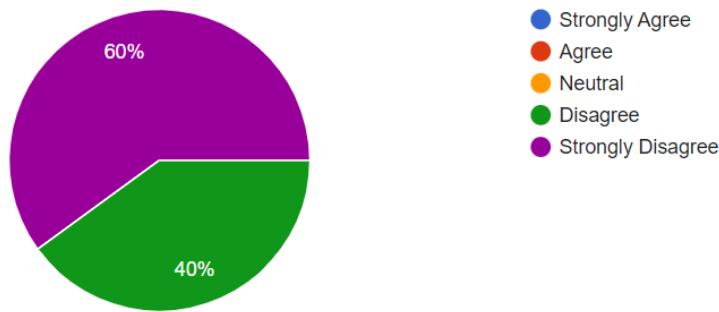


Figure 64 Testing Question Response

I found the error messages were vague

 Copy

5 responses

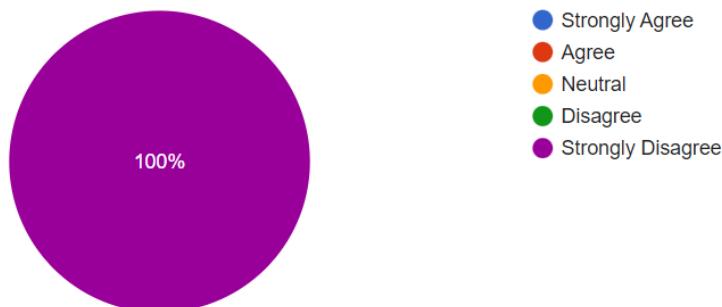


Figure 65 Testing Question Response

I think the system will make GP Help desk management easier

 Copy

5 responses



Figure 66 Testing Question Response

Do you have any comments or suggestion? (optional)

3 responses

The home page website services look like buttons which they are not

Good Luck

Thank you for your efforts

Figure 67 Testing Question Response