كلية علوم الحاسب والمعلومات
قسم تقنية المعلومات

Business Gate (بوابة الأعمال)

IT 497: Graduation Project Report
Product Release-2

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Business Gate

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Abstract:

The Kingdom of Saudi Arabia's Vision 2030 serves as a strategic framework for economic diversification and development, with educational institutions like King Saud University (KSU) playing a crucial role. To align with Vision 2030 goals, KSU has established twenty-two Business Units (BUs) overseen by the King Abdullah Institute, aimed at promoting sustainable development by providing consultation and technical projects to both private and public sectors. However, these BUs face operational challenges such as inefficient communication and complex resource management. To address these challenges, we developed Business Gate, a comprehensive web-based platform and mobile application specifically tailored for KSU's BUs to streamline day-to-day tasks. The main methodology for the development involved data collection through interviews and surveys from both King Abdullah Institute and BU staff to ensure a user-centered design approach. Our evaluation indicates that Business Gate significantly improves communication, efficiency, and time management within KSU's BUs. The software system provides functionalities such as project assignments, team communication, document sharing, and report generation, leading to a more sustainable business environment within the university. Overall, Business Gate offers a potential blueprint for similar workflow management systems in academic institutions worldwide, providing a user-friendly solution to operational challenges faced by educational institutions like KSU.

Abstract (Arabic):

تعد رؤية المملكة العربية السعودية 2030 بمثابة إطار استراتيجي للتنويع الاقتصادي والتنمية، حيث تلعب المؤسسات التعليمية مثل جامعة الملك سعود دورًا حاسمًا. تماشياً مع أهداف رؤية 2030، أنشأت جامعة الملك سعود 22 وحدة عمل يشرف عليها معهد الملك عبد الله، بهدف تعزيز التنمية المستدامة من خلال تقديم الاستشارات والمشاريع الفنية للقطاعين العام والخاص. ومع ذلك، تواجه وحدات الأعمال هذه تحديات تشغيلية مثل عدم كفاءة الاتصالات وإدارة الموارد المعقدة. ولمواجهة هذه التحديات، قمنا بتطوير **Business Gate**، وهي عبارة عن منصة شاملة على شبكة الإنترنت وتطبيقات الهاتف المحمول مصممة خصيصًا لوحدات أعمال جامعة الملك سعود لتبسيط المهام اليومية. تضمنت المنهجية الرئيسية للتطوير جمع البيانات من خلال المقابلات والدراسات الاستقصائية من كل من معهد الملك عبد الله وموظفي جامعة بوسطن لضمان اتباع نهج التصميم الذي يركز على المستخدم. يشير تقييمنا إلى أن **Business Gate** تعمل على تحسين التواصل والكفاءة وإدارة الوقت بشكل كبير داخل وحدات أعمال جامعة الملك سعود. يوفر نظام البرنامج وظائف مثل مهام المشروع، والتواصل الجماعي، ومشاركة المستندات، وإنشاء التقارير، مما يؤدي إلى بيئة عمل أكثر استدامة داخل الجامعة. بشكل عام، تقدم **Business Gate** مخططًا محتملاً لأنظمة إدارة سير العمل المماثلة في المؤسسات الأكاديمية في جميع أنحاء العالم، مما يوفر حلاً سهل الاستخدام للتحديات التشغيلية التي تواجهها المؤسسات التعليمية مثل جامعة الملك سعود.

Keywords:

1) Business Unit (BU): Local and regional leadership in providing technical services and solutions and expanding the unit's members' awareness of the needs of the labor market and its most important developments.

2) King Abdullah Institute (KAI): Governed King Saud University to carry out scientific and advisory studies and services, provide study and training programs, services for holding conferences, seminars, workshops, and forums, and provide academic, administrative, and technical competencies to the beneficiaries. The institute becomes the contractual arm for the university to provide its paid services to beneficiaries, including individuals, government, private and non-profit sectors.

3) Tasks (maham - مهام): Task follow-up feature within the system developed to organize and follow up on the various tasks performed between BU and KAI and facilitates the supervision of tasks and taking various actions on the assigned tasks.

4) Head of Business unit: The person who lead business unit services within the college.

5) Trainee: The person who seeks to gain knowledge from training programs.

1 Introduction

The Kingdom's Vision 2030 [1] serves as a guiding blueprint for Saudi Arabia's future. This vision seeks to diversify the economy, reduce dependence on oil, and enhance public services such as health, education, infrastructure, recreation, and tourism. Universities within the Kingdom, particularly King Saud University (KSU), are instrumental in achieving these ambitious goals.

KSU stands as one of Saudi Arabia's premier higher education institutions. With its wide range of colleges across disciplines, it significantly contributes to the kingdom's academic and research landscape. KSU is not merely a center for learning; it is a hub for innovation, research, and entrepreneurship. A crucial part of KSU's contribution to Vision 2030 is through the King Abdullah Institution for Research and Consulting Studies (KAI) [2]. KAI operates as KSU’s business center and contractual interface, bridging academics and the market.

In line with Vision 2030, KSU has established twenty-two Business Units (BUs), each within a respective college. These BUs utilize university resources and knowledge to serve society and promote sustainable development. BUs contribute to the development of the knowledge economy through distinguished and diversified training, technical, and advisory services. These services aim to achieve sustainable development by facilitating the transfer of knowledge between the college's faculty and students and the private and public sectors. Through these activities, BUs generate additional income for KSU and contribute to societal development.

However, BUs face challenges due to the lack of a robust system for daily activities, leading to communication gaps, resource management issues, and complexities in managing everyday tasks. KAI governs the BUs, but the communication between them is exclusively through email, which does not fully support efficient conversation. Furthermore, there is a lack of transparency in decision-making and workflow, thereby delaying tasks and hindering improvement and growth.

To address these challenges and manage the workflow system, we introduce the Business Gate project. This workflow management system platform aims to improve the operational efficiency of BUs at KSU. It is a technological solution designed to streamline BUs operations, enhance communication, and facilitate resource management. It will handle various tasks, such as initiating training programs or workshops. These programs can be initiated by Business Unit head or proposed by faculty members. Business Gate will ease the process of proposing the program, assigning instructors, and acquiring the acceptance to release the program so that trainees can register for it. Business Gate also effectively handles any task given to the Business Unit by KAI. The system manages the initiation of the task by KAI and takes care of related subtasks such as team assignment by the BU head. It facilitates communication within the work team and between the BU and KAI, ensuring ongoing two-way communication until task completion.

Business Gate is a tool mainly used by KAI heads, staff, and heads of BUs. These users are mostly faculty members with high education levels who manage the daily operations of the BUs, make important decisions, and ensure services are delivered smoothly. Business Gate is supplied with a website that will handle any requests between BUs and KAI, from programs to any task, whether it is a major or minor task. The website users are KAI department of Business Units head, KAI department of Business Units Staff, Heads of Business Units and Faculty Members. At the top of the website, there is an application for users, specifically trainees, who can register for programs and receive certifications through the app.

1.1 Problem

For over a decade, universities have actively engaged in major collaborative projects and partnerships with established universities and industry partners worldwide. Specifically, King Saud University, which established the King Abdullah Institute for Research and Consultancy Studies (KAI), serves as the contractual interface and business center for providing paid consultancy services, advisory services, and training to all institutions of society. The institute works on coordinating, integrating, and utilizing the intellectual and material capabilities of the university. Recently, Business Units (BUs) have been established in all colleges to contribute to the development and sustainability of the university's self-revenue. These BUs aim to support the employment of the university's human and knowledge resources and capabilities, with the goal of achieving financial sustainability. However, the BUs currently lack an underlying system that would facilitate essential day-to-day tasks such as requesting new projects, assigning them to the relevant staff, monitoring project progress and advancement, generating reports, as well as promoting effective communication among the heads of BUs. The absence of a dedicated workflow management system for heads of BUs, heads of KAI and their staff, dean of the college, and faculty members poses significant challenges to operational efficiency, coordination, resource allocation, financial management, and decision-making processes. As a result, it impedes the university's ability to achieve sustainability in self-generated revenue.

1.2 Objectives

The system will cater to seven different types of users, each with specific roles: Business Gate admin, Dean of College, Head of KAI Business Units, KAI Business Units staff, Head of Business Unit, Business Unit staff, Faculty Members, and Trainees.

Below, we provide detailed descriptions for each user type.

The following features for Business Gate Admin:

- The ability to add/delete/update accounts and colleges.
- The ability to sign-in, sign out.

The following features for the Dean of College:

- The ability to sign-in, sign out.
- The ability to track financial revenues by reviewing reports generated from the business unit.
- The ability to view all faculty members' information within the college with their specialty and interests.

- The ability to communicate with the Head of Business Unit by chat and exchanging files such as Pdf, excel and word.

The following features for the Head of KAI Business Units:

- The ability to sign-in, sign out.
- The ability to track financial revenues by reviewing reports generated from all business units.
- The ability to communicate with the staff of KAI business units and Heads of Business Units by chat and exchanging files such as Pdf, excel and word.
- The ability to approve/reject projects and related documents.

The following features for KAI Business Units staff:

- The ability to sign-in, sign out.
- The ability to communicate with the head of KAI business units and Heads of Business Units by chat and exchanging files such as Pdf, excel and word.
- The ability to propose projects to business units.
- The ability to set deadlines for the business unit to accept proposed projects and for projects currently in progress.
- The ability to track financial revenues by reviewing reports generated from all business units.

The following features for the Head of Business Unit:

- The ability to sign-in, sign out.
- The ability to filter, sort, and search all faculty members within the college.
- The ability to view all faculty members' information within the college with their specialty and interests.

- The ability to communicate with the head of KAI business units and their staff, Heads of Business Units, and faculty members by chat and exchanging files such as Pdf, excel and word.
- The ability to view, add, delete, update, filter, sort, and search courses, workshops, and summer camps.
- The ability to accept/reject proposed projects.
- The ability to view the projects' details.
- The ability to track projects, courses, and workshop progress.
- The ability to track financial revenues by reviewing reports generated from the business unit.
- The ability to view registered trainees' information for courses, workshops and summer camps.
- The ability to propose courses, workshops and summer camps to KAI Businesses Units.

The following features for Faculty Members:

- The ability to sign-in, sign out.
- The ability to view and update personal information.
- The ability to accept/reject work on projects.
- The ability to communicate with Heads of Business Units and project team members by chatting and exchanging files such as Pdf, excel and word.
- The ability to request a course creation or accept/reject course training and upload a training bag.
- The ability to view and update the worked-on projects and courses details.

The following features for Trainees:

- The ability to sign up, sign-in, sign out.
- The ability to view and update personal information.
- The ability to view, search, and filter courses, workshops, and summer camps offered by the university.
- The ability to register for courses, workshops, or summer camps offered by the university.
- The ability to cancel registered courses, workshops, or summer camps offered by the university.
- The ability to view obtained certificates.

1.2.1 Scope

Business Gate, primarily a web-based system, is designed to enhance the operational efficiency of BUs within KSU University. Supporting the Arabic language, it provides various features to manage the workflow of BUs (refer to section 1.2). Among these is a faculty database that simplifies task assignments based on specialties or fields of interest. This system also facilitates communication among BUs and the department of BUs at KAI, among different BUs, and among faculty members working on similar tasks, and it manages certain aspects of executive master's programs, Business Gate is also supplied with a mobile application that streamlines trainee registration and the trainee will receive the certification through it. However, it's important to note that the web-based interface and mobile application will not cover any payment processes and will not integrate with any legacy KSU systems. The aim is to complete this project by the end of the academic year 2023-2024.

1.3 Product Vision

Product Vision:
For King Saud University Business Units.
Who require a sustainable system to support their daily operations.
The Business Gate workflow management system
That aims to revolutionize the way business units operate by introducing innovative features that facilitate seamless project assignments, real-time progress tracking among other improvements.
Unlike existing alternatives.
Our product aims to revolutionize the way business units work. It introduces innovative features that streamline project assignments, enable real-time progress tracking, and offer a multitude of additional functionalities. By leveraging cutting-edge technology and user-centric design, our product will set a new precedent in the industry.

1.4 Brief Description of The Approach

The Business Gate system was developed using the Agile approach, which is an iterative and incremental software development methodology that emphasizes flexibility. We used Django, JavaScript, HTML, and CSS to create the website, as well as Dart language and Flutter framework to create a mobile application. Postgres was used as a SQL database for managing user data. Before starting the design phase, we conducted a requirement elicitation process by interviewing BUs, KAI, Trainee to understand their needs. This helped us to identify the features and functionalities required for the system. After gathering requirements, we planned the development phase and started working on the incremental agile approach. The agile approach allowed us to make changes and adapt to any challenges that occur during development. At the end of each sprint, we performed acceptance testing and integration testing to measure both team and application performance. We used several tools during development, including Visual Studio for coding, pgAdmin for database, GitHub for version control, and Jira software for project management.

1.5 Main contribution and solution

To address the aforementioned problems, we present “Business Gate” workflow management system. Business Gate is a comprehensive web-based platform and mobile application designed to address the challenges posed by the absence of an underlying system to support the day-to-day tasks of BUs. Through the website component of Business Gate, BUs head and staff gain access to a wide range of functionalities that streamline their daily operations. These functionalities include task tracking, seamless facilitation of project assignments, team communication by chat and document sharing, and follow-up processes, maintenance of a comprehensive faculty database that spans areas of expertise, facilitating communication between BUs, and efficient administration of training courses and workshops such as suggesting a training course to the facilities to present it. The KAI users will also use the website to manage and communicate with the BUs. Faculties will use the website to work on projects and programs related to the BU. The mobile application component of Business Gate complements the website by providing a user-friendly interface for trainees to enroll in training courses and workshops. This mobile application streamlines the registration process and facilitates certificate obtainment, offering a seamless experience for course participants.

A technological solution like the Business Gate project is crucial both locally and globally. Locally, it directly addresses operational inefficiencies within KSU's Business Units, contributing to Saudi Arabia's Vision 2030 by promoting sustainable development and innovation. Globally, this project's success could serve as a blueprint for universities and institutions worldwide, helping them to streamline their operations and effectively manage their initiatives.

1.6 Report Structure

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

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

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

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

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

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

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

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

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

2 Background

Currently, King Saud University's (KSU) Business Units (BUs) are actively involved in revenue-generating projects, utilizing university resources and expertise to benefit society and promote sustainable development. Nevertheless, they encounter operational challenges, including communication gaps, resource management complexities, intricate task handling, and challenges in progress tracking.

The current predicament involves a lack of a centralized system, leading to the use of multiple platforms for task completion. Tasks are assigned through email, team communication relies on WhatsApp, trainee registration is managed via Google Forms, and training programs announcements are made on Twitter. Additionally, there is a notable absence of a centralized database that comprehensively captures all activities and reports for the BU.

To address these challenges, Business Gate, a workflow management platform, will integrate both web-based and mobile applications to centralize the work of all BUs into a single system. This integration will enable users to efficiently track project progress, assign tasks to team members, and facilitate seamless collaboration and communication.

This section will provide background information on business workflows in KSU, business tracking, communication, and APIs.

2.1 Business workflow at King Saud University

At King Saud University, there is a dedicated Business Unit for each college. These units are responsible for managing various projects, courses, and academic programs. To fulfill these responsibilities, they collaborate with KAI, and each type of business follows a distinct workflow. Here's an example of a competitive workflow:

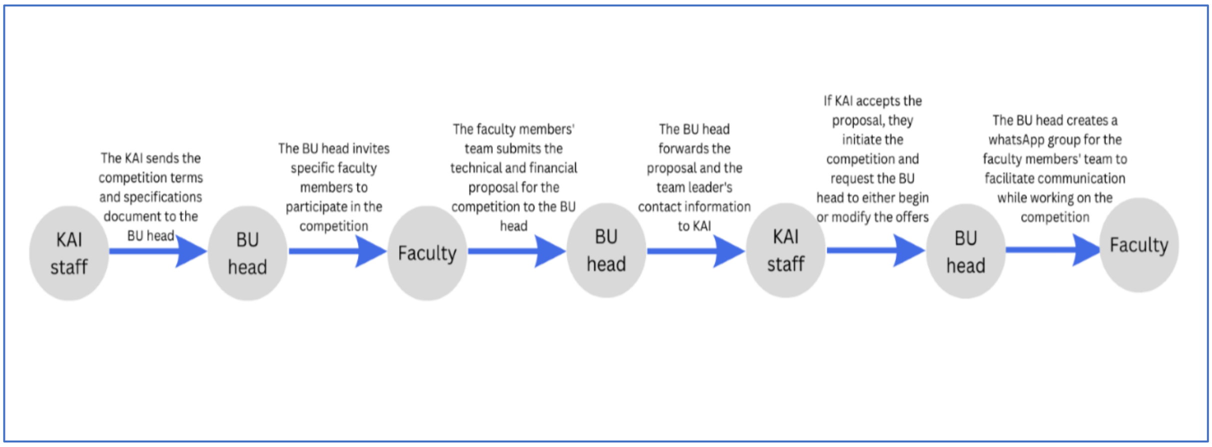


Figure 1 Competitive workflow

2.2 Business tracking

While faculty member teams are engaged in various business projects, the college dean, BU head, and the head of KAI Business Units may want to monitor and track their progress. Currently, this involves individual inquiries to members to obtain updates. Additionally, in the context of training, BU heads review registration forms to ensure trainees have paid and provided the necessary information, while KAI staff also track these forms to issue certificates. Implementing a progress tracking feature and centralizing this information within a single system will significantly streamline and expedite the tracking and management processes.

2.3 Communication

Our users engage in vital relationships that necessitate frequent communication. The BU head assumes a central role as the primary point of contact among all six users involved in various processes. For example, the BU head collaborates closely with KAI, sharing project specifications, proposals, and offers. In training courses, they exchange crucial trainee information, including payments and certificates. Moreover, the BU head directly engages with trainees to ensure the timely delivery of certificates.

Additionally, BU heads maintain ongoing communication with faculty members, inviting them to participate in projects or courses. This iterative process continues until the teams are fully assembled. Furthermore, BU heads also communicate with other BU heads within the university.

In addition to BU head interactions, project teams consisting of faculty members require regular discussions and document sharing. Currently, these exchanges primarily occur through emails and WhatsApp. However, the implementation of a dedicated communication platform offers numerous advantages, including enhanced efficiency, centralization, and coordination. By elevating user communication through this dedicated platform, we not only expedite business growth but also foster seamless and productive collaboration and transparency among all stakeholders.

2.4 APIs

To enhance the website's communication features, we conducted a thorough evaluation of various chat APIs, including Microsoft Teams API and Slack API. We determined that Chat Engine API best aligns with our project requirements for several reasons.

Microsoft Teams API

- Microsoft Teams API [3] offers a comprehensive suite of tools for real-time messaging, collaboration, and document sharing.

- However, its integration may require a deeper understanding of Microsoft's ecosystem, potentially increasing development complexity.

Slack API

- Slack API [4], known for its user-friendly interface and extensive integration capabilities, provides similar features to Microsoft Teams API.

- However, Chat Engine API offers easier integration and a vibrant developer community.

Chat Engine API

- Chat Engine API [5] stands out for its simplicity, flexibility, and ease of integration.

- It prioritizes lightweight architecture, enabling quick setup and customization without the need for extensive backend infrastructure.

- Additionally, Chat Engine API offers real-time messaging and document sharing while enforcing SSL encryption to ensure secure communication channels, providing an added layer of protection for user data and privacy.

- Furthermore, Chat Engine API provides a REST API to host chats and NPM components for Chat UI development, streamlining the integration process and reducing development overhead.

- With clear documentation and robust support resources, Chat Engine API offers the necessary guidance and assistance throughout the integration process, minimizing potential roadblocks and accelerating development timelines.

ZegoCloud API Integration

In addition to communication features, we have integrated ZegoCloud API for video calls within our website. ZegoCloud API offers real-time audio and video communication capabilities, aligning with our project's requirements for a seamless video calling experience. Below is a comparison between ZegoCloud API and other video call APIs, highlighting the reasons for choosing ZegoCloud API for our project.

ZegoCloud API

- ZegoCloud API [6] provides high-quality real-time audio and video communication features.

- It prioritizes security, with built-in encryption to ensure secure communication channels.

- The API offers comprehensive documentation and robust support resources, facilitating easy integration and troubleshooting.

Twilio Video API

- Twilio Video API [7] offers a comprehensive set of features for embedding video calling functionality into web and mobile applications.

- It provides high-quality video and audio transmission and offers extensive documentation and developer resources, making it easy to integrate and customize.

Agora Video SDK

- Agora Video SDK [8] is known for its high-quality real-time audio and video communication features and provides robust security features, including end-to-end encryption and data protection.

In comparison, while Twilio Video API and Agora Video SDK offer similar features to ZegoCloud API, ZegoCloud API provides additional advantages such as comprehensive documentation and built-in security features.

2.5 Summary

In this section, we have explored the essential components of business workflow at KSU, delving into aspects such as business tracking, communication, and APIs. This foundational knowledge sets the stage for the implementation of Business Gate.

3 Literature Review

Business Units are growing significantly, they play a vital role in generating revenue and supporting the institution's financial sustainability. Effective management of Business Units is crucial, and the absence of such a system hampers operational efficiency, coordination, resource allocation, financial management, and decision-making processes. Implementing an integrated system can streamline processes, automate routine tasks, and enable effective information sharing within and across Business Units. This, in turn, can enhance productivity, reduce duplication of efforts, and improve coordination among staff members. However, implementing a system is not without challenges. Factors such as system integration, data security, user adoption, and scalability need to be carefully considered. Successful implementation requires strong leadership, stakeholder involvement, and a clear understanding of the specific needs and goals of the Business Units. We will discuss how similar entities work in comparison with KSU business Units, and discuss similar systems related to our system so we can build a system that is able to provide the best services and experience to our users. We will evaluate similar systems based on their features, interfaces, and interactions.

3.1 Similar Systems to the mobile application

King Faisal University Business Services Center e-training

https://e-training.kfu.edu.sa/ [9]. King Faisal University Business Center offers a lot of utilities, one of them being training programs. They offer their programs through a website.

Some of the features of their website are:

- Tabs displaying program sections.
- Display programs by fields and when the user selects a field only the programs related to it will be displayed.
- There's a program basket where the trainees choose more than one program and then they pay in one transaction. Admins can monitor programs in student baskets and send e-mails.

- Payments and reimbursement of fees: the trainees will be shown all the payments they made, and they can apply for a refund of the payment, provided the program has not started yet.

Figure 2 KFU e-training website

Entrepreneurship Institute at King Fahd University of Petroleum & Minerals (KFUPM)

https://ei.kfupm.edu.sa/our-programs/training-workshops/ [10]. The Entrepreneurship Institute at King Fahd University of Petroleum and Minerals (KFUPM) comprises three centers: the Entrepreneurship Education Center, the Business Incubator Center, and the Entrepreneurship Studies Center. The institute offers various programs, which are training courses. Currently, the institute follows a manual procedure for conducting these training courses, as they do not have a dedicated online platform. The institute makes announcements about upcoming courses via its communication channels. A link to the registration form is given to those who are interested in enrolling in the course. After registration is complete, the institute uses an Excel sheet to maintain the trainee data. This enables them to maintain track of participant information including names, contact information, and any other pertinent information. When the course is completed, the institute generates the certificates for the trainees. However, the distribution of these certificates is done manually. The institute sends the certificates individually to each trainee via email.

Imam Mohammad Ibn Saud Islamic University (IMSIU)

https://apply.imamu.edu.sa/Pages/search.aspx [11]. IMSIU provides a range of paid programs, including a diploma program, to individuals seeking educational opportunities. These programs are conveniently offered through their website, enabling interested individuals to easily register or cancel their registration. A However, it's important to note that the website does not currently support online payment transactions. Upon successful registration, individuals are required to wire the program fees to a designated account provided by the university. IMSIU effectively manages their programs through a dedicated website that allows them to create schedules and assign qualified faculty members to deliver the courses. This simplified procedure guarantees effective program administration and a smooth educational experience for the registered students.

3.2 Similar Systems to the website

"مهام" KSU system

"مهام" is a system designed to help users arrange and keep track of the jobs they complete. The system facilitates the supervision of tasks and the implementation of different actions on assigned tasks. This in turn makes it easier to move from paper-based work to electronic processing, completing a number of duties for the system's user entity.

Monday

https://monday.com/ [13]. Monday is a website that offers a platform called Work OS, designed to revolutionize the way teams work and collaborate. It provides a range of features and functionalities aimed at enhancing productivity, streamlining workflows, and improving communication within organizations. It is used by global enterprises and industries such as Glossier, Coca-Cola, and Wix.

Some of the features they offer:

- Workflow Customization, users can create and customize boards, views, and dashboards to match their preferred work style and requirements.
- Automations, users can choose from a library of automation recipes or create their own custom automations.
- Collaboration and Communication, users can communicate with team members, assign tasks, share files and documents, and track progress.

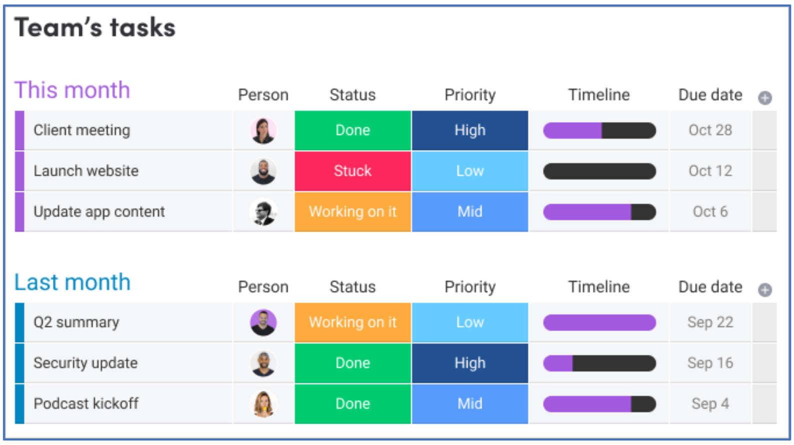


Figure 3 Monday system interface

Click Up

https://clickup.com/ [14]. ClickUp is a website and project management software that offers a comprehensive set of features and functionalities to help individuals and teams stay organized and collaborate effectively. It is incorporated by Mayo Clinic, Wake Forest university, and Stanley Security.

Some of the features they offer:

- Task Management, it enables users to create, manage, and track tasks efficiently.
- Communication, users can message team members, and receive notifications.
- Time Tracking, this feature is helpful for monitoring productivity and managing billable hours.

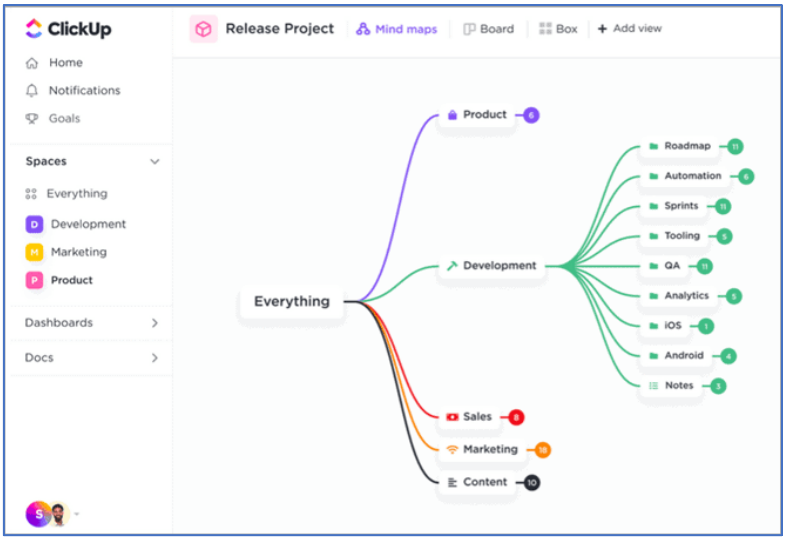


Figure 4 ClickUp system interface

Accelo

https://www.accelo.com/ [15]. Accelo is a comprehensive business management platform designed specifically for professional service businesses. It is used by Vortex Fire, Leap IT, and Global Business Solution (gbs) Group.

Some of the features they offer:

- Visibility & Confidence, offers real-time staffing, status, and budget details, giving businesses a snapshot of their projects.
- Custom Sales Statuses & Workflows, it allows businesses to systemize their workflows, processes, and sale types according to their specific needs.
- Project Triggers & Notifications, it sends notifications when exceptions occur in projects.

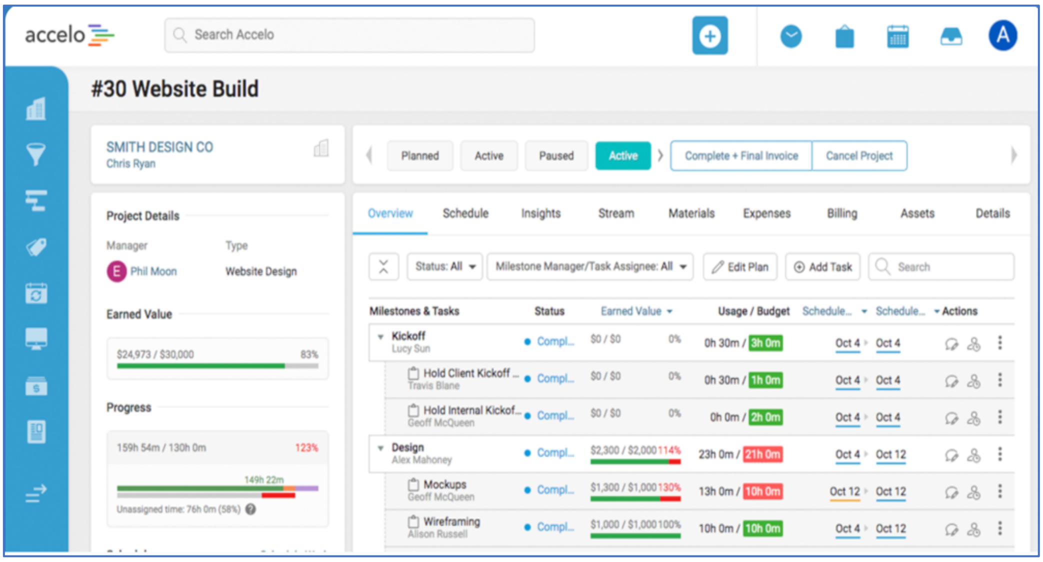


Figure 5 ClickUp system interface

3.3 Competitive Product Analysis

Features	KFU e-training	IMSIU	Our system application (Business Gate)
Register to a program	✓	✓	✓
Cancel Registration	✓	✓	✓
Payment Handling	✓		
Support Arabic Language	✓	✓	✓
Support Training mobile application			✓

Table 1 Mobile application Competitive Comparison

Features	Monday	ClickUP	Accelo	"مهام"	Our system Website (Business Gate)
Provide a dashboard	✓	✓	✓	✓	✓
Assign Project		✓	✓	✓	✓
See Projects Status	✓	✓	✓	✓	✓
Enable Communication		✓		✓	✓
Notifications	✓	✓	✓	✓	✓
Integration with third Party	✓	✓	✓		
Provide a list of staff to work on project					✓

Table 2 Website Competitive Comparison

3.3.1 Summary

The tables provided above offer a comparison between our system and other similar systems available in the market. By mentioning the features listed before, we can gain valuable insights into the system we aspire to develop. Additionally, we can leverage technological advancements and learn from the experiences of existing systems to enhance our own offerings. Our system provides a comprehensive solution for workflow management, communication, and training administration, it enhances productivity, collaboration, and efficiency within the organization. Our system also includes a mobile application that complements the website by providing a user-friendly interface for trainees to enroll in training courses and workshops, simplifying the registration process. This comparative analysis allows us to envision and shape our system into a cutting-edge solution that meets the needs and expectations of our users.

4 System Design and Development

4.1 Methodology

In developing the Business Gate software, we adopted an Agile approach, specifically utilizing the Scrum framework. Agile methodology allowed us to respond to changes in requirements swiftly and effectively, ensuring that the software meets the evolving needs of our users.

4.1.1 Agile Approach

Agile methodology emphasizes iterative development, continuous improvement, and customer collaboration. It enables us to break down the project into smaller, manageable tasks, allowing for frequent inspection and adaptation throughout the development process. This approach ensures that the software is developed incrementally, with a focus on delivering high-quality, working software at the end of each iteration.

4.1.2 Scrum Framework

The Scrum framework is a specific implementation of the Agile approach to software development. It is designed to help teams deliver working software quickly and adapt to changing requirements and priorities. In the Scrum framework, there are three main roles: the Scrum Master, the Product Owner, and the Development Team. The Scrum Master is responsible for ensuring that the team follows the Scrum framework and removes any barriers to progress. The Product Owner is responsible for defining and prioritizing the work that needs to be done. The Development Team is responsible for doing the work and delivering working software

4.1.3 Roles

Scrum Team	
Product Owner:	Dr.Nourah Alrossais
Developers:	Alanoud Alghayth Ghaida Alabdulqader Lina Alshiddi Munira Alhammad
Scrum Master (SM):	Dr.Nourah Alrossais
Stakeholders:	KAI - KSU Business Units head and staff – Trainees

Table 3 Roles and Responsibilities

4.1.4 Events

There are five events in the scrum framework: the Sprint, the Sprint Planning, the Daily Scrum, the Sprint Review, and the Sprint Retrospective. During the sprint the scrum team creates work and provides value to the product. The sprint planning includes the development team and product owner. They work together to identify high value work. The daily scrum is a 15–30-minute daily meeting of the team to discuss the progress so far. The sprint review showcases the work that has been done within the sprint to the stakeholders. The Sprint Retrospective is a meeting where the team reflects on their process and identifies ways to improve. There are also three artifacts in the Scrum framework: the Sprint Backlog, the Product Backlog, and the Increment. The Sprint Backlog is the list of work that the team has committed to completing during the current sprint. The Product Backlog is the list of all the work that needs to be done to complete the project. The increment is the sum of all work completed during a sprint, plus all previous increments [16].

4.1.5 Artifacts

1. Product Backlog: A prioritized list of all desired work on the project.

2. Sprint Backlog: The list of tasks that the team commits to complete during a sprint.

3. Increment: The sum of all the completed tasks during a sprint.

Throughout the project, we practiced Agile principles by embracing change, delivering working software frequently, collaborating closely with stakeholders, and reflecting on our processes to continuously improve.

4.1.6 Tools

We utilized Jira for project management and GitHub for version control and collaboration. These tools helped us effectively manage our tasks, track our progress, and ensure seamless collaboration within the team.

Link to Business Gate Jira https://jira.external-share.com/issue/dc6472a4-75fa-4c47-9712-b4a38dd40ff3

Link to Business Gate GitHub Link: https://github.com/Ghaida474/2023-GP1-10/tree/main

***Please note that the Business Gate website is on the main branch and the Application is on another branch called ‘Flutter-Application**

4.2 System Requirements

4.2.1 System Users

- **Business Gate Admin**

The Business Gate Admin is a technically proficient individual with experience in managing both web platforms and mobile applications. He / She possesses a high level of expertise in the underlying systems and is comfortable with authorizing access, adding, and deleting user accounts across both platforms. Their role requires a deep understanding of system administration.

- **Colleges' Deans**

Colleges' Deans are high-ranking academic officials with an extensive background in academia. They possess a high level of education, often a doctorate, and have considerable experience in university administration. Although not required to be highly technical, they are comfortable using digital tools for administrative and communication purposes. They oversee the academic programs within their colleges, make decisions regarding curriculum and faculty, and are involved in setting academic goals and standards.

- **Head of KAI department of Business Units**

The Head of the KAI department of Business Units is a senior leader with a strong background in business management. They have a high level of education. They are technologically adept and comfortable using digital tools to oversee projects, approve or reject proposals, and track financial revenues.

- **KAI department of Business Units Staff**

The KAI department of Business Units Staff are professionals with a good level of education and some technical expertise. They are comfortable using digital tools to propose projects, set deadlines, communicate with other units, and track project progress.

- **Head of Business Unit**

Heads of Business Units are often members of the faculty who have taken on additional administrative responsibilities. They have a high level of education, often a master's degree or higher, and demonstrate expertise in their respective academic fields. Comfortable with digital tools, including web platforms and mobile applications, they manage the faculty members within their unit, track project progress, oversee the financial aspects of the business unit, and maintain communication with other units.

- **Faculty Members**

Faculty members are professionals with high levels of education and expertise in their respective fields. They may have varying levels of technical expertise but are primarily involved in project implementation, course delivery, and communication with other team members.

- **Trainees**

Trainees are learners with varying levels of education and digital literacy. They are end-users of the platform, primarily using it to view, register for, workshops, and summer camps. They may also use the platform to view and update their personal information and track their progress.

4.2.2 Requirements Elicitation and Analysis

Requirement elicitation was conducted through interviews and questionnaires. The interviews were conducted with four key stakeholders to gain insights into their needs and pain point. The stakeholders included three heads of business units, an associate head of business unit, and staff member from the King Abdullah Institute for research and consulting studies (KAI). The interviews outlines are provided in Appendix A. The questionnaires were distributed to fifty-four participants to gather trainees' perspectives. The questionnaires details are provided in Appendix B.

The interviews:

The heads of the business units provided details about the services they offer, including research, consulting, training courses, workshops, and events. They expressed a need for cross-unit networking for collaborations and sharing best practices.

The associate head discussed challenges related to project sourcing, team formation, and communication with KAI.

The KAI staff members focused on pre-approval processes including proposal submission, progress tracking, and financial reporting. This pointed to requirements for workflow automation and file sharing.

The Questionnaires:

The questionnaires collected data on user demographics (university students, high school students, employees), platform preferences (app vs website), course provider preferences (KSU vs external), difficulties in finding courses and the nature of these difficulties, preference for profile-based form filling, certification receipt, notifications receipt, and desired features. The details of this questionnaire are listed in Appendix B.

The questionnaires produced the following results:

66.6% of respondents were university students, 30.4% were employees, and the rest were high school students.

63.8% prefer using an app over a website for registration, while 36.2% prefer a website.

63.8% prefer to register for KSU courses, while 36.2% prefer courses from other entities.

91.3% of respondents frequently face problems when finding courses or workshops.

Of those who face problems, 68.1% don't find the courses they need, 55.1% can't find courses that suit them, 65.2% learn about the courses too late, 1.4% find there is not enough information about the courses, and 1.4% feel that the courses are not widely publicized.

89.9% of respondents would like the option to have the course registration form automatically filled out with their personal information.

95.7% would like to receive their course certifications through the app and have them stored there.

47.8% expressed a medium preference for receiving notifications when a new course is added, 47.8% expressed a high preference, and the rest had a low preference.

100% of respondents would like to see evaluations of the courses they entered and the course presenter.

When asked about desired features, responses included a field of interest specification during registration for personalized notifications, clarity about the course duration and timing, a discussion space for participants, previous reviews if someone has taken the course before, course ratings and descriptions, and overall ease of use for everyone.

Similar systems:

Additionally, we have analyzed existing solutions like Monday.com, Click Up, and King Faisal University's system revealed best practices and key capabilities like project/task management, status tracking, notifications, reporting, and course administration. Examining competitors.

Synthesis of Findings:

Based on stakeholder perspectives through interviews, trainees' questionnaires, and analysis of similar systems, it is suggested that the Business Gate should provide the following features:

Project, Task, and Team Workflow Automation: This will streamline the project sourcing, team formation, and progress tracking processes.

Training Course Administration and Registration: This will help manage the training courses, workshops, and events offered by the business units.

Database Management: A robust database management system is required to store and retrieve data efficiently.

Team Communication and File Sharing: A platform for effective team communication and file sharing is necessary to enhance collaboration.

Notifications and Reminders: This feature will keep the team updated on their tasks and deadlines. It will keep trainees updated.

Reporting across Projects, Courses, and Financials: This will provide a high-level view of all the ongoing activities and their status.

Direct trainee's information transformant at course registration: This feature will ease trainee registration process.

Digital certification storage: This feature will ease the trainee's certification obtention.

4.2.3 User Interactions

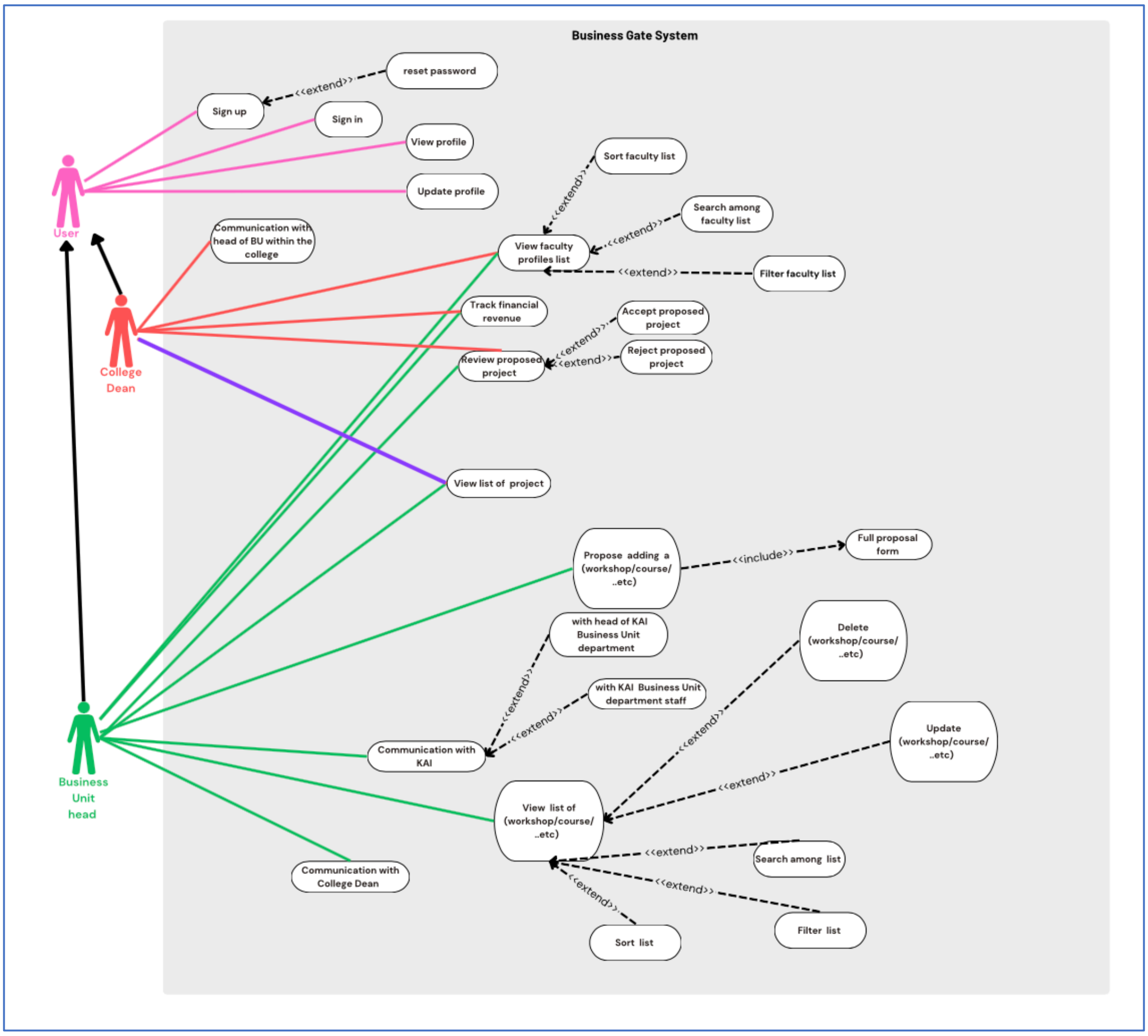


Figure 6 User Interaction 1

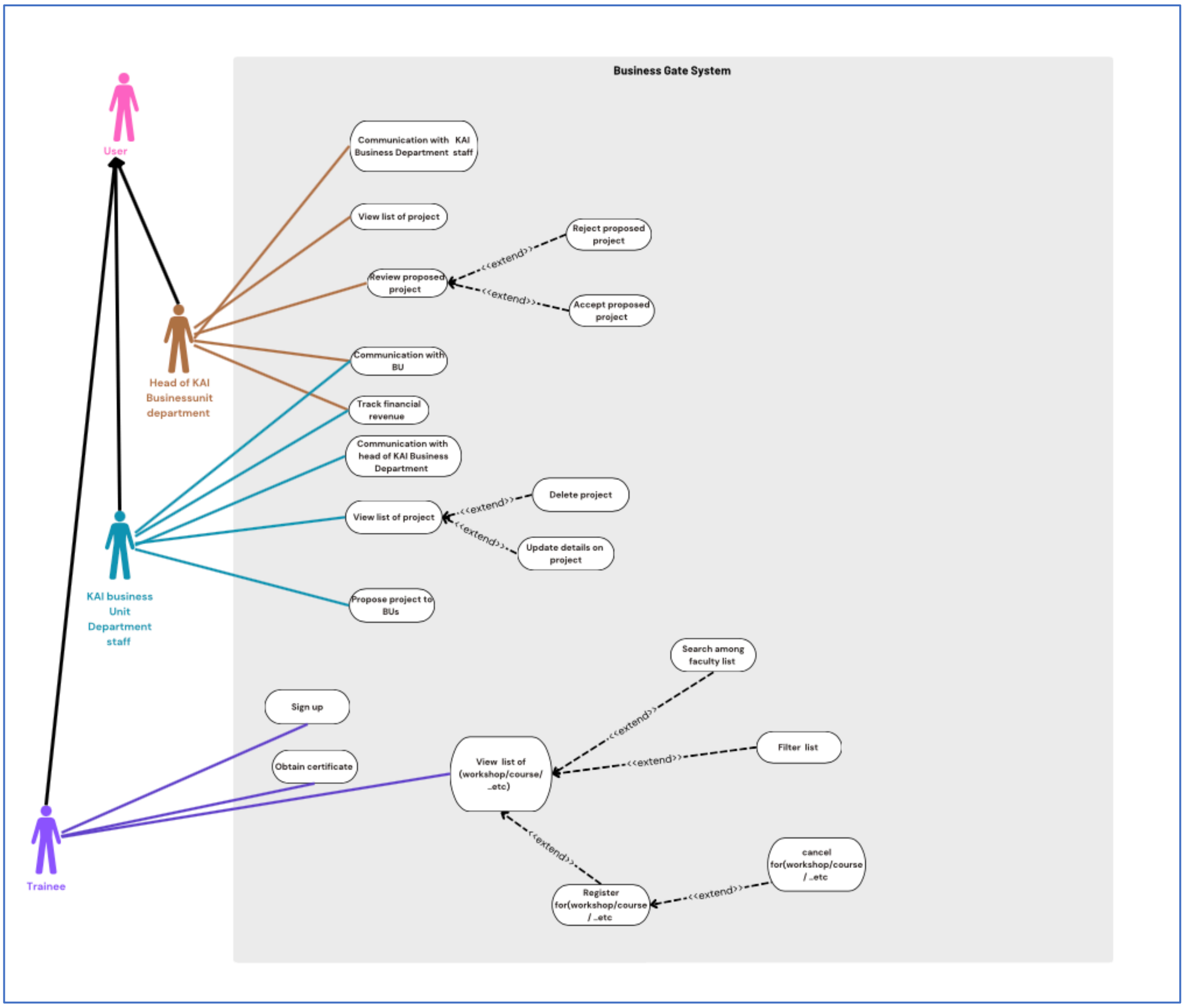


Figure 7 User Interaction 2

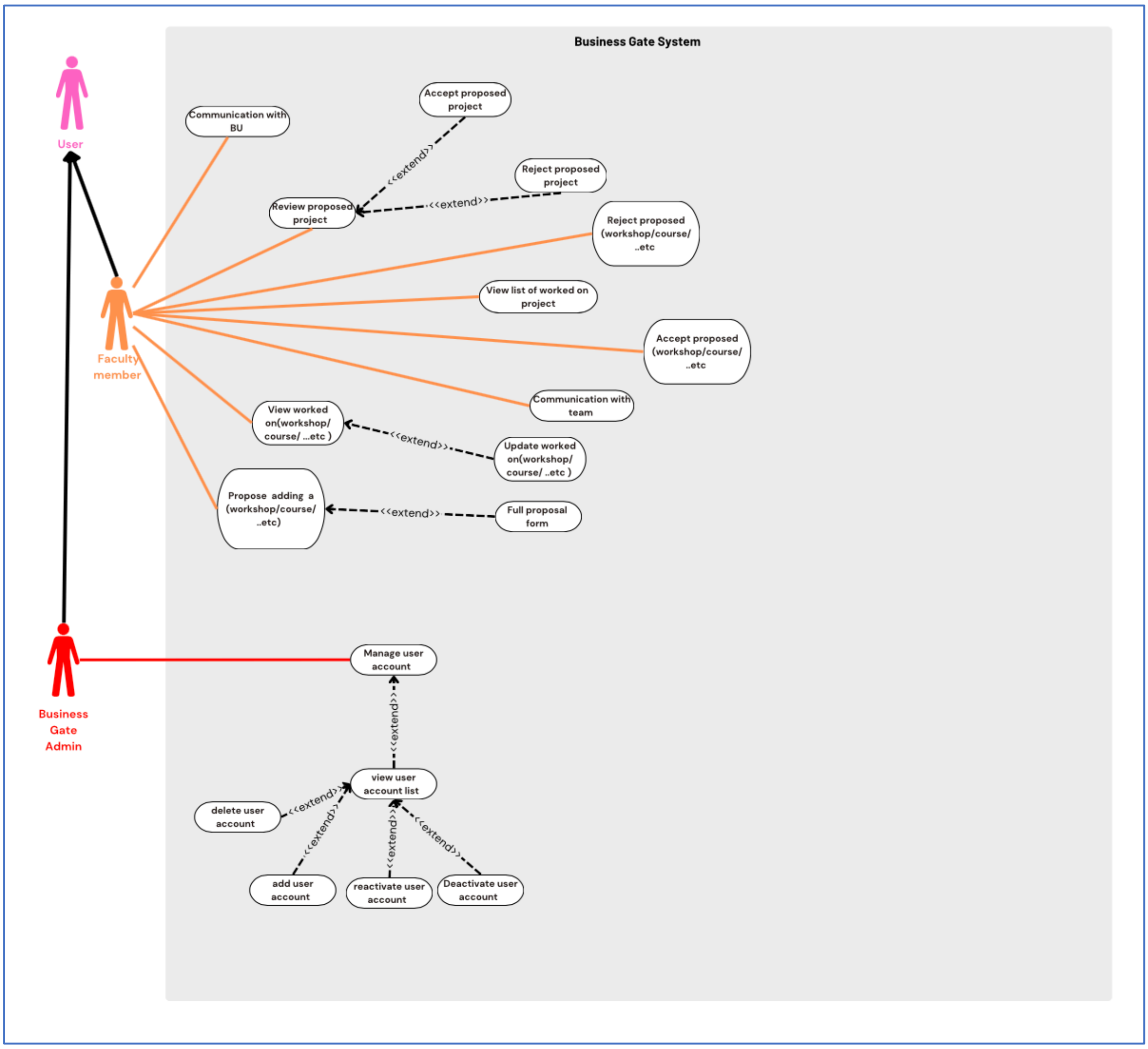


Figure 8 User Interaction 3

4.2.4 Roadmap and Product Backlog

Roadmap

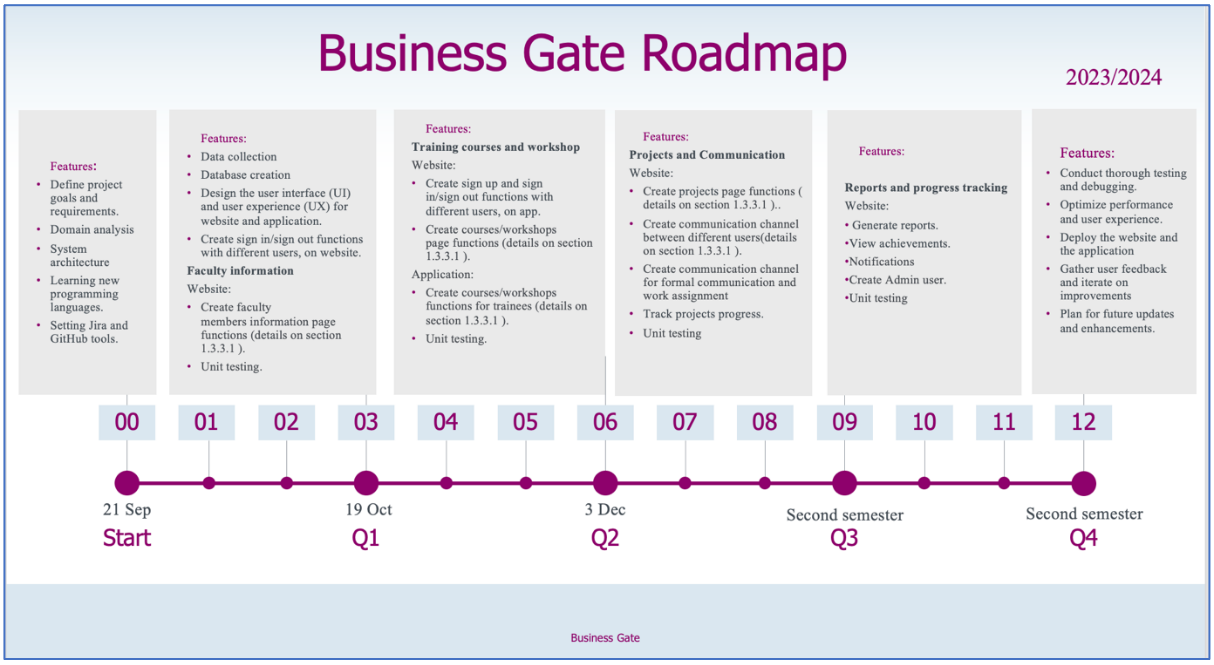


Figure 9 Roadmap

Product Backlog

This section outlines the pending work items, organized by priority, and provides a clear roadmap for what needs to be accomplished in the future. The backlog is a fundamental component of agile methodologies like Scrum, ensuring that development teams are focused on delivering the highest-priority items to maximize value for the project or product.

✓	Business value is clearly articulated
✓	Details are sufficiently understood
✓	Dependencies are identified; no blocking dependencies exist
✓	Team is appropriately staffed relative to the PBI
✓	Estimated and small enough to be completed during sprint
✓	Acceptance criteria are clear and testable
✓	Performance criteria, if any, are defined and testable
✓	Team understands how to demo the completed PBI

Table 4 Definition of ready

ID	PBI	Size	Type	Status	Acceptance Criteria
1	**As a** user of the Business Gate website**, I want** secure and efficient sign-in **so that** I can perform my business unit tasks.	2	Feature	Done	If I open the "تسجيل الدخول" page and fill in the "Email" and "Password" and "role" fields with my authentication credentials and I click the تسجيل الدخول button, then the system signs me in. If I open the "تسجيل الدخول" page and fill in the "Email" and "Password" and "role" fields with incorrect password or/and username or/and role and I click the تسجيل الدخول button, then the system should not sign me in and display an error message. If I open the "تسجيل الدخول" page and fill in the "Email" and "Password" and "role" fields empty and I click the تسجيل الدخول button, then the system should not sign me in and display an error message. If I open the "تسجيل الدخول" page and click on the " نسيت كلمة المرور؟" link, then I should be directed to a password reset page.
2	**As a** user of the Business Gate website, **I want** to be able to reset my password **so that** I can access my account.	3	Feature	Done	If I click on the "نسيت كلمة المرور؟" link from the "تسجيل الدخول " page, then I should be directed to a password reset page and I should see fields to enter my registered email address, after entering an email address and clicking "Request OTP," the system should verify if the email address is valid and available in the system, if it verified then the system should generate a one-time password (OTP) and send it to my registered email address, if it is not verified then a message explaining the issue. If I receive an email from Business Gate containing the

					OTP, then I should enter the OTP code in the password reset page, then the system should validate the OTP code, if it is valid I should see fields to enter a new password, and the password reset page should validate that the new password meets security requirements (e.g., minimum length, combination of letters, numbers, and special characters), after successfully entering and confirming the new password, I should see a confirmation message indicating that my password has been reset, if OTP is incorrect or expired then a message explaining the issue.
3	**As a** user of the Business Gate website**, I want** secure and efficient sign-out **so that** I can securely sign-out and protect my account from unauthorized access.	1	Feature	Done	If a user wants to sign out, then the sign out button should be clear. If a user successfully signs out, then they should be redirected to the website's homepage.
4	**As a** Dean of the College, head of the business unit, **I want** the ability to view list all faculty members within the college, including their specialties and interests, **so that** I can effectively oversee academic activities.	2	Feature	Done	If I click on a faculty member from the list of faculty members, then I should be able to view detailed information about that faculty member, including their name, academic background, current specializations, research interests, and projects worked on.
5	**As a** Dean of the College, head of the business unit**, I want** to have the ability to filter faculty members within the college **so that** I can efficiently identify faculty members based on specific criteria, facilitating tasks.	1	Feature	Done	If I want to find a specific faculty member, then I should have the ability to filter the list based on specialties, interests.
6	**As a** Dean of the College, head of the business unit **, I want** to have the ability to sort faculty members within the college **so that** I can easily organize and find faculty members based on different criteria.	1	Feature	Done	If I select the desired sorting option, such as name, experience, or interest, then the system should arrange the list accordingly in ascending or descending orders.

7	**As a** Dean of the College, head of the business unit**, I want** to have the ability to search faculty members within the college **so that** I can easily locate specific faculty members based on their name, department, experience, or interest.	2	Feature	Done	If I enter a faculty member's name, experience, or interest into the search bar then the system should display a list of faculty members matching the criteria entered.
8	**As a** user of the Business Gate website, **I want to** view my profile **so that** I can see my personal information.	2	Feature	Done	If I click on the profile button, then I should be directed to the "profile" page to view my personal information such as name, email, phone number, CV, college, major, sub major, experience, interest, Iban, position and degree.
9	**As a** user of the Business Gate website, **I want to** update personal information **so that** I can keep my data updated.	3	Feature	Done	If I open the "profile" page and click an "Edit Profile" button, then I should be able to make changes to my personal information, such as updating my experience, specialties and contact information, when I click a "Save" button, then the changes I made should be saved, and updated accordingly, and I should receive a confirmation message that the changes have been saved successfully. If I am editing my profile information, then I decide not to save the changes I should have the option to click a "Cancel" button, and if I click "Cancel," any unsaved changes should be discarded.
10	**As the** head of the business unit, **I want to** add courses, workshops, and summer camps **so that** I can expand the non-academic programs provided by my business unit.	5	Feature	Done	If I open "non-academic programs" page and click "Add" button, then I should fill a form with the needed information such as start date, end date, topic, description, registration capacity and any relevant material then click" Add" button conformation message will show to confirm the addition and it will reflect on the system.

11	**As the** head of the Business Unit , **I want** the ability to propose the added courses, workshops and summer camps to the head of KAI business units **so that** I can expand the non-academic programs provided by my business unit.	5	Feature	Done	If I want to launch the non-academic programs for trainees, then I should click the "send a proposal" button to send the intended educational offering to KAI business units. If a proposal is accepted or refused, then I should see the state of it.
12	**As the** head of the business unit, **I want to** delete courses, workshops, and summer camps **so that** I can manage BU programs effectively.	2	Feature	Done	If I open “non-academic programs” page and click on particle course or workshop or summer camp, then I should see a “Delete” button. If I click on the” Delete” button, then a message will show to ask if you are sure of the deletion, if delectation is confirmed then it should reflect on the system.
13	**As the** head of the business unit, **I want to** update courses, workshops, and summer camps **so that** I can keep our non-academic programs accurate and reflective of our organization's goals.	3	Feature	Done	If I open “non-academic programs” page and clicked on particle course or workshop or summer camp, then I should see a “Update” button. If I click on the” Update” button, then I should be able to make changes to the assigned instructor, trainee, topic, description, start date, end date, and registration capacity, when I click the "Save" button, then the changes I made should be saved and updated accordingly, and I should receive a confirmation message that the changes have been saved successfully. If I am editing a course or workshop or summer camp, then I decide not to save the changes I should have the option to click a "Cancel" button, and if I click "Cancel," any unsaved changes should be discarded.

14	**As the** head of the business unit, **I want** to be able to view a list of courses, workshops, and summer camps **so that** I can track which programs the BU is currently offering.	2	Feature	Done	If I click on a course, workshop, or summer camp from the list, then I should be able to view detailed information such as name, price, trainee list, instructor, topic, description.
15	**As the** head of the business unit, **I want** to be able to sort a list of courses, workshops, and summer camps **so that** I can easily organize and find courses, workshops, and summer camps based on different criteria.	1	Feature	Done	If I select the desired sorting option, such as name or topic, then the system should arrange the list accordingly in ascending or descending order.
16	**As** the head of the business unit, I want to be able to search list of courses, workshops, or summer camps **so that** I can easily locate specific courses, workshops, and summer camps based on different criteria.	1	Feature	Done	If I enter courses, workshops, and summer camps name, topic or other different criteria into the search bar then the system should display a list of courses, workshops, and summer camps matching the criteria entered.
17	**As a** faculty member, **I want to** accept/reject courses, workshops, or summer camps training **so that** I can be able to choose what I can train.	3	Feature	Done	If I receive a request to instructor course, workshop, or summer camp then then I should find details such as state date, end date, topic and description and the option button "Accept" or "Reject". If I clicked on the "Accept" button, then I will be assigned to instructing the course, workshop, or summer camp. If I clicked on the "Reject" button, I will not be assigned anything.
18	**As a** faculty member, **I want to** propose courses, workshops, or summer camp creation **so that** I can suggest programs to the BU to train.	3	Feature	Done	If I open "non-academic programs" page and click "propose" button, then I should fill out a form with the necessary information, including the start date, end date, proposed price for the course, and training (materials or bag). When I submit it, a confirmation

					message should appear to confirm the request. If a proposal is accepted or refused, then I should see the state of it.
19	**As a** faculty member, **I want to** view the worked-on courses, workshops, or summer camps details **so that** I can ensure the accuracy of the information and make necessary updates as required to enhance the non-academic programs.	2	Feature	Done	If I click on a course, workshop, or summer camp from the list, then I should be able to view detailed information such as name, price, trainee list, instructor, topic, description.
20	**As a** faculty member, **I want to** update the worked-on courses, workshops, or summer camps details **so that** I can edit them and present them.	3	Feature	Done	If I open “non-academic programs” page and clicked on particle course or workshop or summer camp, then I should see a “Update” button. If I click on the” Update” button, then I should be able to make changes to the check trainees attendance and upload documents related to the program then click the "Save" button, then the changes I made should be saved and updated accordingly, and I should receive a confirmation message that the changes have been saved successfully. If I am editing a course or workshop or summer camp, then I decide not to save the changes I should have the option to click a "Cancel" button, and if I click "Cancel," any unsaved changes should be discarded.
					If I click on the sign-up page and fill in the form of information (name, phone number, email address, and password) with the correct credentials and format then click “Sign-up” button, then the user will be registered to the

21	**As a** trainee, **I want** to have a secure and efficient sign-up **so that** I can create a personal account.	3	Feature	Done	system and directed to homepage. If I click on the sign-up page and fill in the form of information (name, phone number, email address, and password) with the incorrect credentials or format then click “Sign-up” button, then a message will appear indicating the error. If I click on the sign-up page and fill in the form of information (name, phone number, email address, and password) with one or more empty fields then click “Sign-up” button, then a message will appear indicating the error.
22	**As a** trainee, **I want** to have a secure and efficient sign-in **so that** I can carry out my activities effectively.	3	Feature	Done	If I open the “sign in” page and fill in the “Email” and “Password” fields with my authentication credentials and I click the Sign-In button, then the system signs me in. If I open the “sign in” page and fill in the “Email” and “Password” fields with my incorrect password or/and username and I click the Sign-In button, then the system should not sign me in and display an error message. If I open the “sign in” page and leave the “Email” or/and “Password” fields empty and I click the Sign-In button, then the system should not sign me in and display an error message. If I open the “sign in” page and click on the "Forgot Password?" link, then I should be directed to a password reset page.

23	**As a** trainee, **I want to** be able to reset my password **so that** I can access my account.	3	Feature	Done	If I click on the "Forgot Password?" link from the “sign in ” page, then I should be directed to a password reset page and I should see fields to enter my registered email address, after entering an email address and clicking "Request OTP," the system should verify if the email address is valid and available in the system, if it verified then the system should generate a one-time password (OTP) and send it to my registered email address, if it is not verified then a message explaining the issue. If I receive an email from Business Gate containing the OTP, then I should enter the OTP code in the password reset page, then the system should validate the OTP code, if it is valid I should see fields to enter a new password, and the password reset page should validate that the new password meets security requirements (e.g., minimum length, combination of letters, numbers, and special characters), after successfully entering and confirming the new password, I should see a confirmation message indicating that my password has been reset, if OTP is incorrect or expired then a message explaining the issue.
24	**As a** trainee, **I want to** secure and efficient sign-out **so that** I can prevent unauthorized access to my account and ensure account security.	1	Feature	Done	If I want to sign out, then the sign out button should be clear. If I sign out, then they should be redirected to the application’s main page.

25	**As a** trainee, **I want to** view my personal information **so that** I can verify the accuracy of my personal details.	2	Feature	Done	If I click on the profile button, then I should be able to view my personal information such as name, email, phone number.
26	**As a** trainee, **I want to** update my personal information **so that** I can keep my information up to date.	2	Feature	Done	If I view my profile, then I should be able to click an "Edit Profile" button and then change details such as name, phone number, email address, when I click a "Save" button, then the changes I made should be saved, and updated accordingly, and I should receive a confirmation message that the changes have been saved successfully.
27	**As a** trainee, **I want to** view courses, workshops, and summer camps **so that** I can choose the appropriate one for my needs and interests.	2	Feature	Done	If I click on courses, workshops, or summer camps buttons, then the system should preview the available courses, workshops, or summer camps with their details such as start date, end date, topic and description.
28	**As a** trainee, **I can change** the language of the application **so that** I can easily use it.	3	Feature	Done	If I choose a language from the provided choices, then the system should display the application with the provided language.
29	**As a** trainee, **I want to** filter courses, workshops, and summer camps **so that** I can easily find the one that matches my needs and interests.	2	Feature	Done	If I filter the courses, workshops, or summer camps by its name, subject or collage then the system should display a list matching the criteria entered.
30	**As a** trainee, **I want to** register for courses, workshops, or summer camps **so that** I can enroll and learn the program.	5	Feature	Done	If I click on the register button, then a pre-written form of my information should appear to confirm of my details, if I click "Confirm" then the IBAN number for transfer should appear, and a seat is booked for a certain period of time to upload transfer receipt.

					If I uploaded the transfer receipt, then the registration is completed, and my information will be directly transferred to KAI for the purpose of completing the process of exporting certificates and authenticating transfers.
31	**As a** trainee, **I want to** fill out the course, workshop or summer camp evaluation questionnaire **so that** I can provide feedback on the overall learning experience.	3	Feature	Done	If I click on the rate button, then an evaluation questionnaire should be presented with “submit” button.
32	**As a** trainee, **I want to** cancel registered courses, workshops, or summer camps **so that** I can withdraw from the program and adjust my learning schedule or preference.	5	Feature	Done	If I click on the cancel button, then a confirmation message should appear to ensure the cancellation process with "Confirm" and "Cancel" buttons. If I click on the "Confirm" button, then my information will be directly sent to KAI for the purpose of completing the cancelation process. If I click on the "Cancel" button, then nothing will happen.
33	**As a** trainee, **I want to** view obtained certificates **so that** I can acknowledge and preserve my learning achievements.	2	Feature	Done	If I click on the view certificates button, then I should see all my certificates will be provided with their details.
34	**As a** KAI Business Units staff and head of the business unit, **I want** the ability to assign task, **so that** we can align our resources with the strategic goals of the university.	3	Feature	Done	If I want to assign task, then I should fill a form with needed Information such as Task type, deadline date, description, assigned name and any relevant material then click” إنشاء” button then it should reflect on tasks page.

35	As a KAI Business Units staff and head of the business unit, **I want** the ability to subtask a task **so that** I can break down complex tasks into smaller.	5	Feature	Done	If I want to assign task, then I should fill a form with needed Information such as Task type, deadline date, description, assigned name and any relevant material then click" إنشاء" button then it should reflect on task page.
36	As a KAI Business Units staff and head of the business unit, I want the ability to withdraw unaccomplished tasks or subtasks so that I can effectively manage our workload and prioritize tasks based on their urgency and importance.	3	Feature	Done	If I click on the withdraw button, then a confirmation message should appear to ensure the withdraw process with "Confirm" and "Cancel" buttons.
37	As a KAI Business Units staff and head of the business unit, I want the ability to pend unaccomplished tasks or subtasks so that I can temporarily pause their progress without removing them from the task list entirely.	3	Feature	Done	If a user requests to pend the task or subtask initiator should accept.
38	**As the** head of the business unit , **I want to** add projects **so that** I can expand projects provided by my business unit.	3	Feature	Done	If I open "المشاريع" page and click "إنشاء مشروع" button, then I should fill a form with the needed information such description and any relevant material then click" إنشاء" button then it should reflect on projects page.
39	**As the** head of the business unit , **I want** to view a list of projects **so that** I can track what projects the BU operates.	3	Feature	Done	If I click on a project, then its details, including the project name, description, start date, end date, status, assigned team members and "room/channel" button, should be displayed. If I click on the "room/channel" button, then I will be redirected to the project channel/room to

					view document details and communicate with team members.
40	**As a** faculty member, **I want to** accept/ reject work on a project after reviewing it **so that** I can make decisions aligned with my availability and expertise, ensuring that I can effectively contribute to the projects I choose to be a part of.	3	Feature	Done	If I review a project, then I should have clear “Accept” and “Reject” buttons. If I click “Accept” to the project proposal, then a should I be a member of the channel/room to work on the project. If I click “Reject” to the project proposal, then user redirected to project page.
41	**As a** faculty member, **I want to** view a list of the worked-on projects **so that** I can work on my projects and see their progress.	2	Feature	Done	If I click on a specific project from the list, then I should be transferred to the room / channel to be able to communicate with team members, and access any reports, documents, related to the project's outcomes.
42	**As the** head of the business unit , **I want** the ability to seamlessly communicate with the head of KAI business units and staff, faculty members within the college, and the heads of other business units within the university **so that** I can facilitate effective collaboration and information exchange.	5	Feature	Done	If I want to review previous communications, then I should have access to a message history. If I need to share files, then I should be able to attach documents, files, or reports to messages.
43	**As a** Dean of the College, **I want** the ability to seamlessly communicate with the head of business units within the college, **so that** I can facilitate effective collaboration and information exchange.	5	Feature	Done	If I want to review previous communications, then I should have access to a message history. If I need to share files, then I should be able to attach documents, files, or reports to messages.

44	**As a** Head of KAI Business Units, **I want** the ability to seamlessly communicate with the heads of business units and KAI business units staff, **so that** I can facilitate effective collaboration and information exchange.	5	Feature	Done	If I want to review previous communications, then I should have access to a message history. If I need to share files, then I should be able to attach documents, files, or reports to messages.
45	**As a** KAI Business Units staff, **I want** the ability to seamlessly communicate with the heads of business units and head of KAI business units, **so that** I can facilitate effective collaboration and information exchange.	5	Feature	Done	If I want to review previous communications, then I should have access to a message history. If I need to share files, then I should be able to attach documents, files, or reports to messages.
46	**As a** faculty member, **I want to** communicate with the Head of Business Unit within the college and project team members **so that** I can work with them and report to them efficiently.	5	Feature	Done	If I want to review previous communications, then I should have access to a message history. If I need to share files, then I should be able to attach documents, files, or reports to messages.
47	**As the** head of the business unit and the Dean of the College, **I want to** track financial revenues generated from the business unit **so that** I can monitor financial performance.	3	Feature	Done	If I click the revenues button, then the system will provide an analysis revenue report and list of the achievements for a specific period.
48	**As a** Head of KAI Business Units and KAI Business Units staff, **I want** to track the financial revenues generated by university business units, **so that** I can monitor financial performance and make data-driven decisions.	5	Feature	Done	If I click the revenues button, then the system will provide an analysis revenue report and list of the achievements for a specific time period.

49	**As a** user of the Business Gate website, **I want** to receive timely navigation reminders and prompts on the tasks that should be done **so that** it helps me finish my tasks efficiently.	5	Feature	Done	If I receive reminders and prompts then it should be displayed prominently on the website's interface, ensuring that they catch my attention without being obtrusive or interfering with my workflow.
50	**As an** admin, **I want** secure and efficient sign-in **so that** I can perform my business unit tasks.	3	Feature	Done	If I open the “sign in” page and fill in the “Email” and “Password” and “role” fields with my authentication credentials and I click the Sign-In button, then the system signs me in. If I open the “sign in” page and fill in the “Email” and “Password” and “role” fields with my incorrect password or/and username or/and role and I click the Sign-In button, then the system should not sign me in and display an error message. If I open the “sign in” page and leave the “Email” or/and “Password” or/and “role” fields empty and I click the Sign-In button, then the system should not sign me in and display an error message.
51	**As an** admin, **I want** secure and efficient sign-out **so that** I can securely sign-out and protect my account from unauthorized access.	1	Feature	Done	If a user wants to sign out, then the sign out button should be clear. If a user signs out, then they should be redirected to the website's homepage.
52	**As an** Admin, **I want** to be able to list all user accounts and collages within the system, **so that** I can maintain control.	1	Feature	Done	If the Admin opens the “ قائمة الكليات”, then the system should display all the collages available within the system. If the Admin opens the " قايمة منسوبي جامعة الملك سعود”, then the system should display all the

					faculty members available within the system and can filter based on their collage. If the Admin opens the " قايمة موظفين قسم وحداة الاعمال في معهد الملك عبدالله", then the system should display all the BUKAI members available within the system.
53	**As an** admin, **I want** to able to add college, faculty and BUKAI user accounts to system, **so that** I can effectively manage and organize the user base within the system.	3	Feature	Done	If Admin press on "إضافة كلية" then the college required, and optional fields should display clearly. If Admin press on " إضافة منسوب بجامعة الملك سعود" then the faculty required, and optional fields should display clearly. If user press on " إضافة موظف بقسم وحدات الاعمال بمعهد الملك عبدالله" then the BUKAI required, and optional fields should display clearly. If the entered email in email field available in the system, then the system should restrict account to be added. If the added user account assigned to be Head of Business unit or assistance within a college and that college have already Head of Business unit assigned or assistance, then the system should restrict account to being added. If the added user account assigned to be Head of KAI Business unit and that system has already Head of KAI Business unit assigned, then the system should restrict account to be added.

54	**As an** admin, **I want** to able to edit college, faculty and BUKAI user accounts information, **so that** I can keep the user information accurate and up to date and effectively manage and organize the user base within the system.	4	Feature	Done	If the Admin presses a college name from the table of colleges, then the edit page should display with its fields and can modify its Information. If the Admin presses a faculty member name from the table of faculties, then the edit page should display with its fields and can modify its Information. If the Admin presses a BUKAI member name from the table of BUKAI staffs, then the edit page should display with its fields and can modify its Information. If the modified email is available in the system, then the system should restrict from being changed. If the Admin assigned a faculty member to be Head of Business unit or assistance within a college and that college have already Head of Business unit assigned or assistance, then the system should restrict from being changed. If the Admin assigned BUKAI member to be Head of KAI Business unit and that system has already Head of KAI Business unit assigned, then the system should restrict from being changed.
55	**As an** admin, **I want** to able to delete college, faculty and BUKAI user accounts to system, **so that** so that I can effectively manage and organize the user base within the system.	3	Feature	Done	If the Admin presses "حذف" from the college edit page, a confirmation message should be displayed to ensure intention. If the college has faculties assigned, then the system should restrict deletion and display a message. If the Admin presses " "حذف from the faculty member edit

					page, a confirmation message should be displayed to ensure intention. If the faculty member is assigned to a project, training program, or holds a position as the head of a business unit, then the system should restrict deletion and display a message. If the Admin presses " حذف" from the BUKAI member edit page, a confirmation message should be displayed to ensure intention. If the BUKAI member is assigned to a task, then the system should restrict deletion and display a message.
56	**As a** business unit head and faculty member, **I want to** view a calendar with my work in it, **so that** I can track my work and know my deadlines.	3	Feature	Done	If I review the calendar they should be able to view past work, and also future work.
57	**As a** user, **I want to** have the website available 90% of the time I try to access it **so that** I can access it reliably and perform my tasks without significant delays.	5	Feature	Done	If the user tries to access the app 10 times, then it must be available at least 9 times to ensure the availability.
58	**As** a user, **I want to** have secure authentication **so that** I can ensure the confidentiality and privacy of my account and prevent unauthorized access to sensitive data.	5	Feature	Done	The system shall implement a secure password recovery mechanism that ensures only authorized users can reset their passwords, using methods such as email verification or security questions.
59	**As a** user, **I want to** be provided with up-to-date information on projects **so that** I can accurately track progress and effectively work on tasks related to the projects.	5	Feature	Done	The system shall display project updates, including overall progress and details, ensuring that users have access to the most recent information.
60	**As** a user, **I want to** have intuitive and user-friendly interfaces **so that** I can easily	5	Feature	Done	The system shall provide a visually appealing and consistent user interface design throughout

	navigate through the system and perform tasks efficiently.				the system by using icons and navigation bars, ensuring a cohesive and professional user experience.
61	**As** a user, **I want to** get a response time of less than 5 seconds **so that** I can efficiently access and work on tasks without experiencing significant delays.	5	Feature	Done	Upon initiating a request, the system shall respond with the requested page within 5 seconds for 90% of the requests.

Table 5 Product Backlog

4.3 System Design

4.3.1 Architectural Diagram

The Business Gate system is built on a multi-tier client-server approach. This approach separates system functions into different layers. Each layer manages specific parts of the system's operations. This design ensures efficiency, scalability, and resilience.

Business Gate Presentation Tier

The Presentation Tier is the main interface for user interaction and system communication. It has two main components:

Website: This interface is for administrators, KAI heads, department staff, Business Unit heads, college deans, and faculty members. It allows comprehensive project management and communication. The website interacts directly with the Business Logic Tier. It sends user requests and receives processed data.

Mobile Application: This application is specifically for trainees. It allows course and workshop registration, and certificate reception. Unlike the website, the mobile app communicates directly with the Data Tier. It bypasses the Business Logic Tier for data retrieval and submission operations.

Business Gate Business Logic Tier

This tier is the system's processing brain. It handles all the core business rules:

Business Logic Server: This server sits in the middle for the website. It organizes workflows, manages important data, and processes user requests. It acts as a bridge between the Presentation Tier (the website) and the Data Tier. It makes sure that user interactions turn into actionable data processes.

Business Gate Data Tier

This tier includes the critical components for storing and managing data:

Database Server: This is the central storage for all system data. It stores user profiles, project details, course information, permissions, and more. It directly communicates with:

* The Business Logic Server, allowing data storage, retrieval, and changes as needed by the business processes started from the website.

* The Mobile Application, giving direct database access for specific mobile user functions. This streamlines operations and could boost performance for mobile-specific tasks.

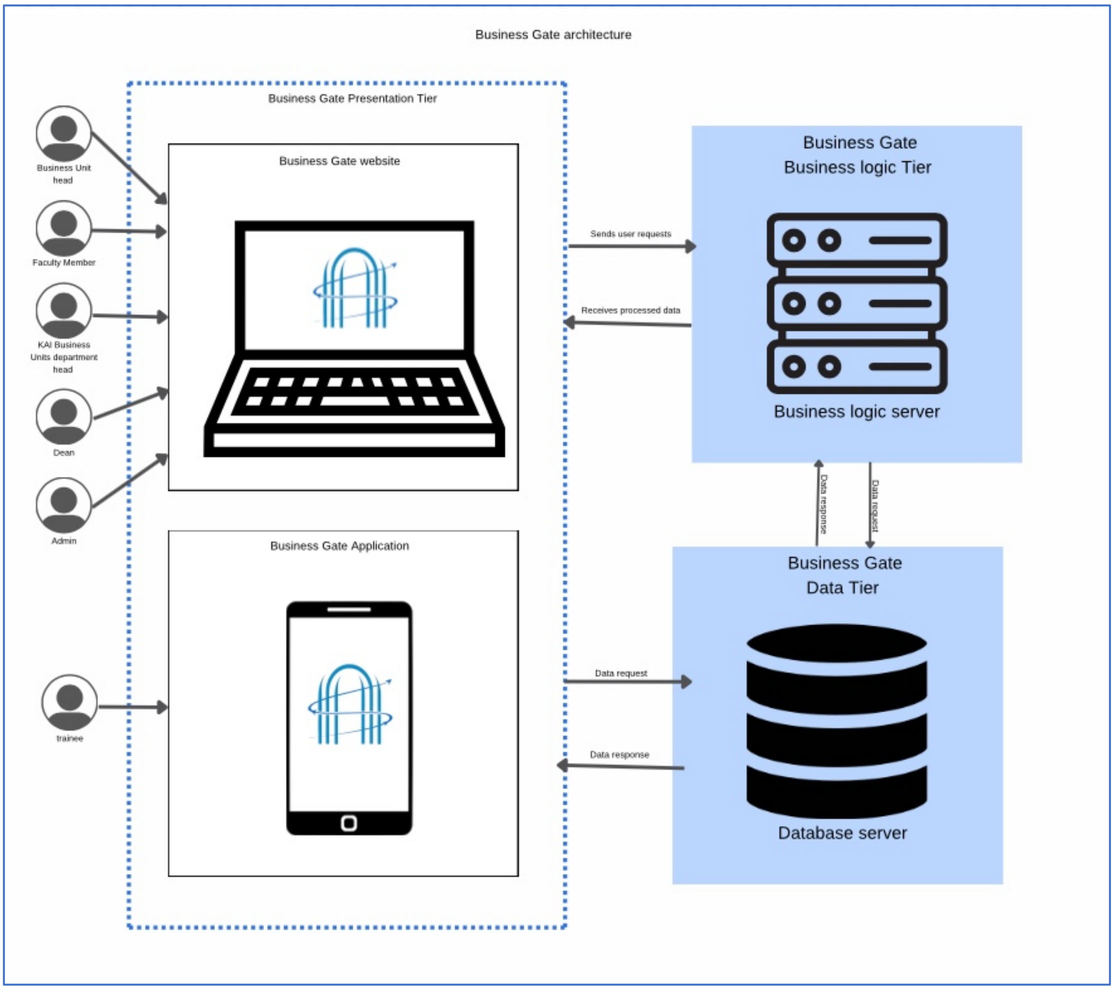


Figure 10 Business Gate Architecture

4.3.2 Class Diagram /DFD

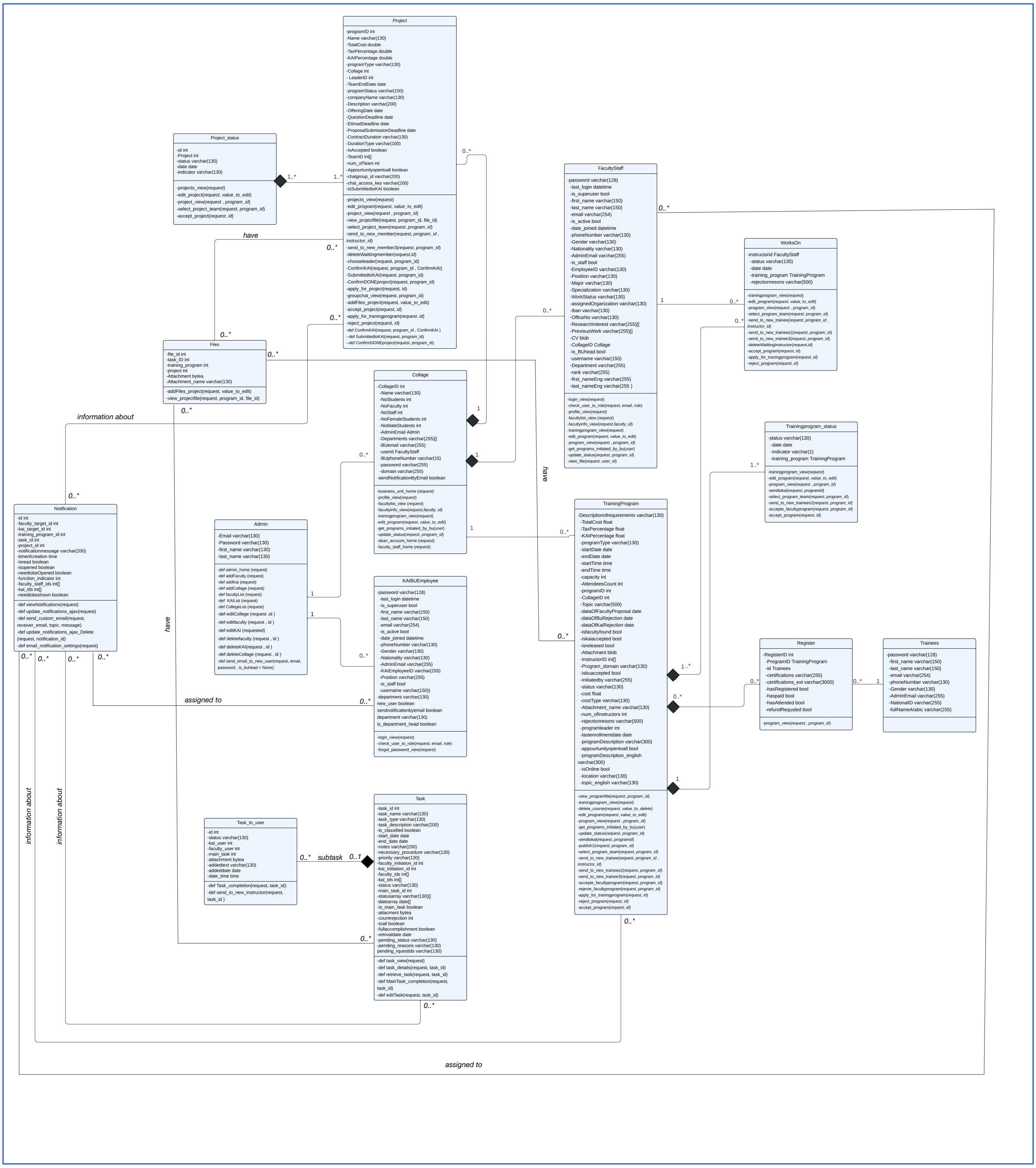


Figure 11 Website Class Diagram

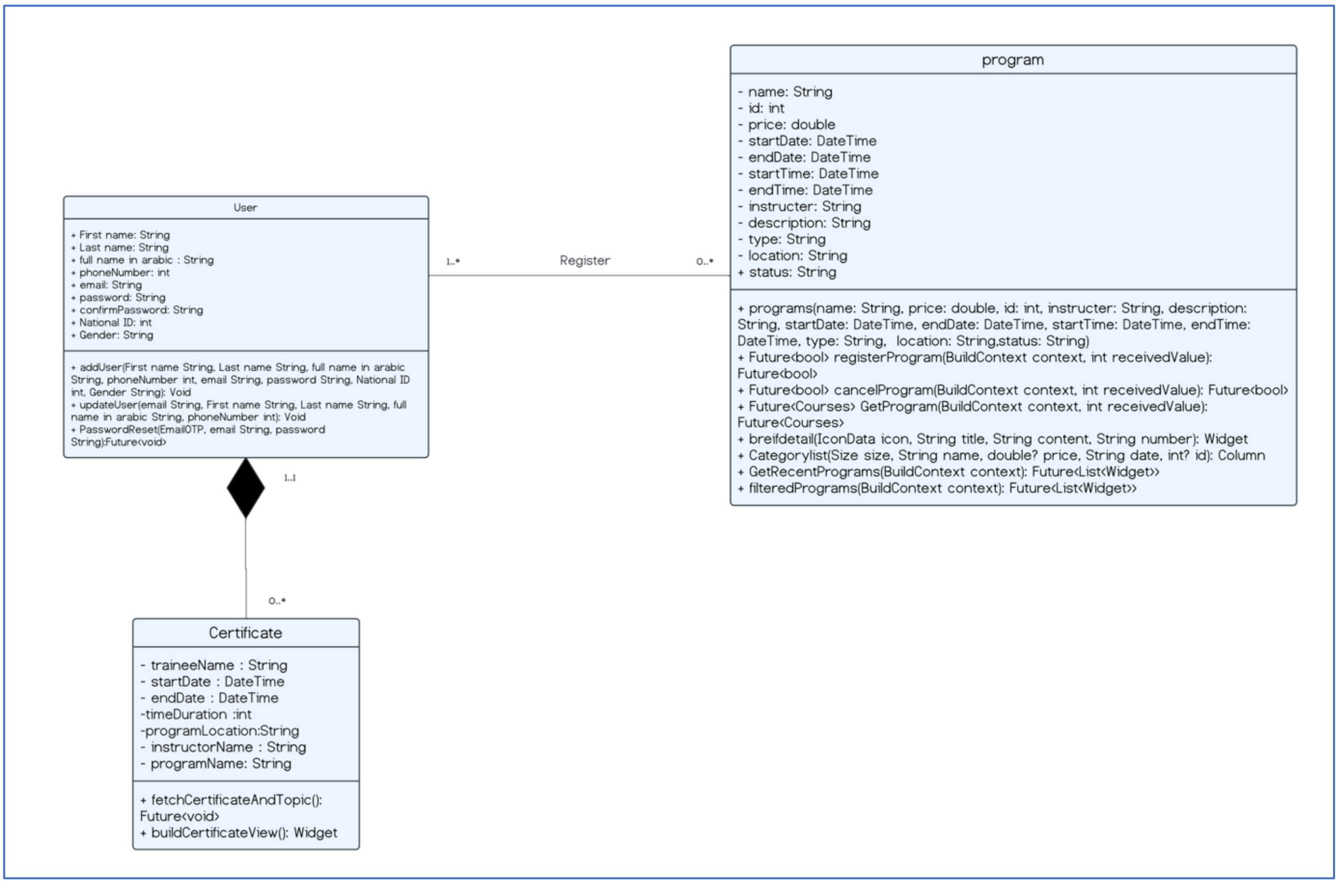


Figure 12 Application Class Diagram

4.3.3 Component Level Design

For the Website:

1. Forget Password

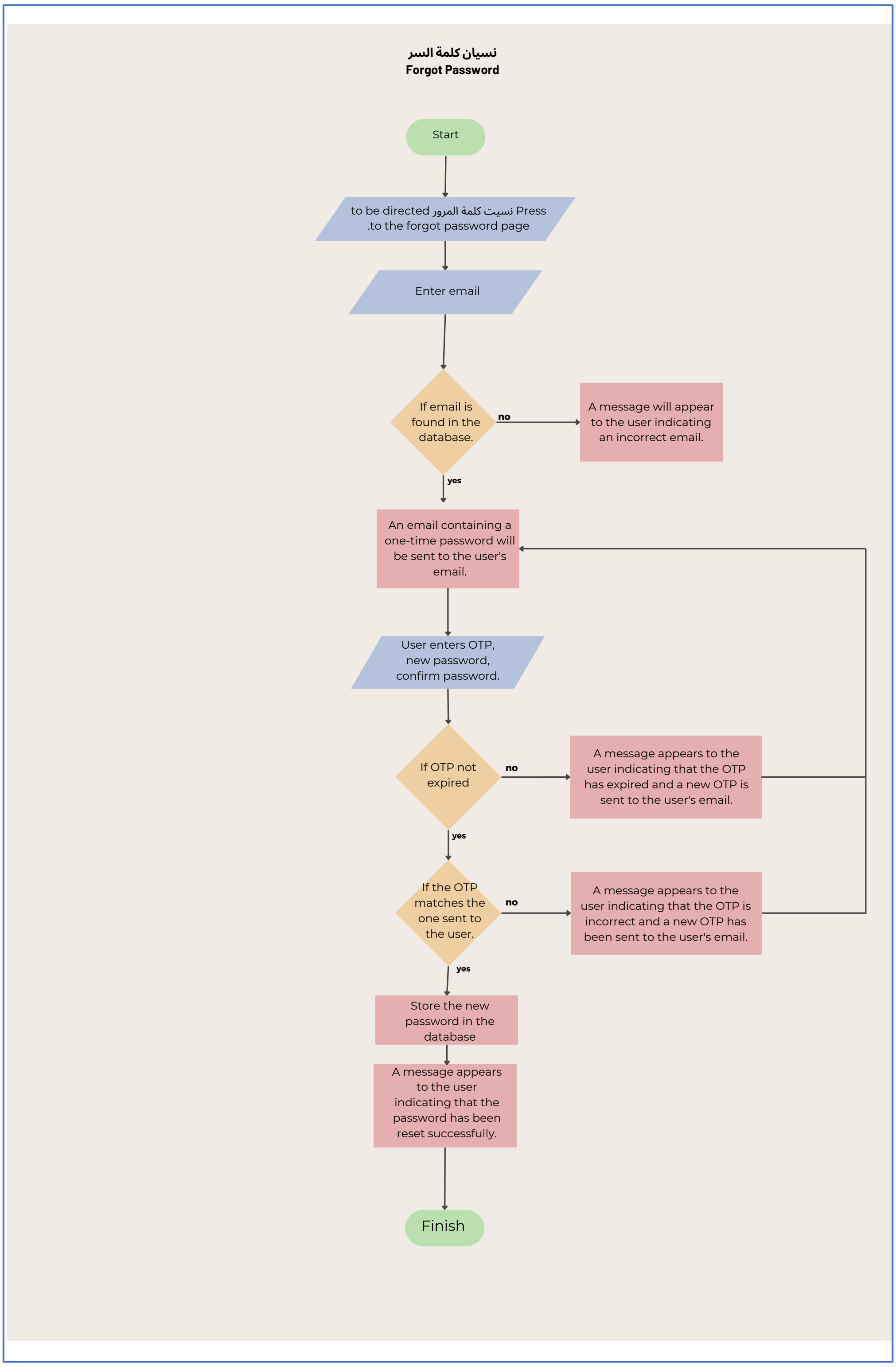


Figure 13 Website Forget Password Flowchart

2. Initiate a Training Program by Faculty Member

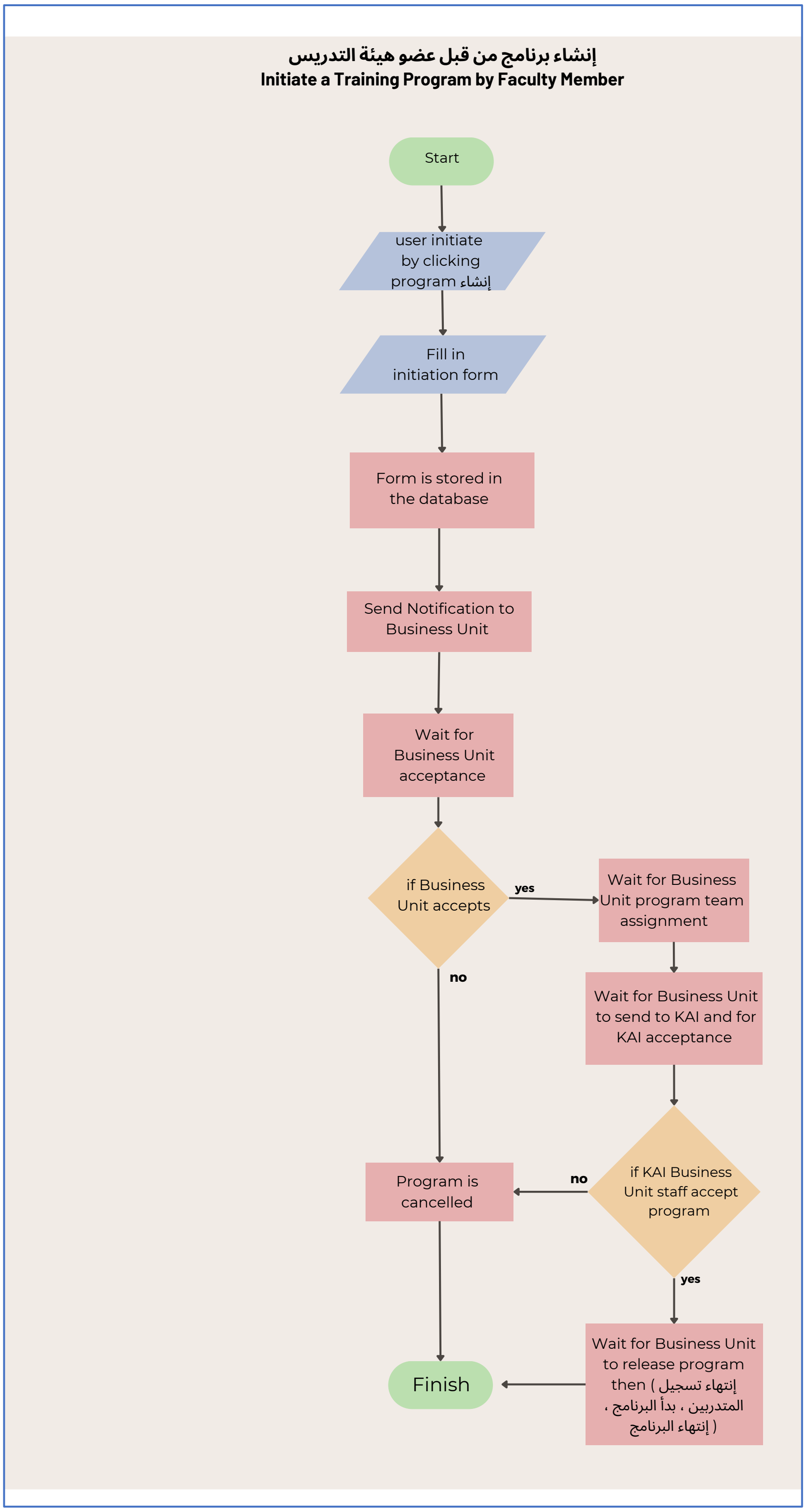


Figure 14 Initiate Training program by a faculty Flowchart 1

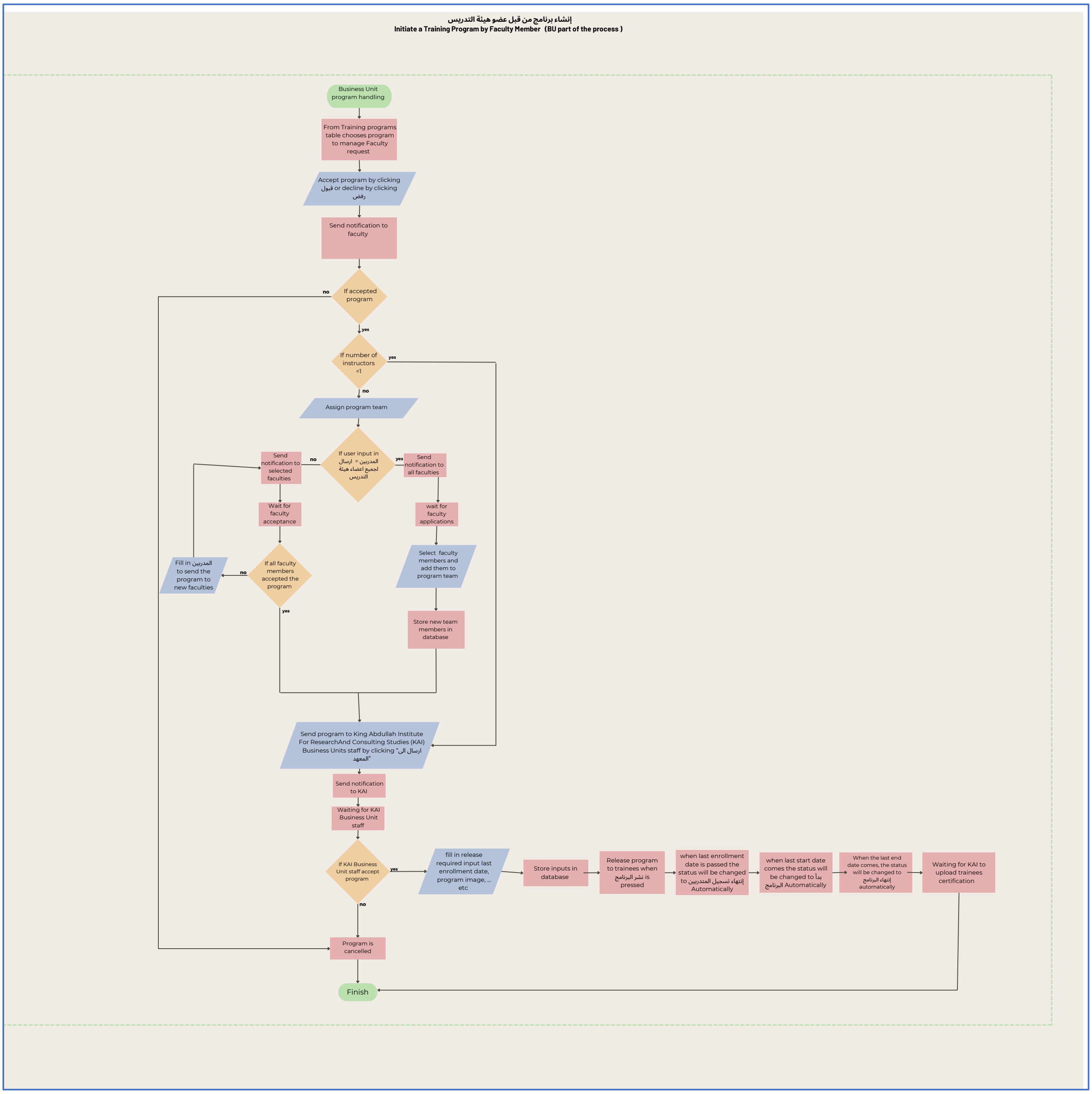


Figure 15 Initiate Training program by a faculty Flowchart 2

إنشاء برنامج من قبل عضو هيئة التدريس
Initiate a Training Program by Faculty Member (Other faculties part of the process)

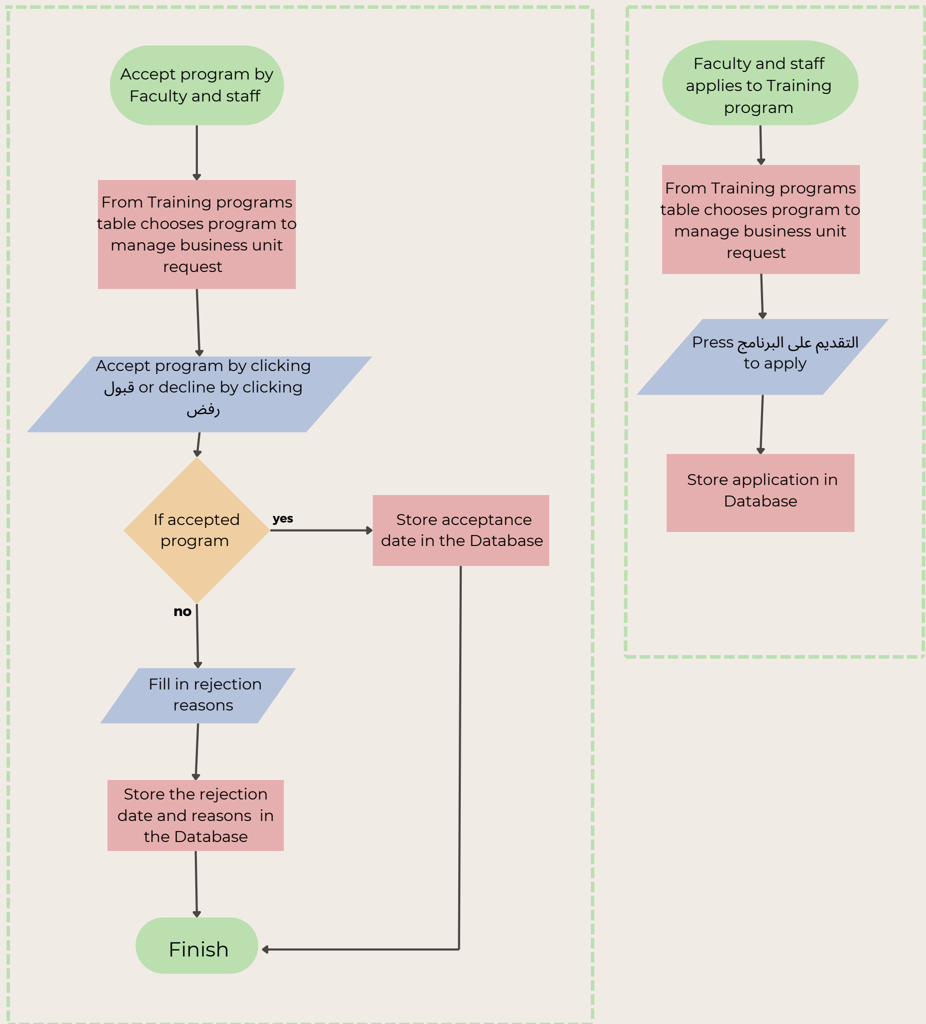


Figure 16 Initiate Training program by a faculty Flowchart 3

3. Start a Meeting

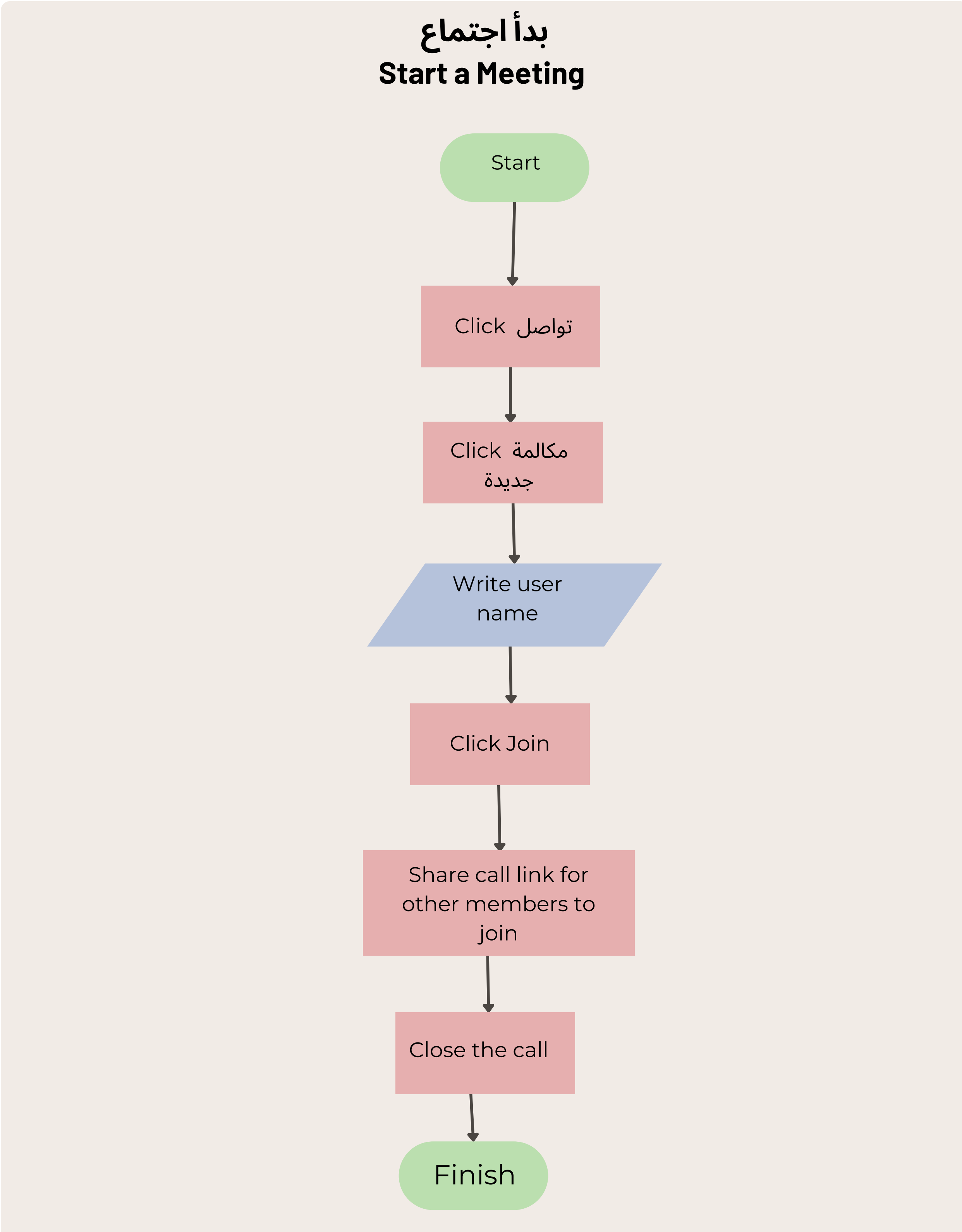


Figure 17 Starting a meeting Flowchart

4. Update user information

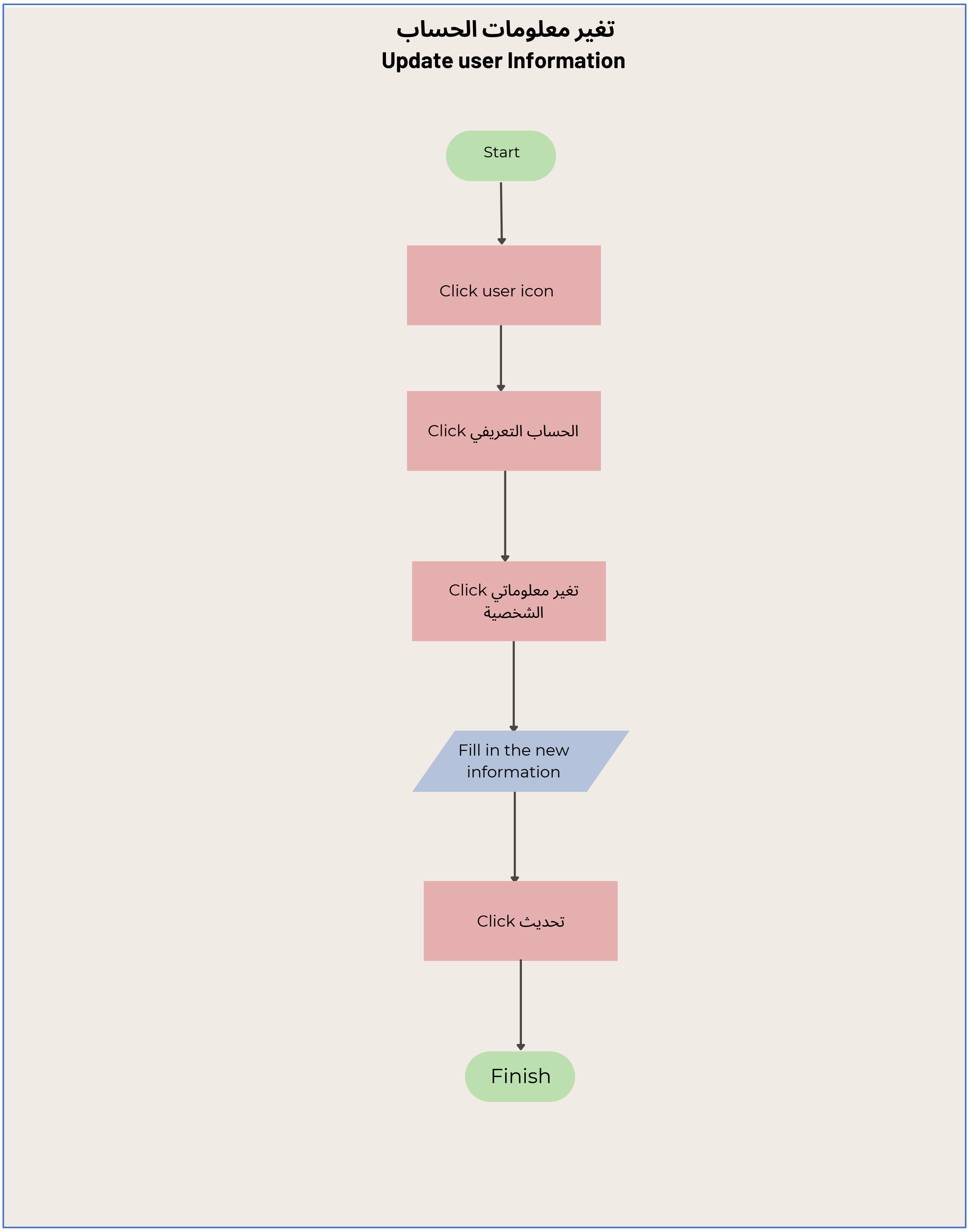


Figure 18 Update User Information Flowchart

For the Application:

1. Sign Up

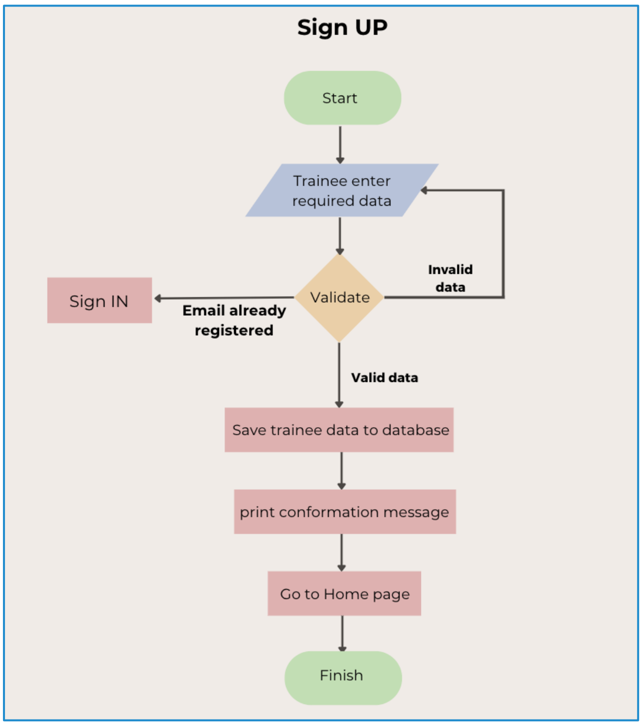


Figure 19 Sign Up Flowchart

2. Sign In

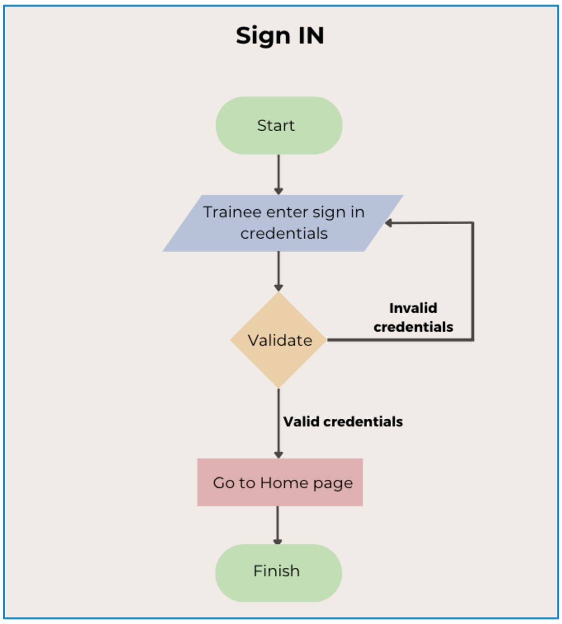


Figure 20 Sign In Flowchart

3. Register for a program

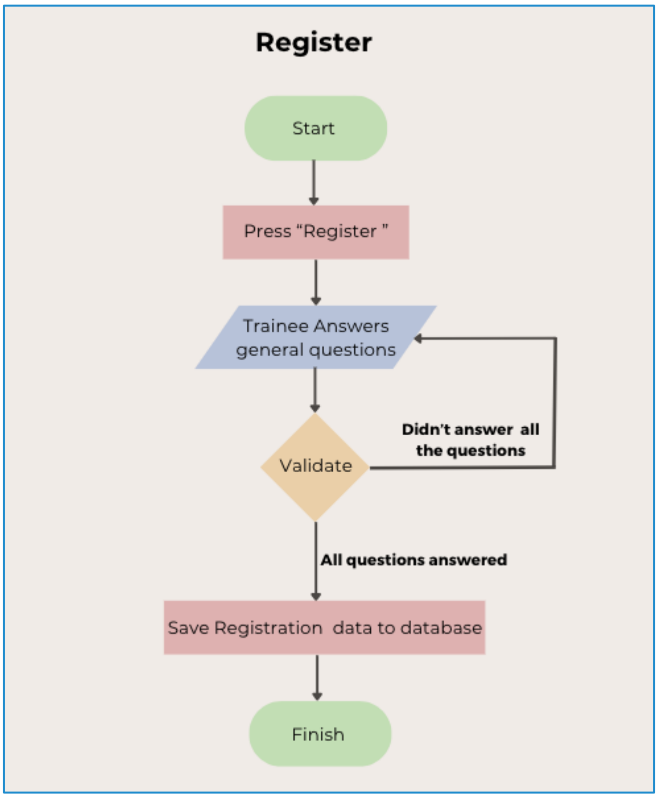


Figure 21 Register in a program Flowchart

4. View a Program

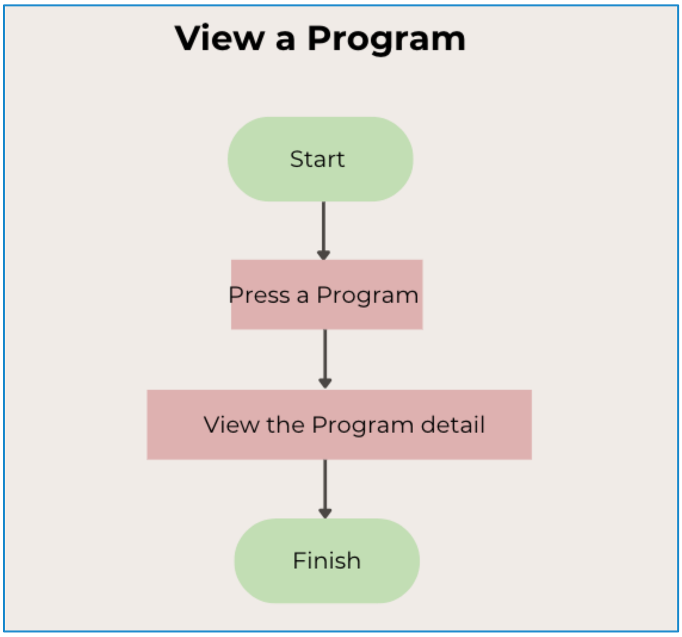


Figure 22 View a program Flowchart

5. View Certificates

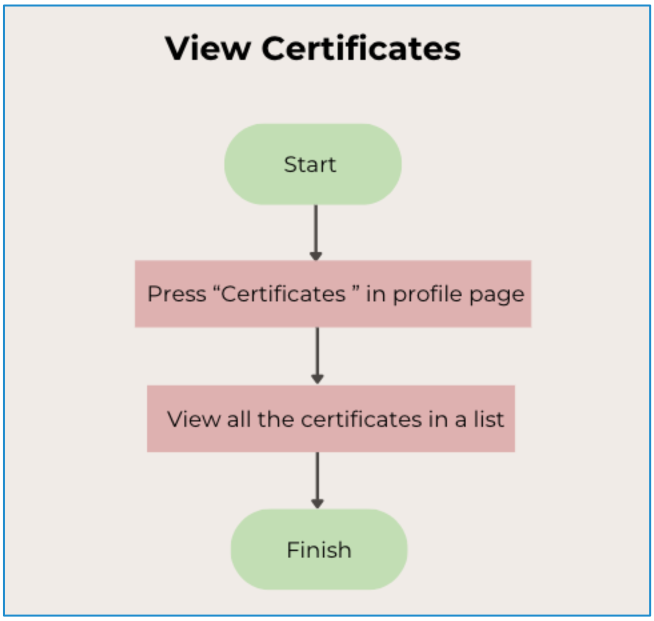


Figure 23 View Certificate Flowchart

6. Filter Programs

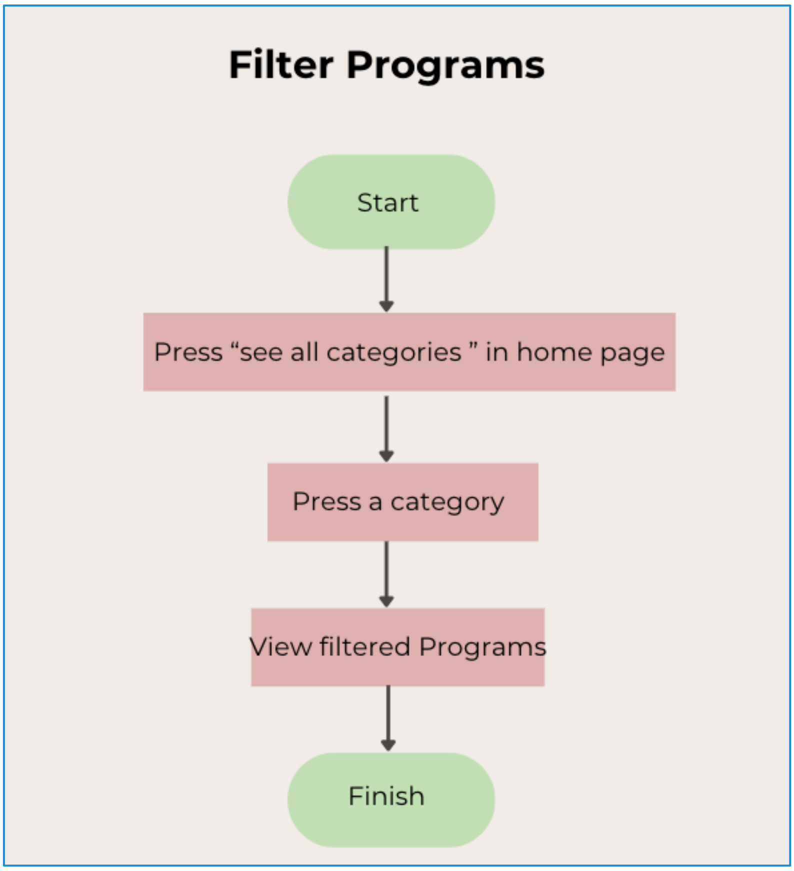


Figure 24 Filter programs Flowchart

4.4 Data Design

4.4.1 Data Models

The Business Gate system relies on a PostgreSQL SQL database, ensuring robust and scalable data management for a holistic understanding of the data structure. In this section, we will explore the fundamental aspects of the data environment through three sub-sections: the Entity-Relationship (ER), which depicts conceptual data entities and relationships; the Relational Schema, which illustrates the logical organization by translating entities into tables; and the Data Dictionary, providing a comprehensive guide to data elements and relationships.

ER Diagram:

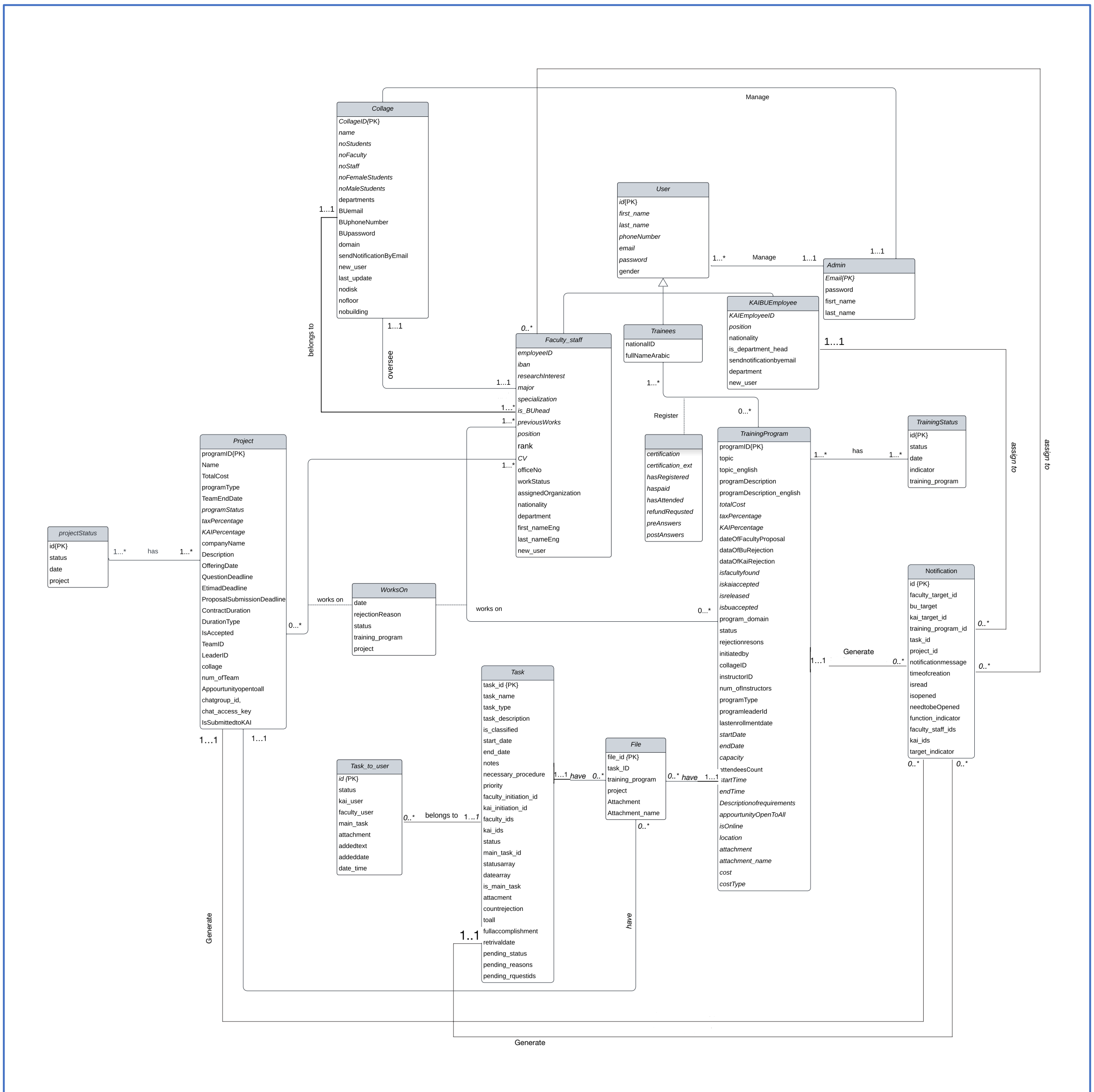


Figure 25 ER Diagram

Relational Schema:

Admin (Email, password, first_name, last_name)

Primary key Email

Collage (CollageID, AdminEmail, name, noStudents, noFaculty, noStaff, noFemaleStudents, noMaleStudents, departments, domain, BUemail, BUphoneNumber, password, nofloor, nobuilding ,nodisk, last_update , new_user)

Primary key CollageID

Foreign key AdminEmail references Admin(Email)

Faculty_Staff (id, AdminEmail, CollageID, employeeID, password, first_name, last_name, email, phoneNumber, gender, nationality, position, rank, major, specialization, workStatus, assignedOrganization, iban, officeNo, researchInterest, previousWork, CV, is_BUhead, department, first_nameEng , last_nameEng, new_user)

Primary key id

Foreign key AdminEmail references Admin (Email)

Foreign key CollageID references Collage (CollageID)

KAIBUEmployee(id, AdminEmail, KAIEmployeeID, password, first_name, last_name, email, phoneNumber, gender, nationality, position, new_user)

Primary key id

Foreign key AdminEmail references Admin (Email)

Register (RegisterID, ProgramID, id, certification, certification_ext, hasRegistered, haspaid, hasAttended, refundRequsted, preAnswers, postAnswers)

Primary key RegisterID

Foreign key ProgramID references TrainingProgram (programID)

Foreign key id references Trainees (id)

Trainees (id, password, first_name, last_name, email, phoneNumber, gender, nationalID, fullNameArabic)

Primary key id

TrainingProgram (programID, topic, topic_english, programDescription, programDescription_english,totalCost,taxPercentage,KAIPercentage, dateOfFacultyProposal, dataOfKaiRejection, dataOfBuRejection, isfacultyfound, iskaiaccepted, isreleased, isbuaccepted, program_domain, status, rejectionresons, initiatedby, collageID, instructorID, num_ofInstructors, programType, programleaderId, lastenrollmentdate, startDate, endDate, capacity, attendeesCount, startTime, endTime, Descriptionofrequirements, appourtunityOpenToAll, isOnline, location, attachment, attachment_name, cost, costType)

Primary key programID

Foreign key collageID references Collage (CollageID)

WorksOn(id, training_program, project, instructorid, status, date, rejectionReason)

Primary key id

Foreign key instructorid references Faculty_Staff (id)

Foreign key training_program references TrainingProgram (programID)

Foreign key project references Project (programID)

Trainingprogram_status(id, training_program, status, date, indicator)

Primary key id

Foreign key training_program references TrainingProgram (programID)

Project (programID, Name, TotalCost, TaxPercentage, KAIPercentage, programType ,

Collage, LeaderID , TeamEndDate, programStatus , companyName , Description,

OfferingDate, QuestionDeadline, EtimadDeadline, ProposalSubmissionDeadline, ContractDuration, DurationType, IsAccepted, TeamID, num_ofTeam, Appourtunityopentoall , chatgroup_id, chat_access_key, IsSubmittedtoKAI)

Primary key programID

Foreign key Collage references Collage(CollageID)

Project_status(id, project, status, date, indicator)

Primary key id

Foreign key project references Project (programID)

Files (file_id , task_ID , training_program , project, Attachment, Attachment_name)

Primary key file_id

Foreign key training_program references TrainingProgram (programID)

Foreign key project references Project (programID)

Foreign key task_ID references Task (task_id)

Task (task_id , task_name , task_type , task_description , is_classified , start_date , end_date , notes , necessary_procedure , priority , faculty_initiation_id , kai_initiation_id , faculty_ids , kai_ids , status , main_task_id , statusarray , datearray , is_main_task , attacment , countrejection , toall , fullaccomplishment , retrivaldate , pending_status , pending_reasons , pending_rquestids)

Primary key task_id

Foreign key faculty_initiation_id references Faculty_Staff (id)

Foreign key kai_initiation_id references KAIBUEmployee (id)

Task_to_user(id, status, kai_user, faculty_user, main_task, attachment, addedtext, addeddate, date_time)

Primary key id

Foreign key faculty_user references Faculty_Staff (id)

Foreign key kai_user references KAIBUEmployee (id)

Notification (id, faculty_target_id, kai_target_id , training_program_id , task_id , project_id, notificationmessage , timeofcreation , isread , isopened , needtobeOpened, function_indicator, faculty_staff_ids, kai_ids, target_indicator, needtobeshown)i

Primary key id

Foreign key faculty_target_id references Faculty_Staff (id)

Foreign key kai_target_id references KAIBUEmployee (id)

Foreign key training_program_id references TrainingProgram (programID)

Foreign key task_id references Task (task_id)

Foreign key project_id references Project (programID)

Data Dictionary:

The table below presents a data dictionary with descriptions for each entity in the ER diagram:

Entity	Description	Occurrence
Admin	A person who manages the "Business Gate" system	Each admin can manage user and collage.
Collage	A college affiliated with King Saud University, featuring a business unit.	Each college is associated with a Business Unit (BU) head, forming an administrative structure.
User	A user who is registered in the system.	Serves as a superclass for three distinct roles: Faculty/Staff, Trainees, and KAIBU Employee. Each user is mandated to have exactly one of these roles, defining their specific attributes and functionalities within the system.
Faculty_ staff	A faculty and staff members associated with the college.	Each faculty/staff member is uniquely identified and associated with a specific college, with attributes defining their roles, contact information, and other relevant details within the system.
Trainees	A trainee who is registered in the system.	Each trainee is uniquely identified and associated with specific training programs, with attributes defining their registration details, contact information, and other relevant data within the system.
KAIBU Employee	An employee affiliated with the KAI BU	Each KAI BU employee is uniquely identified with attributes defining their roles, contact information, and other relevant details within the system.

Training Program	**A training program offered by the collage**	**Each training program has distinct program details, and multiple trainees can register for a program. Programs are offered by one or more faculty members.**
Project	**A project that business unit works on**	**Each project is offered by one or more faculty members.**
Task	**A task assignment between head of business units or KAI staff or head of business units and KAI staffs.**	**Each task is assigned to one faculty member or KAI staff.**
Task_to _user	**A subtask assignment from head of business unit and KAI staff.**	**Each subtask is assigned to one faculty member or KAI staff.**
WorksOn	**A record of what faculty member worked on or rejected in Training Programs or projects.**	**Each WorksOn records a faculty member along with the Training Programs or projects that he got offered to.**
Files	**A file is a document record of Training Programs or projects.**	**Each Files records a Training Programs or projects documents.**
Notification	**A Notification represents a message or alert generated by the system to inform users about important reminders, updates and requests.**	**Each notification is generated when a task is assigned, updates, reminders occur of tasks, training program or project.**

Table 6 Data Dictionary for Entity

The table below shows a data dictionary that describes each relationship in the ER diagram:

Entity Name	Multiplicity	Relationship	Entity Name	Multiplicity
Admin	**1..1**	**Manage**	**Collage**	**1..***
Admin	**1..1**	**Manage**	**User**	**1..***
Trainees	**1..***	**Register**	**TrainingProgram**	**0..***
TrainingProgram	**0..***	**works on**	**Faculty_staff**	**1..***
Faculty_staff	**1..***	**belongs to**	**Collage**	**1..1**
Faculty_staff	**1..1**	**oversee**	**Collage**	**1..1**
TrainingProgram	**1..***	**has**	**TrainingProgram _status**	**1..***
Project	**0.. ***	**works on**	**Faculty_staff**	**1.. ***
Project	**1.. ***	**has**	**Project_status**	**1.. ***
Project	**1.. 1**	**have**	**Files**	**0.. ***
Task	**1.. 1**	**have**	**Files**	**0.. ***
TrainingProgram	**1.. 1**	**have**	**Files**	**0.. ***
Project	**1.. 1**	**generate**	**Notification**	**0.. ***
TrainingProgram	**1.. 1**	**generate**	**Notification**	**0.. ***
Task	**1.. 1**	**generate**	**Notification**	**0.. ***
Faculty_staff	**1.. 1**	**have**	**Notification**	**0.. ***
KAIBUEmployee	**1.. 1**	**have**	**Notification**	**0.. ***
Task_to_user	**0...***	**belongs to**	**Task**	**1...1**

Table 7 Data Dictionary for relationships

Entity Name	Attributes	Description	Data Type	Length	Null	PK
Admin	Email	Uniquely identifies the system administrator	Character varying	200	no	yes
	Password	Administrator's password	Character varying	500		
	First_name	Administrator's first name	Character varying	130		
	Last_name	Administrator's last name	Character varying	130		

Table 8 Admin Entity

Entity Name	Attributes	Description	Data Type	Length	Null	Multi Value	Default Value	PK
Collage	CollageID	Uniquely identifies a collage	integer		no			yes
	name	Collage's name	Character varying	130	no			
	noStudents	Number of students in the collage	integer					
	noFaculty	Number of faculty in the collage	integer					
	noStaff	Number of staff in the collage	integer					
	NoFemale Students	Number of female students in the collage	integer					
	NoMale Students	Number of male students in the collage	integer					
	departments	Collage's department names	Character varying	130	no	yes		
	domain	Collage's domain	Character varying	130				
	BUemail	Collage's business unit head email	Character varying	200	no			
	BUphone Number	Collage's business unit phone number	Character varying	130	no			
	password	Collage's business unit head password	Character varying	500	no			
	nofloor	business unit office floor	integer					
	nobuilding	business unit building number	integer					
	nodisk	business unit office number	Character varying	130				
	last_update	Collage Information last update	date		no			
	new_user	Checks if there is new head of business unit	boolean		no		True	

Table 9 Collage Entity

Entity Name	Attributes	Description	Data Type	Length	Null	Multi Value	Default Value	Range	PK
Faculty_Staff	id	Uniquely identifies a faculty/staff	integer		no				yes
	Employee ID	Faculty/staff employee ID	Character varying	130	no				
	password	Faculty/staff password	Character varying	500	no				
	first_name	Faculty/staff first name	Character varying	130	no				
	last_name	Faculty/staff last name	Character varying	130	no				
	email	Faculty/staff email	Character varying	200	no				
	Phone Number	Faculty/staff phone number	Character varying	130	no				
	gender	Faculty/staff gender	Character varying	130	no			ذكر ، انثى	
	nationaliy	Faculty/staff nationality	Character varying	130	no				
	position	Faculty/staff position	Character varying	130	no			موظف ، بالكلية عضو هيئة ،تدريس عميد الكلية	
	rank	Faculty/staff rank	Character varying	130				معيد محاضر, أستاذ , مساعد استاذ مشارك	
	major	Faculty/staff major	Character varying	130	no				
	Specialization	Faculty/staff specialization	Character varying	130					
	Work Status	Current work status of faculty/staff	Character varying	130	no				
	Assigned Organization	Organization assigned to faculty/staff	Character varying	130					
	iban	Faculty/staff iban	Character varying	200	no				
	officeNo	Faculty/staff office number	Character varying	100	no				
	Research Interest	Research interests of faculty/staff	Character varying	130		yes			

	previous Work	Previous work of faculty/staff members	Character varying	130		yes			
	CV	CV for faculty/staff members	bytea						
	is_BUhead	Indicates if the faculty/staff is a BU head	boolean		no				
	department	Department of faculty/staff	Character varying	130					
	first_nameEng	Faculty/staff first name in english	Character varying	130					
	last_nameEng	Faculty/staff last name in english	Character varying	130					
	new_user	Checks if there is new member	boolean		no		True		

Table 10 Faculty Staff Entity

Entity Name	Attributes	Description	Data Type	Length	Null	Default Value	Range	PK
KAIBU Employee	id	Uniquely identifies a KAI business unit employee	integer		no			yes
	KAIEmployeeID	KAI business unit employee ID	Character varying	130	no			
	password	KAI business unit employee password	Character varying	500	no			
	first_name	KAI business unit employee first name	Character varying	130	no			
	last_name	KAI business unit employee last name	Character varying	130	no			
	email	KAI business unit employee email	Character varying	200	no			
	PhoneNumber	KAI business unit employee phone number	Character varying	130	no			
	gender	KAI business unit employee gender	Character varying	130	no		ذكر ،انثى	
	nationality	KAI business unit employee nationality	Character varying	130	no			
	position	KAI business unit employee position	Character varying	130	no		موظف ،رئيس	
	new_user	Checks if there is new member	boolean		no	True		

Table 11 KAI BU Employee Entity

Entity Name	Attributes	Description	Data Type	Length	Null	Multi Value	Default Value	PK
Register	RegisterID	Uniquely identifies records in the 'register' table	integer		no			yes
	certification	Trainee's certification in encoded format	Character varying	500				
	certification_ext	File extension of the certification	Character varying	130				

	Has Registered	Indicates if the trainee has registered on a program	boolean		no		true	
	haspaid	Indicates if the trainee has paid a program cost	boolean		no		false	
	hasAttended	Indicates if the trainee has attended a program	boolean		no		false	
	Refund Requsted	indicates whether the trainee is eligible to request a refund	boolean					
	preAnswers	Trainee pre-training program review answers	Character varying	500		yes		
	postAnswers	Trainee post-training program review answers	Character varying	500		yes		

Table 12 Register Entity

Entity Name	Attributes	Description	Data Type	Length	Null	PK
Trainees	id	Uniquely identifies a trainee	integer		no	yes
	password	Trainee's password	Character varying	500	no	
	first_name	Trainees' first name in English	Character varying	130	no	
	last_name	Trainees' last name in English	Character varying	130	no	
	email	Trainee's email	Character varying	200	no	
	phoneNumber	Trainee's phone number	Character varying	130	no	
	gender	Trainee's gender	Character varying	130	no	
	nationalID	Trainee's national ID	Character varying	130	no	
	FullName Arabic	Trainees' full name in Arabic	Character varying	130		

Table 13 Trainee Entity

Entity Name	Attributes	Description	Data Type	Length	Null	Multi val	PK
TrainingProgram	programID	Uniquely identifies a training program	integer				yes
	topic	Training program's topic	Character varying	130	no		
	topic_english	Training program's topic in English	Character varying	130			
	programDescription	Training program's description	Character varying	200			
	programDescription_english	Training program's description in English	Character varying	200			
	totalCost	Training program's total cost	double				
	taxPercentage	Tax percentage for the training program from the total cost	double				
	KAIPercentage	KAI percentage for the training program from the total cost	double				
	DateOfFacultyProposal	Date of Faculty Training Program Proposal	date				

	dataOfKaiRejection	Date of KAI rejecting the Training Program	date				
	dataOfBuRejection	Date of business unit rejecting the Training Program	date				
	isfacultyfound	Indicates whether the faculty has founded	boolean				
	iskaiaccepted	Indicates whether the KAI has accepted the proposal	boolean				
	isreleased	Indicates whether the training program has been released	boolean				
	isbuaccepted	Indicates whether the BU has accepted the proposal	boolean				
	program_domain	The domain of the training program	Character varying	130			
	status	The final status of the training program	Character varying	130			
	rejectionresons	Rejection reasons for the training program proposal from KAI or BU	Character varying	130			
	initiatedby	The name of the faculty member who initiates the training program proposal	Character varying	130			
	collageID	College ID to which the training program belongs	integer				
	instructorID	Faculty members' IDs who will train the program for trainees	integer		no	yes	
	num_ofInstructors	Count of faculty members who will train the program for trainees	integer				
	programType	Training program's type	Character varying	130	no		
	programleaderId	Leader of training program	integer				
	lastenrollmentdate	Last enrollment date to the training program	date				
	startDate	The start date of the training program	date		no		
	endDate	The end date of the training program	date		no		
	capacity	Training program's capacity	integer		no		
	attendeesCount	Count of attendees to the training program	integer				
	startTime	The start time of the training program	time		no		
	endTime	The end time of the training program	time		no		
	Descriptionofrequirements	Training program's requirements	Character varying	200			
	appourtunityOpenToAll	Indicates whether the opportunity to participate in the training program is open to all faculty members	boolean				
	isOnline	Indicates whether the training program is online or onsite	boolean				
	location	Training program's location	Character varying	200			

Table 14 Training program Entity

Entity Name	Attributes	Description	Data Type	Length	Null	PK
Training program _status	id	Uniquely identifies a record in the "Trainingprogram _status "table	integer		no	yes
	status	Training program's general status	Character varying	130		

	date	Date of the training program status	date			
	indicator	Indicate whether a status is current, completed, or planned	Character varying	130		

Table 15 Training Program Status Entity

Entity Name	Attributes	Description	Data Type	Length	Null	PK
Works On	id	Uniquely identifies a record in the ' WorksOn' table	integer		no	yes
	status	Status of the training program proposal, proposed by either faculty or BU	Character varying	130		
	date	Date of Status for the Training Program Proposal	date			
	rejection Reason	Reason for Faculty Member's Rejection for Training Program Proposal	Character varying	130		

Table 16 Works On Entity

Entity Name	Attributes	Description	Data Type	Length	Null	Multi Value	Default Value	PK
Project	programID	Uniquely identifies a project	integer		no			yes
	Name	Project name	Character varying	130	no			
	TotalCost	Project total cost	double					
	Tax Percentage	Tax percentage for the project from the total cost	double					
	KAI Percentage	KAI percentage for the project from the total cost	double					
	Program Type	Project type	Character varying	130	no			
	Collage	College to which the project belongs	integer		no			
	LeaderID	Leader of the peoject	integer					
	TeamEndDate	Deadline for the team to submit the project	date		no			
	ProgramStatus	The current project statues	Character varying	150	no			
	CompanyName	Company name that project works for	Character varying	130				
	Description	Project descriptions	Character varying	200				
	OfferingDate	Date of project initiation	date					
	QuestionDeadline	Deadline for the team to ask the company a question	date					
	EtimadDeadline	Deadline for submitting the project to the company	date					
	ProposalSubmissionDeadline	Deadline for submitting the project to the KAI	date					
	ContractDuration	Specifies the duration of the contract.	Character varying	130				
	DurationType	Indicates the type of duration for the contract e.g., months	Character varying	100				

	IsAccepted	**Indicator if project is accepted from company**	**boolean**					
	TeamID	**Project team members**	**integer**		**no**	**Yes**		
	num_ofTeam	**Number of team member**	**integer**					
	Appourtunitopentoall	**Indicates whether the opportunity to participate in the project is open to all faculty members**	**boolean**				**false**	
	chatgroup_id	**Unique identifier for the chat group**	**Character varying**	**200**				
	chat_access_key	**Access key for joining the chat group**	**Character varying**	**200**				
	IsSubmittedtoKAI	**Indicator if project is submitted to KAI**	**boolean**				**false**	

Table 17 Project Entity

Entity Name	Attributes	Description	Data Type	Length	Null	PK
Project _status	**id**	**Uniquely identifies a record in the "Project_status "table**	**integer**		**no**	**yes**
	status	**Project general status**	**Character varying**	**130**		
	date	**Date of the project status**	**date**			
	indicator	**Indicate whether a status is current, completed, or planned**	**Character varying**	**130**		

Table 18 Project Status Entity

Entity Name	Attributes	Description	Data Type	Length	Null	Multi Value	PK
Task	**task_id**	**Uniquely identifies a task**	**integer**		**no**		**yes**
	Task_name	**Task name**	**Character varying**	**130**			
	task_type	**Task type**	**Character varying**	**130**			
	task_description	**Task description**	**Character varying**	**200**			
	is_classified		**boolean**				
	start_date	**Task start date**	**date**				
	end_date	**Task end date**	**date**				
	notes		**Character varying**	**200**			
	necessary_procedure		**Character varying**	**130**			
	priority		**Character varying**	**130**			
	faculty_initiation_id		**integer**				
	kai_initiation_id		**integer**				
	faculty_ids		**integer**			**yes**	
	kai_ids		**integer**			**yes**	
	status		**Character varying**	**130**			
	main_task_id		**integer**				

	statusarray		Character varying	130		yes	
	datearray		date			yes	
	is_main_task		boolean				
	attacment		bytea				
	countrejection		integer				
	toall		boolean				
	fullaccomplishment		boolean				
	retrivaldate		date				
	pending_status		Character varying	130			
	pending_reasons		Character varying	130		yes	
	pending_rquestids		Character varying	130		yes	

Table 19 Task Entity

Entity Name	Attributes	Description	Data Type	Length	Null	PK
Task_to_user	id	Uniquely identifies a task_to_user	integer		no	yes
	Status		Character varying	130		
	kai_user		integer			
	faculty_user		integer			
	main_task		integer			
	Attachment		bytea			
	Addedtext		Character varying	200		
	Addeddate		date			
	date_time		time			

Table 20 Task to user Entity

Entity Name	Attributes	Description	Data Type	Length	Null	PK
Files	file_id	Uniquely identifies a file	integer		no	yes
	task_ID	Task id	integer			
	training_program	training_program id	integer			
	project	Project id	integer			
	Attachment	bytea	bytea			
	Attachment_name	Attachment extension name	Character varying	130		

Table 21 Files Entity

Entity Name	Attributes	Description	Data Type	Length	Null	Multi Value	PK
Notification	id	Uniquely identifies a Notification	integer		no		yes
	faculty_target_id		integer				

	kai_target_id		integer					
	training_ program_id	Task id	integer					
	task_id	training_program id	integer					
	project_id	Project id	integer					
	Notification message	Notification content message	Character varying	200				
	timeofcreation	Notification creatin time	time					
	isread	Indicator of read notification	boolean					
	isopened	Indicator of opened notification	boolean					
	Needtobe Opened	Indicator of need to be read notification	boolean					
	function_ indicator		integer					
	faculty_ staff_ids		integer				yes	
	kai_ids		integer				yes	
	needtobeshown		boolean					

Table 22 Notification Entity

4.5 Interface Design

4.5.1 Website Site map

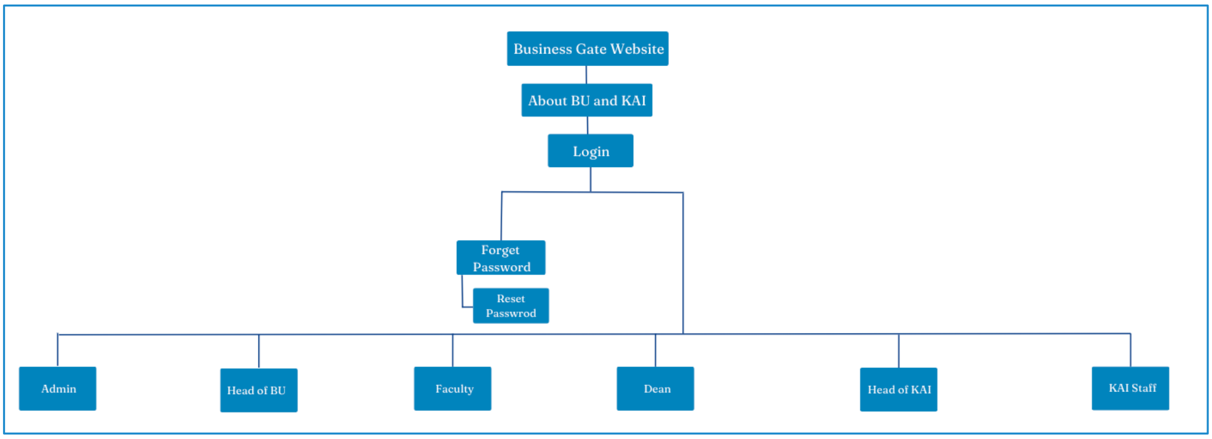


Figure 26 Website Sitemap main overview

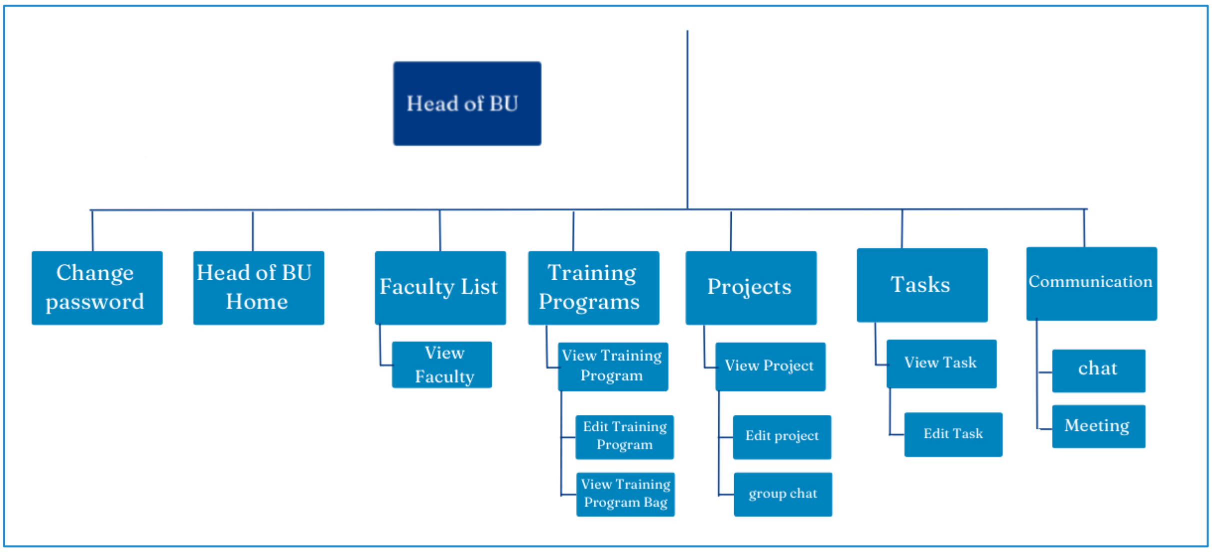


Figure 27 Website Sitemap BU view

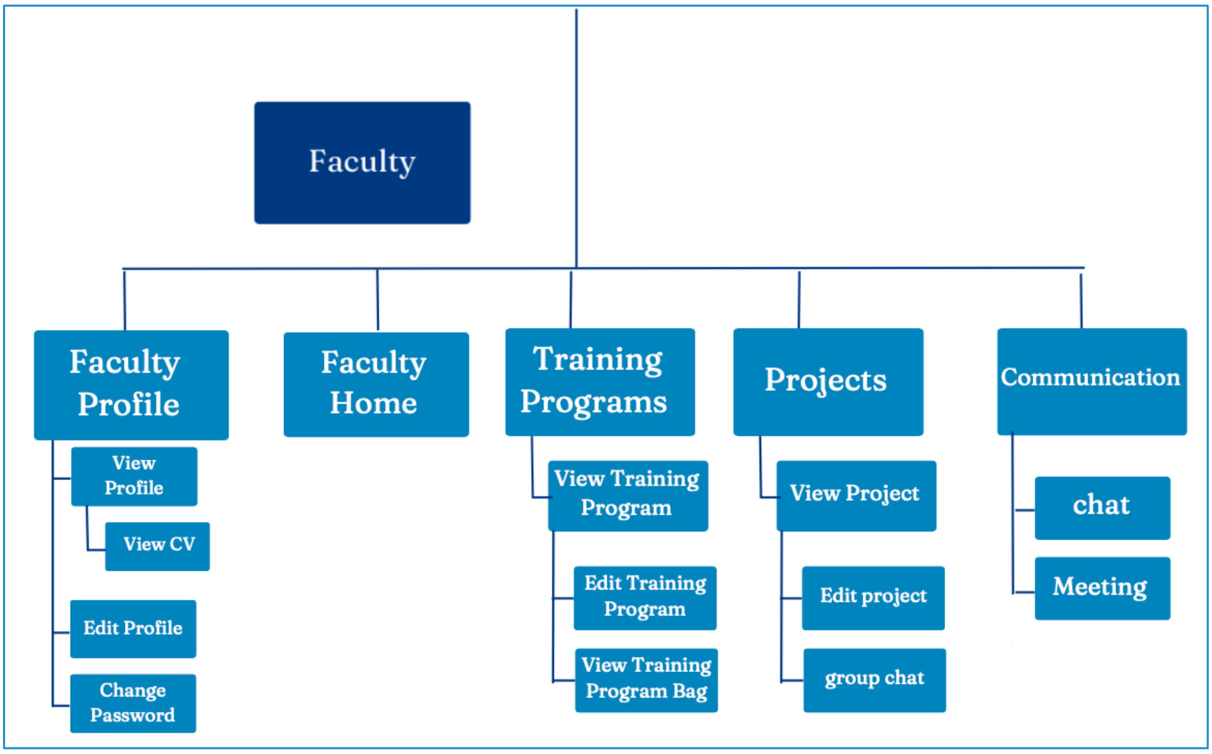


Figure 28 Website Sitemap Faculty view

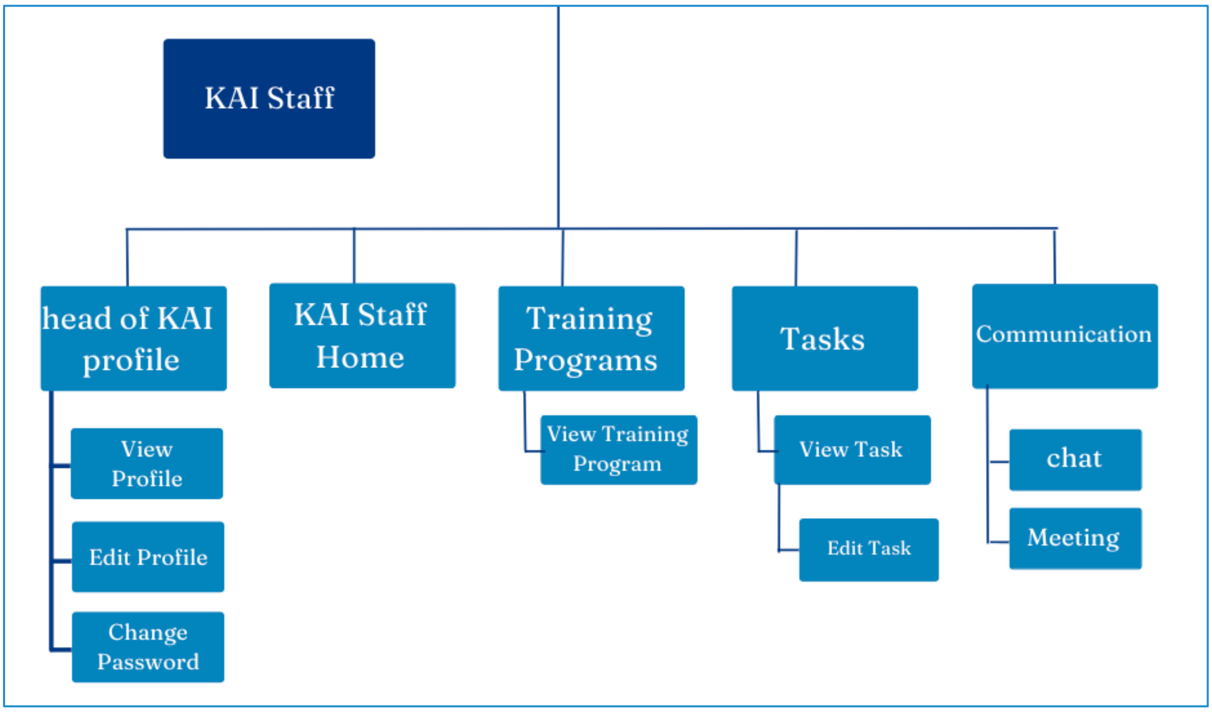


Figure 29 Website Sitemap KAI Staff view

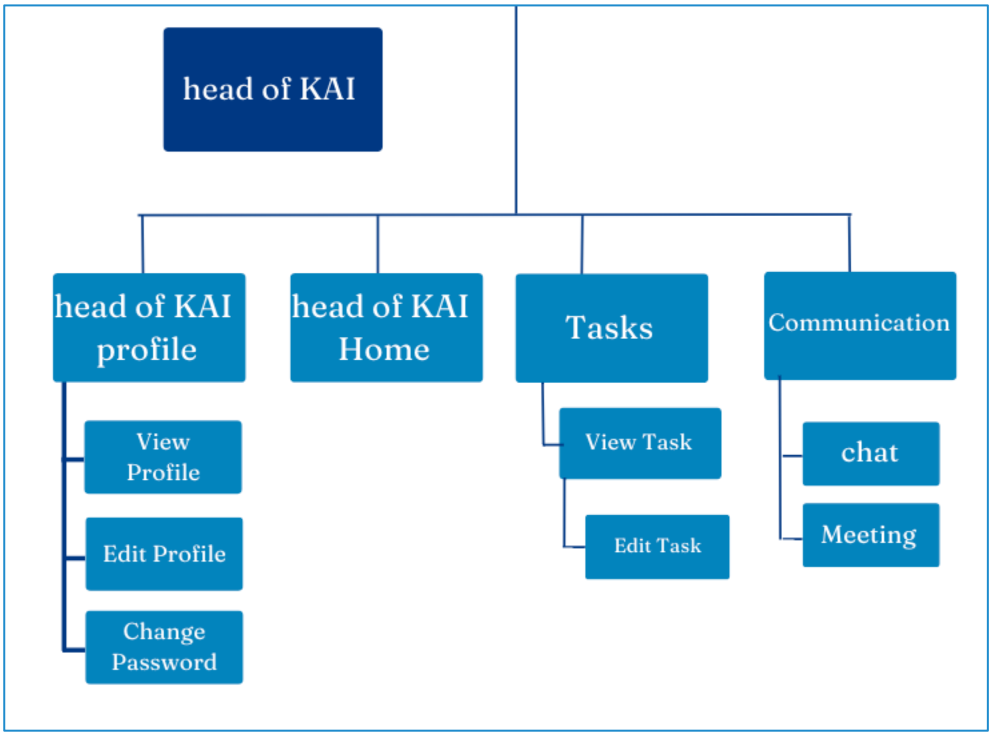


Figure 30 Website Sitemap KAI Staff view

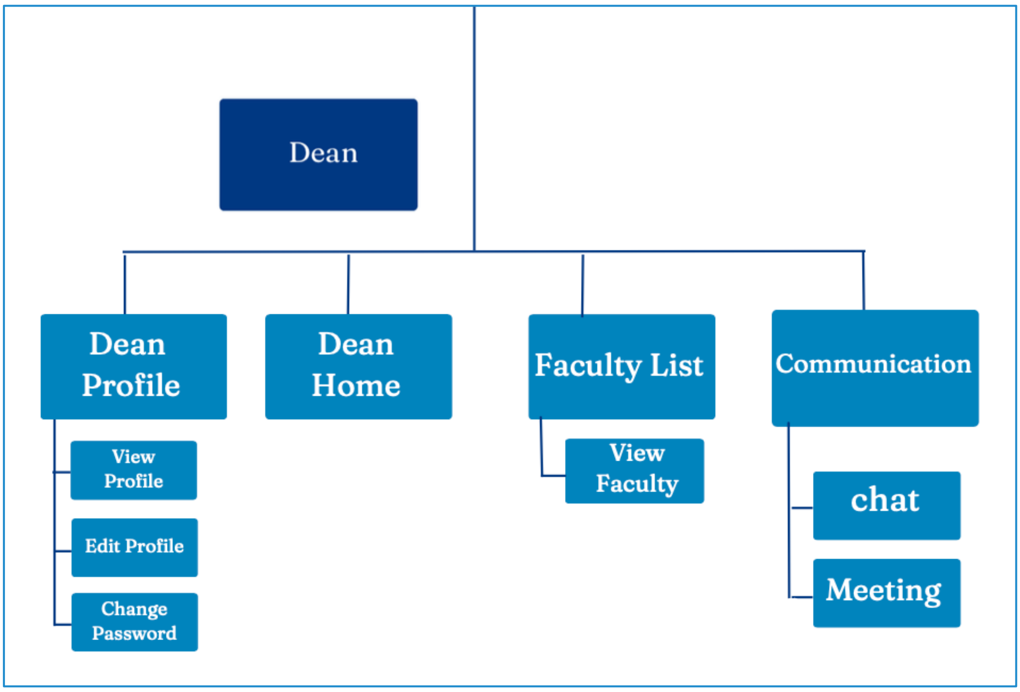


Figure 31 Website Sitemap Dean view

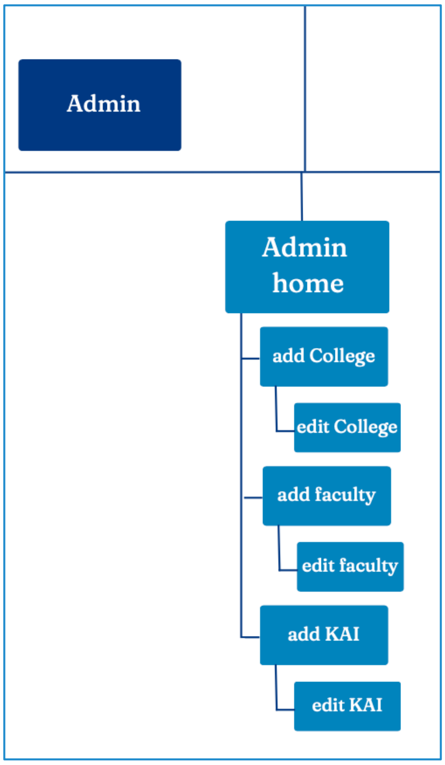


Figure 32 Website Sitemap Admin view

4.5.2 Application Site map

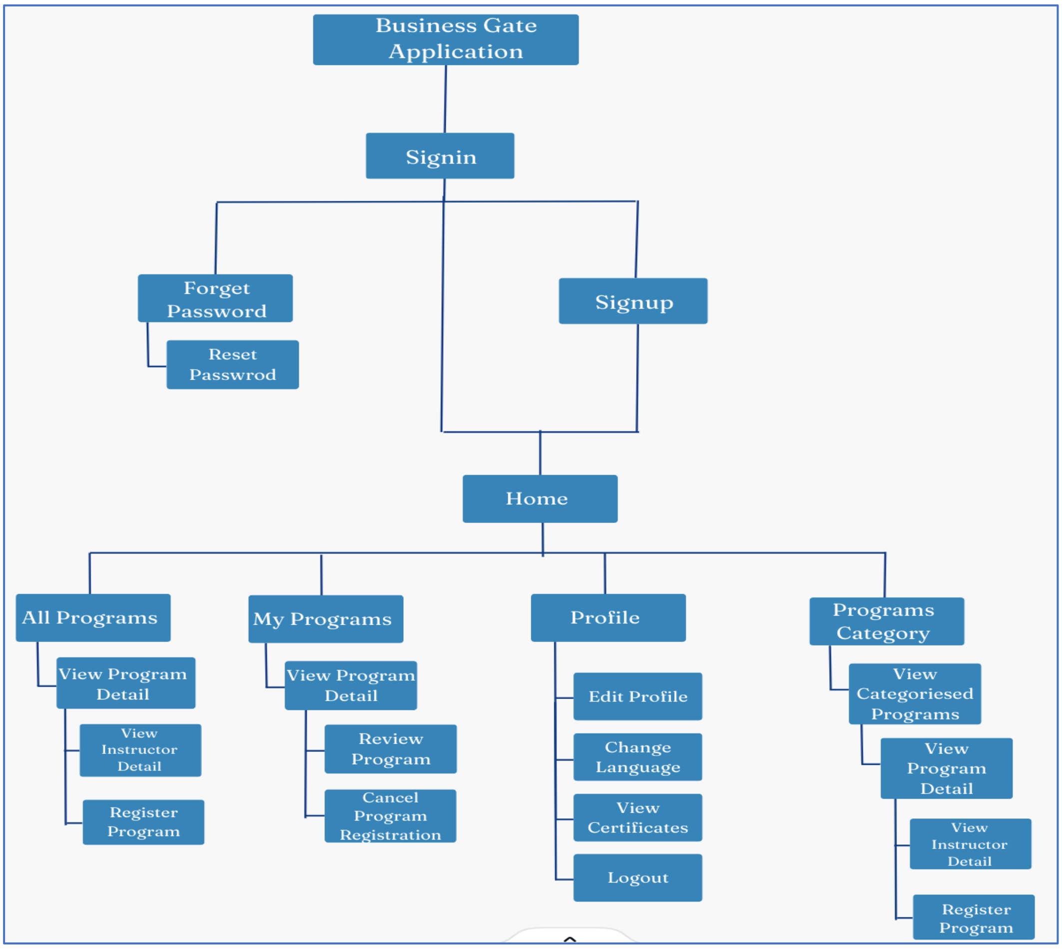


Figure 33 Application Sitemap

4.5.3 UX Guidelines

4.5.3.1 Usability

A fixed sidebar for navigating through different pages provides clear and intuitive navigation. Consistency in navigation elements, such as a continuous sidebar, helps users understand the structure of the application and enables smooth navigation between pages.

Figure 34 Usability Example

4.5.3.2 Consistency

Using color blue and its shades and white have similar styles in the card backgrounds and sidebar.

4.5.3.3 Feedback

Using Ajax in forms to provide real-time validation and warnings about incorrect syntax. Real-time validation helps users identify errors and correct them immediately, reducing frustration and improving the overall user experience.

Figure 35 Feedback Example

4.5.3.4 Accessibility

Switching languages (in the App) supports accommodating users with diverse language preferences or needs. It ensures inclusivity, allowing users to interact with the interface in their preferred language, thereby enhancing accessibility for a broader user base.

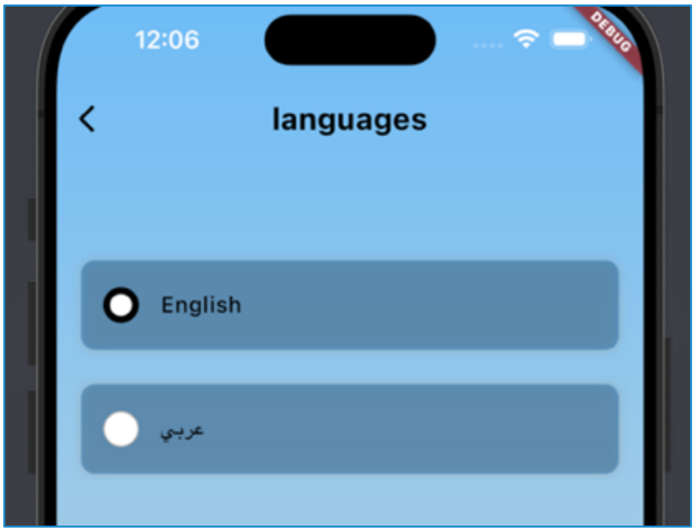


Figure 36 Accessability Example

4.5.3.5 Confirmation

Using attention-grabbing colors like red and distinct symbols like asterisks (*) provides immediate feedback. Users quickly recognize required fields, preventing errors and providing confirmation that they've completed necessary information.

Figure 37 Conformation Example

4.5.3.6 Clarity

Offering a visual representation of the training program request's development presents a structured flow of stages or steps. This visual hierarchy aids users in understanding the sequence of actions or stages required.

Figure 38 Clarity Example

4.6 Implementation

This section aims to outline the primary components, implementation steps, methodologies, and challenges encountered during the development of Business Gate. During the requirements gathering phase, we encountered challenges due to the diverse user base. Managing and accommodating multiple user requirements posed significant hurdles in the development process. However, the implementation of Agile methodology proved instrumental in navigating these challenges. Its iterative approach allowed us to adapt swiftly to changing user demands, fostering continuous collaboration and flexibility. Furthermore, during testing, the presence of various user types introduced complexities. Ensuring comprehensive testing across multiple user scenarios and functionalities presented a notable challenge. Nevertheless, by employing Agile practices, such as iterative testing and user-centric feedback loops, we effectively addressed these testing challenges, ensuring a more thorough validation of our system across diverse user personas and use cases.

The implementation of Business Gate entailed the adept utilization of various technologies, employing Django, JavaScript, HTML for the website, and Flutter/Dart for the mobile application and Postgres database.

4.6.1 Website Side

Django's Authentication System Integration

The incorporation of Django's authentication system within Business Gate significantly bolstered security measures against prevalent threats. This framework's intuitive design streamlined login, logout, and authentication processes, reducing development complexities. While Django allows tailored user model customization to fit project specifics, challenges surfaced during the integration of distinct custom user models—'FacultyStaff' and 'Kaibuemployee'. To address this hurdle, we devised specialized authentication backends for each user model within 'auth_backends.py'. Additionally, validated field mapping was employed, ensuring seamless alignment with Django's authentication mechanisms, resolving complexities encountered.

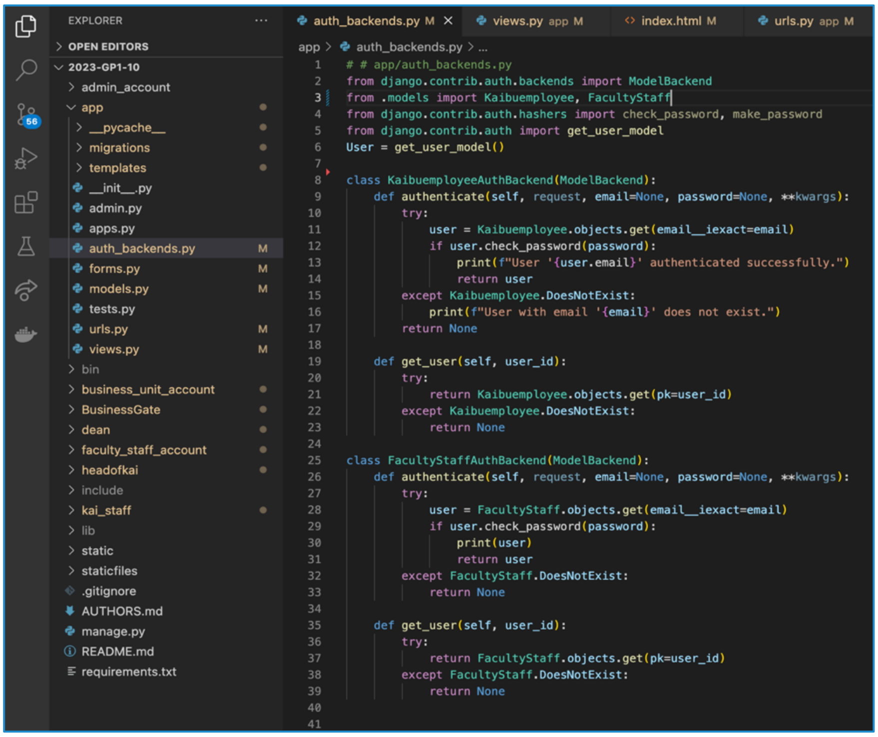


Figure 39 Authentication methods

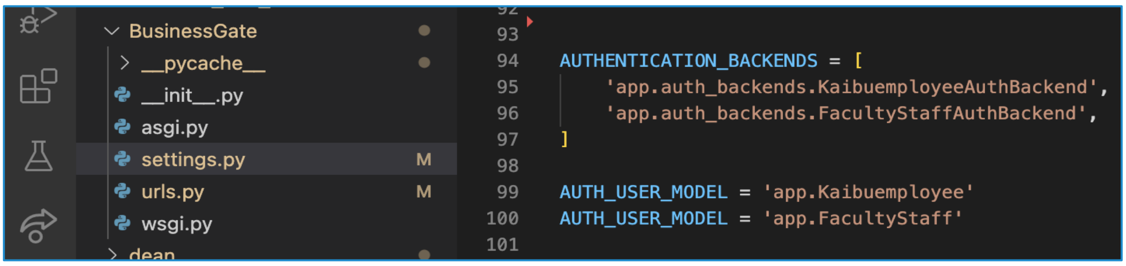


Figure 40 Implementing authentication methods in Business Gate setting

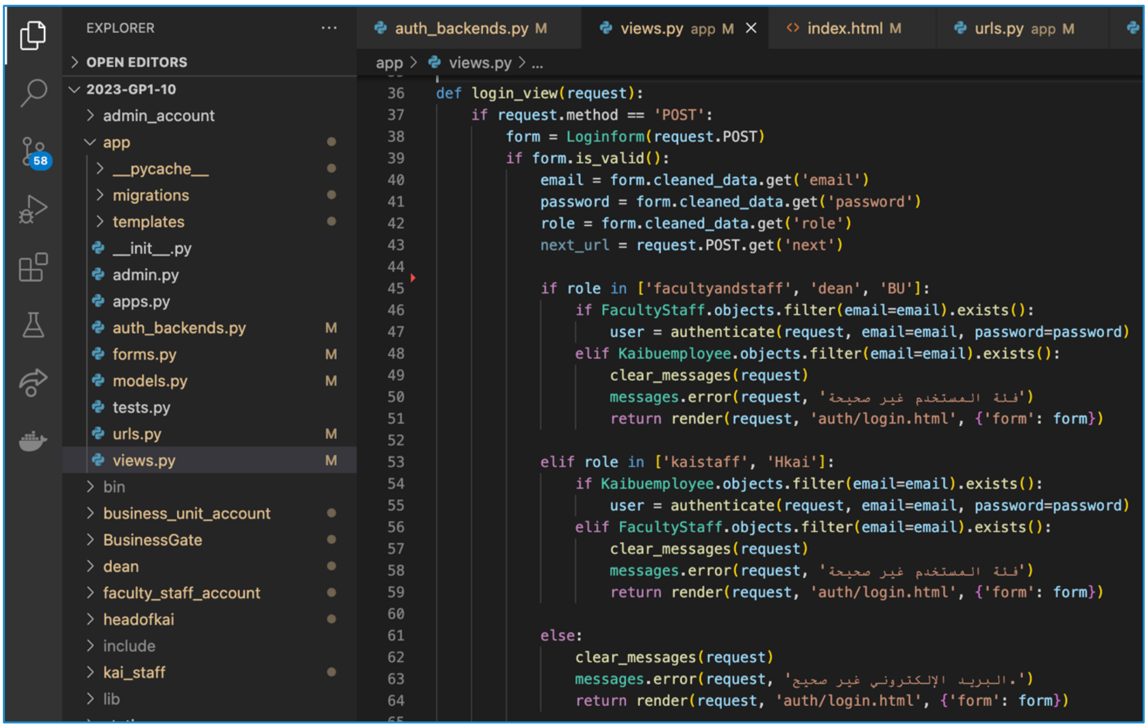


Figure 41 Login view using the authenticate method

Sending Emails

Facilitating password resets through email verification posed a significant challenge in the site's functionality. Establishing a seamless process for sending one-time passwords (OTPs) via email demanded meticulous configuration and implementation. Properly configuring email settings within Django, including SMTP server details, became a complex endeavor, further compounded by utilizing the 'smtplib' library for email transmission. The intricacy arose in establishing a secure connection to the SMTP server and ensuring accurate authentication methods, which became apparent during the debugging phase. Addressing this challenge involved extensive debugging procedures, validating the SMTP server configuration, managing SSL contexts appropriately, and meticulously cross-verifying authentication details for the designated email account. Resolving these complexities demanded an in-depth comprehension of email protocols, secure connections, and precise error handling within the email transmission system. This intensive process was crucial in ensuring the successful and secure delivery of password reset emails to users, underscoring the intricacies involved in email functionality within the site's architecture.

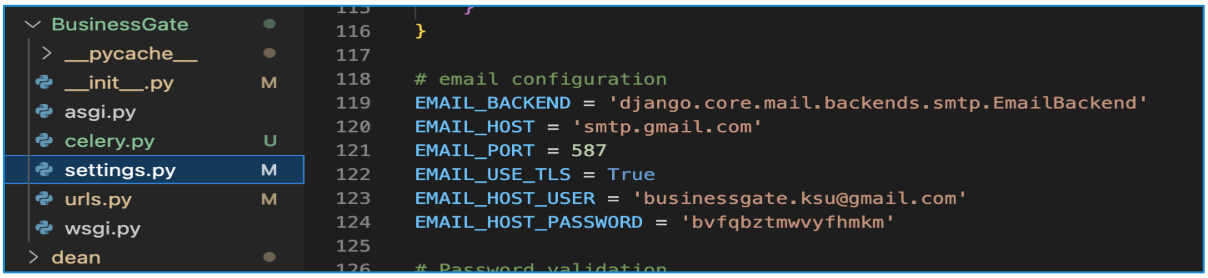


Figure 42 Configure email server

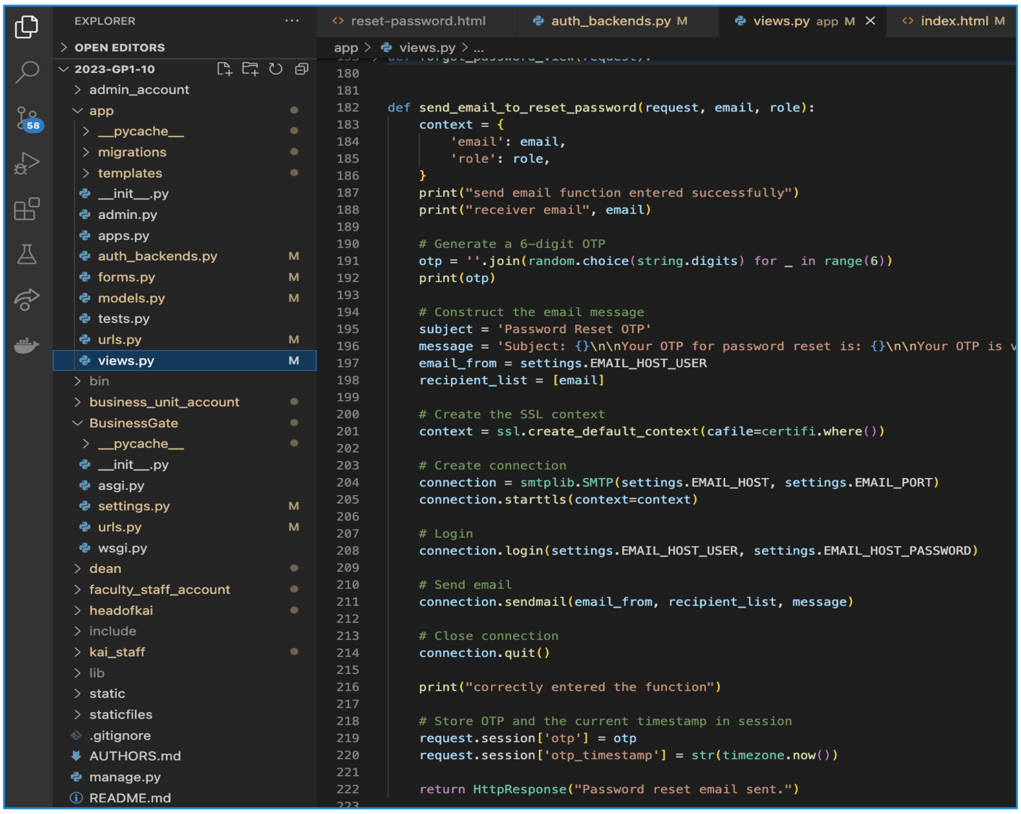


Figure 43 Sending the email view using 'smtplib' and 'ssl' libraries and email server

4.6.2 Application Side

Date retrieval

Retrieving date type columns from a Postgres database and saving them as variables with a date type in Flutter presented a considerable challenge. Upon retrieval, the data often resulted in errors, either storing as null values or becoming corrupted. To resolve this issue, we sought a solution through the integration of external resources. We found that importing the "package:intl/intl.dart" package proved instrumental. This package offers comprehensive internationalization and localization functionalities tailored for app development needs. Specifically, leveraging the 'format' method within this package allowed us to seamlessly align the retrieved date data with the expected database date format. By utilizing this method, we effectively mitigated the issues encountered during the data retrieval process, ensuring accurate and consistent handling of date information within the Flutter framework.

```
String formattedDate1 = DateFormat('dd-MM-yyyy').format(row[4]);
String formattedDate2 = DateFormat('dd-MM-yyyy').format(row[5]);
```

Figure 44 Using dateFormat method

Retrieving trainee certificates

Managing certificates stored as binary data in the database presented a significant challenge. Encoding and decoding the certificates during retrieval caused data corruption. Additionally, attempts to convert these certificates into PDF format using available packages were unsuccessful. To address this issue, we explored various strategies. Ultimately, the solution involved encoding the certificates before storing them in the database and implementing the 'package:flutter_pdfview/flutter_pdfview.dart'. When retrieving the certificates for viewing, we decoded them. This encoding step played a critical role in maintaining data integrity, successfully preventing corruption during retrieval and manipulation processes. The encoded certificates were seamlessly processed, ensuring their smooth translation into PDF format without compromising data integrity.

```
Widget build(BuildContext context) {
  return Scaffold(
    appBar: AppBar(
      title: Text('Certificate Detail'),

    ), // AppBar
    body: Column(
      mainAxisAlignment: MainAxisAlignment.center,
      children: [
        Expanded(
          child: PDFView(

            pdfData: base64Decode(certificateData),
            enableSwipe: true,
            swipeHorizontal: false,
            autoSpacing: false,
            pageFling: false,
            onRender: (pages) {
              // PDF document is rendered successfully
              print('Pages: $pages');
            },
            onError: (error) {
              // Handle error during PDF view
              print('Error: $error');
            },
          ), // PDFView
```

Figure 45 Retrieving Certificates Widget

5 System Evaluation

5.1 Overview

In this chapter, we will perform system testing to ensure that the system functions as required. We will use user acceptance testing (UAT) to test our system.

5.2 User Acceptance Testing

In this section, we present the user acceptance testing to verify that our software meets user needs. We conducted UAT for 6 types of users. First, we defined the goals and scope of testing. We conducted tests on the website using 10 users and similarly had 10 individual users test the application.

We scheduled a meeting a week in advance with Dr. Abdualrahman Alshehri (Head of the Business Unit in the Nursing College), Dr. Nourah Alrossais (Head of the Business Unit in the CCIS College), Mr. Sami AlMubiriak (Head of the Business Unit in the Business College) ,Dr. Nuha bin Tayash as (Assistant Head of the Business Unit in the CCIS College) and as (faculty members in the CCIS College), Mr. Turki Alajmi (staff member in KAI Business Units), Dr. Arwa Alawajy and Dr. Zahida Almuallem (faculty members in the CCIS College), and Dr. Manal Albahlal (Deputy Dean in the CCIS College) as (faculty members in the CCIS College) and on the behalf of the dean Dr.Manal tested the Dean account.

During the meeting, we set up a testing environment simulating real usage. We developed test cases covering key user tasks and features. The testers evaluated the system's performance on these cases. Finally, we analyzed the results, discussed any issues, and determined if the system was ready for release or needed further improvements.

UAT Test Cases

1. Application Test Cases:

    - Sign up with valid credentials
    - Sign up with invalid credentials
    - Sign in with valid credentials
    - Sign in with invalid credentials

- Edit Profile and Save Changes
- User reset their Password
- View Available Programs
- Filter Programs
- Register for a Program
- View Registered Programs
- Cancel Registration for a Program
- Fill out the Evaluation Questionnaire
- Change Language

2. Website Test Cases:

- Sign in with valid credentials
- Sign in with invalid credentials
- Users Reset their Password
- View Faculty Member Details
- Faculty Member Proposes a Non-academic Program
- BU Head Accepts a Course Proposed by a Faculty Member
- BU Head Rejects a Course Proposed by a Faculty Member
- BU Head Proposes a Non-academic Program
- Faculty Member Accepts a Course Request Proposed by BU Head
- Faculty Member Declines a Course Request Proposed by BU Head
- Faculty Member Requests to Contribute to a Published Program
- BU Head Proposes a Project
- BU Head Accepts the Project Team Members

- BU Head Rejects the Project Team Members
- BU Head Chooses the Project Team Leader
- BU Head reviews reports for completed programs and projects.
- User Creates a New Chat with Authorized Users or Sends Messages to an Existing Chat
- User Creates a New Meeting
- User Joins an Existing Meeting
- Faculty Member Accepts a Request to Contribute to a Project
- Faculty Member Rejects a Request to Contribute to a Project
- BU Head and KAI create tasks.
- BU Head and KAI assign tasks to other users.
- BU Head and KAI reject tasks.
- BU Head and Dean view the college revenue and count
- BU Head views their program, project, and task dates on a calendar
- Faculty members view their program and project dates on a calendar
- Users View notifications
- Users Delete notifications

5.2.1 Demographics of Participant

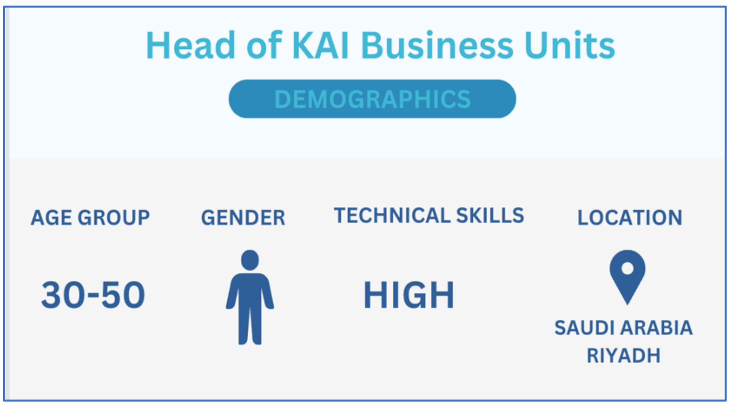


Figure 46 Demographics of testing participants 1

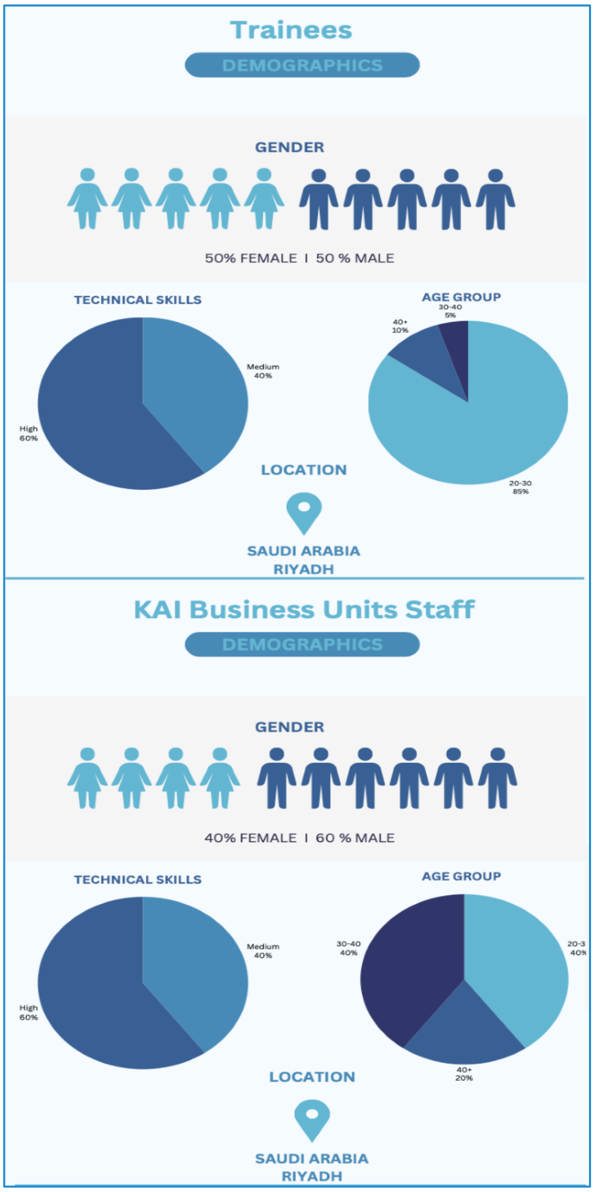


Figure 47 Demographics of testing participants 2

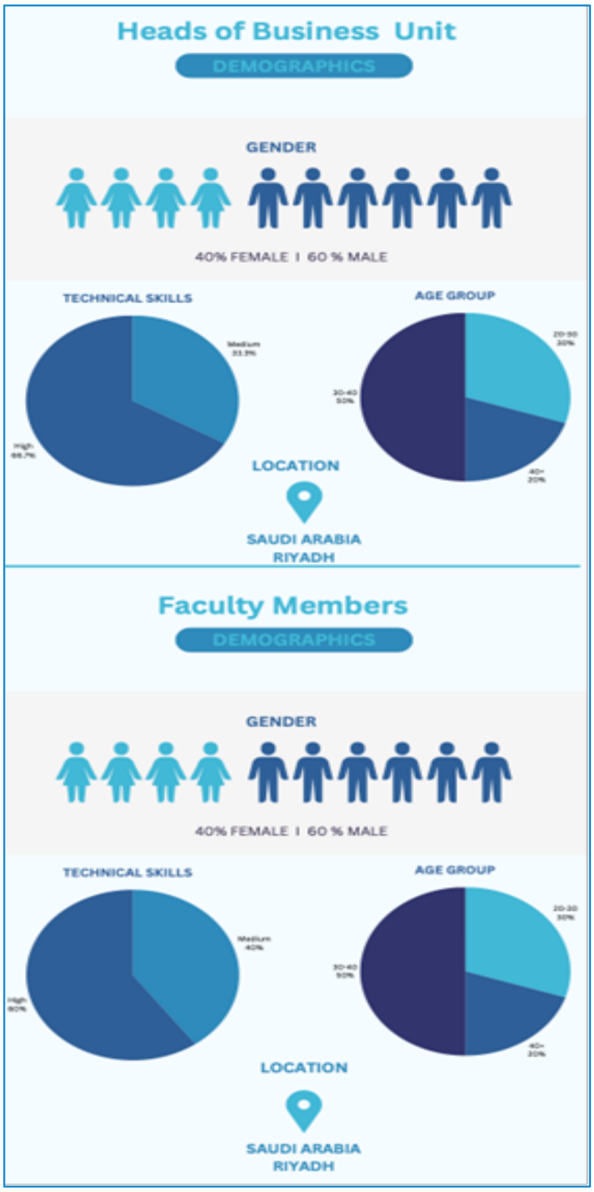


Figure 48 Demographics of testing participant 3

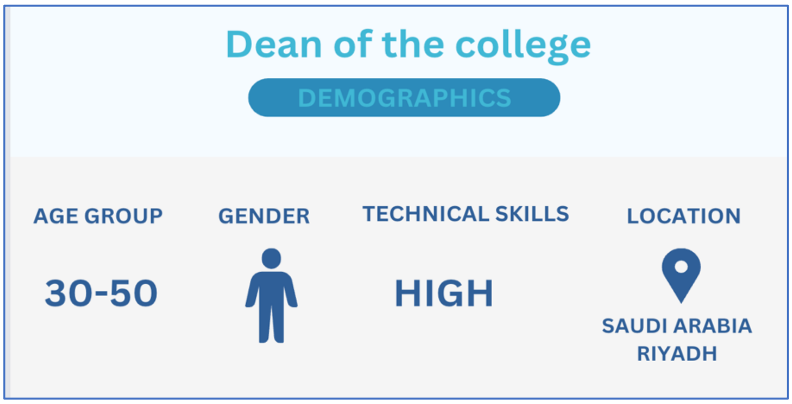
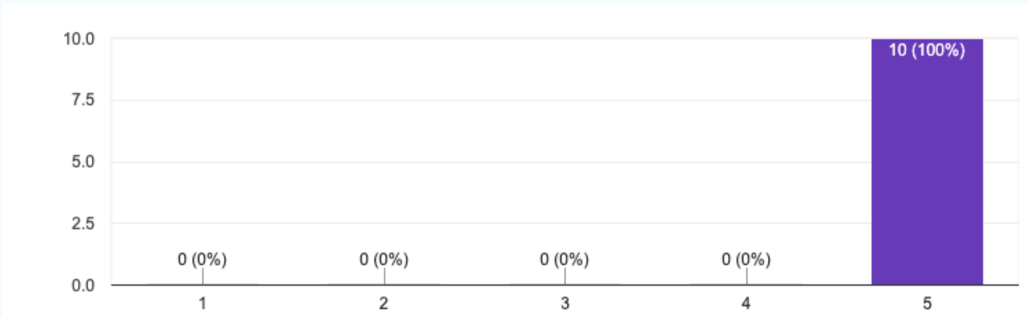
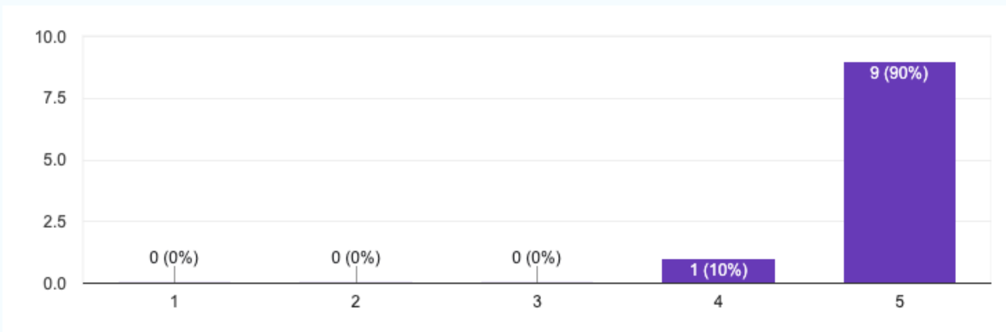
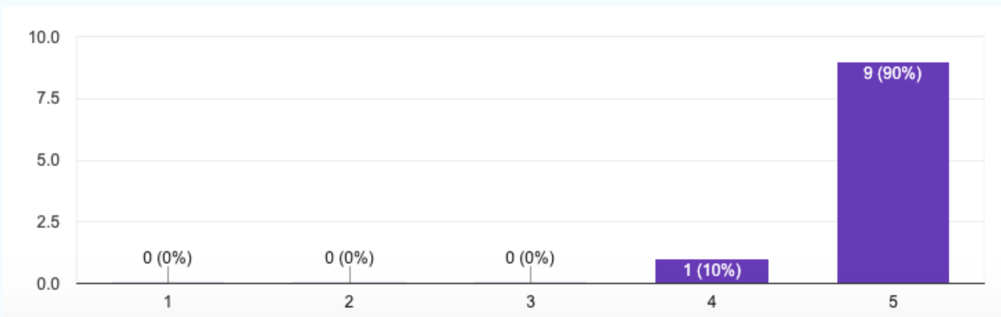
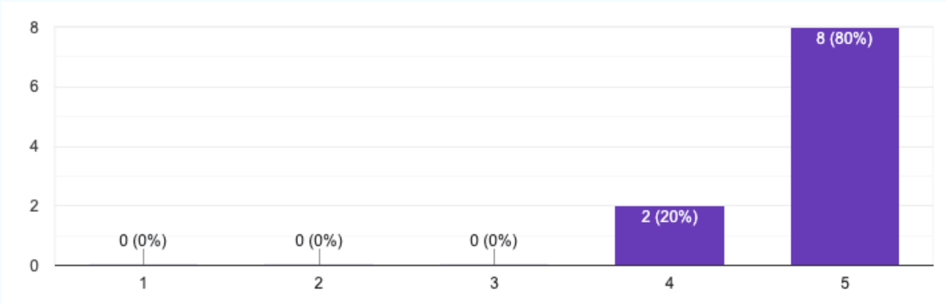


Figure 49 Demographics of testing participant 4

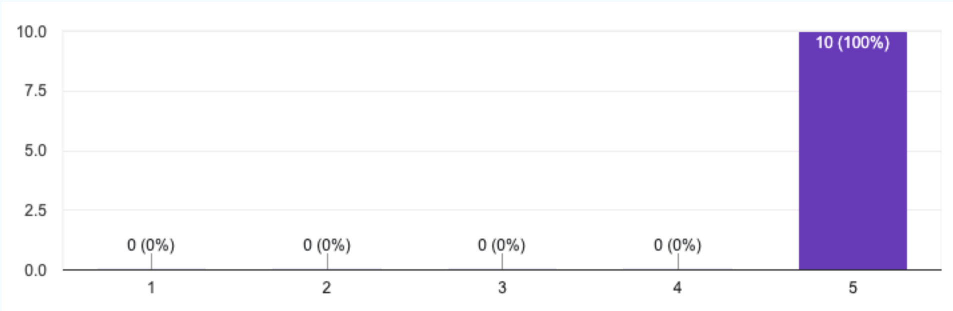
5.2.2 Questionnaire/Interview Results

Question Number	Question
Application Testing Questions	
1	1 (very hard), 2 (hard), 3 (neutral), 4 (easy), 5 (very easy). 
2	1 (very hard), 2 (hard), 3 (neutral), 4 (easy), 5 (very easy). 
3	1 (very hard), 2 (hard), 3 (neutral), 4 (easy), 5 (very easy). 

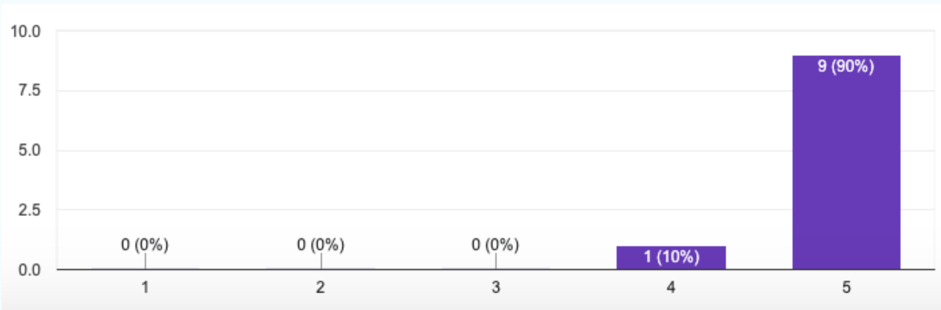
<table>
<tr><td>4</td><td>1 (very hard), 2 (hard), 3 (neutral), 4 (easy), 5 (very easy).



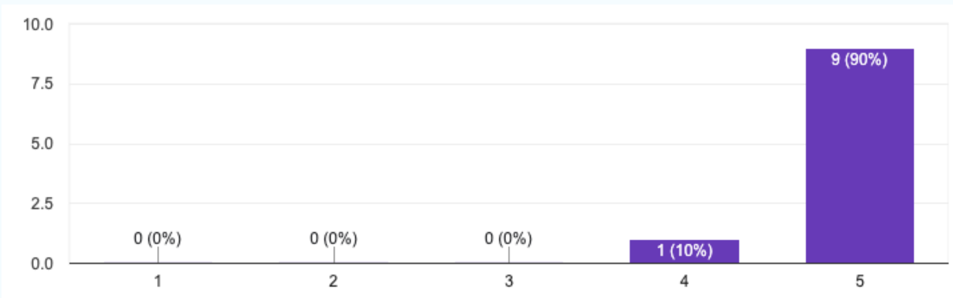
</td></tr>
<tr><td colspan="2">Website Testing Questions</td></tr>
<tr><td>1</td><td>1 (very hard), 2 (hard), 3 (neutral), 4 (easy), 5 (very easy).



</td></tr>
<tr><td>2</td><td>1 (very unsatisfying), 2 (unsatidfying), 3 (neutral), 4 (satisfying), 5 (very satisfying).



</td></tr>
<tr><td>3</td><td>1 (very unsatisfying), 2 (unsatidfying), 3 (neutral), 4 (satisfying), 5 (very satisfying).



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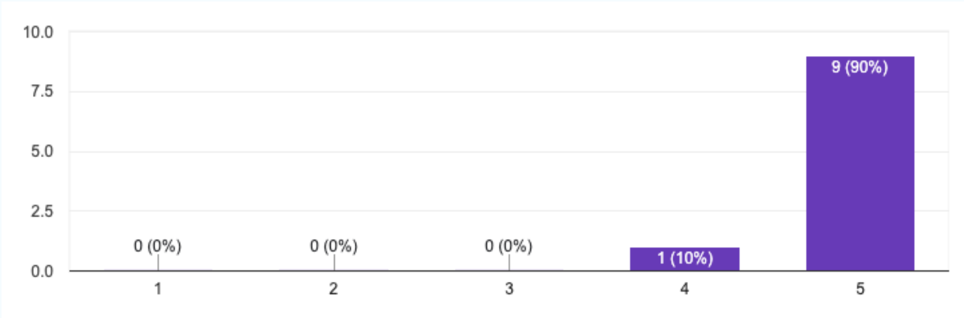
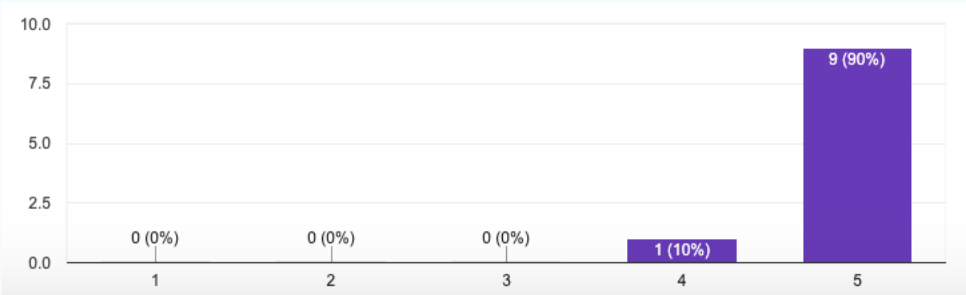
</table>

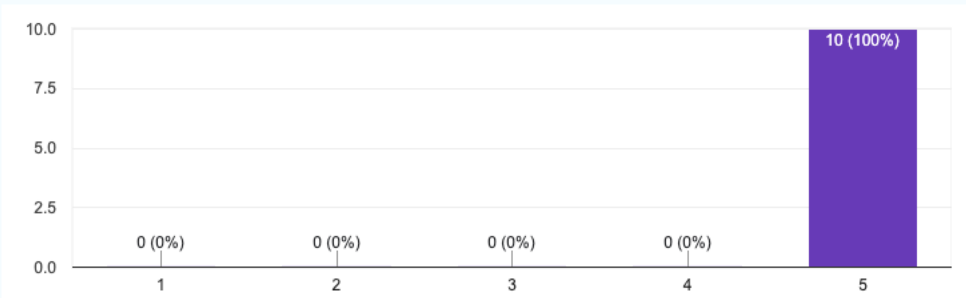
<table>
<tr><td>4</td><td>1 (very unsatisfying), 2 (unsatidfying), 3 (neutral), 4 (satisfying), 5 (very satisfying).



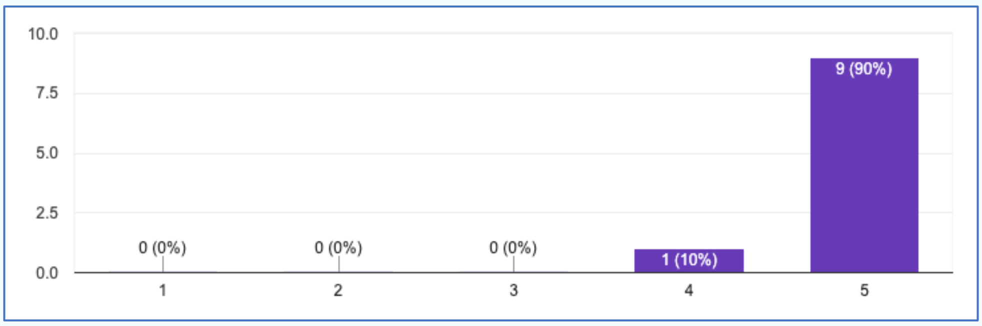
</td></tr>
<tr><td>5</td><td>1 (very uneffective), 2 (uneffective), 3 (neutral), 4 (effective), 5 (very effective).



</td></tr>
<tr><td>6</td><td>1 (very uneffective), 2 (uneffective), 3 (neutral), 4 (effective), 5 (very effective).



</td></tr>
<tr><td>7</td><td>1 (very unuser-friendly), 2 (unuser-friendly),3 (neutral),4 (user-friendly),5 (very user-friendly).



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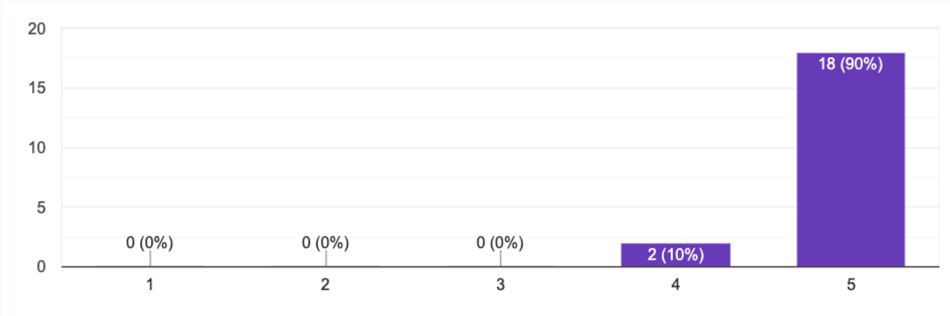
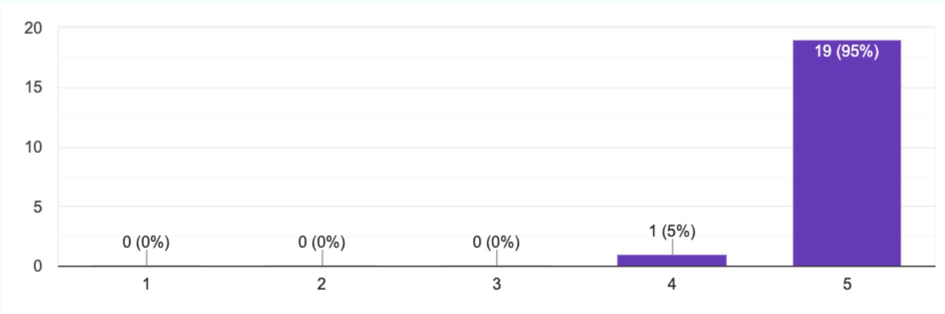
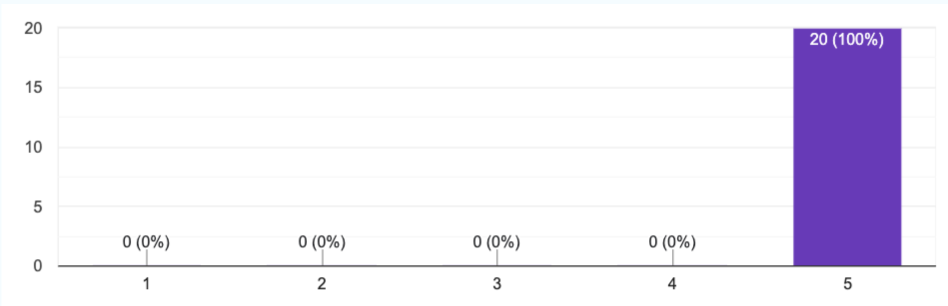
<table>
<tr><th colspan="2">General system feedback</th></tr>
<tr><td>1</td><td>1 (very unsatisfying), 2 (unsatidfying), 3 (neutral), 4 (satisfying), 5 (very satisfying).



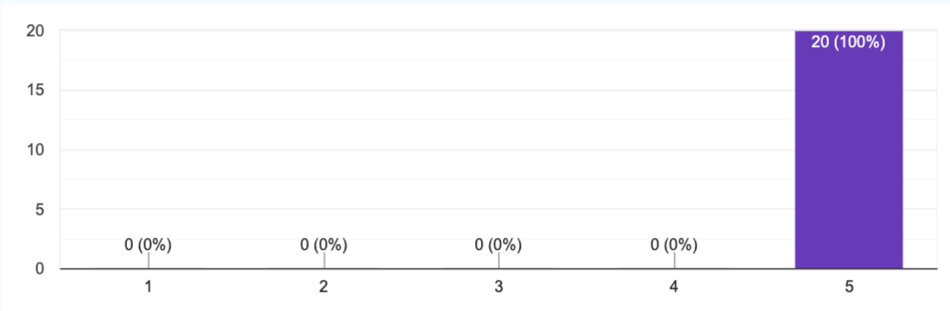
</td></tr>
<tr><td>2</td><td>1 (very hard), 2 (hard), 3 (neutral), 4 (easy), 5 (very easy).



</td></tr>
<tr><td>3</td><td>1 (very hard), 2 (hard), 3 (neutral), 4 (easy), 5 (very easy).



</td></tr>
<tr><td>4</td><td>1 (very unclear), 2 (unclear), 3 (neutral), 4 (clear), 5 (very clear).



</td></tr>
</table>

5	جدا سهل وواضح بالاستخدام، جهود جباره عمل راااائع ونظام متكامل اتمنى نشوفه على ارض الواقع 😍 Nothing, it's was great experience لايوجد، مشروع متكامل. بالتوفيق ❤️❤️❤️ Good luck 💕I like the interfaces, good luck Add dark mode النظام ممتاز وسهل الاستخدام👍

Table 23 Testing results

Overall, the user feedback produced very good results. The goal of Business Gate was clear to all types of users, which is a testament to the application's ease of use, as agreed upon by most users. The application interfaces were consistent, with clear icons, buttons, and system messages that helped users perform the required tasks without problems. The released functionalities and services met most of the users' requirements and needs, indicating a successful alignment with user expectations.

5.3 Quality Attributes (NFR testing)

User Story	Quality Attribute	Measure	Results
As a user, I want to have the website available 90% of the time I try to access it so that I can access it reliably and perform my tasks without significant delays.	**Availability**: The proportion of time that the system is operational under normal conditions.	Compute the level of system availability.	Business Gate depends on PostgreSQL, so we compute the availability by following these steps: Monitoring Period: 8.5 months (259 days). Data Collection: Total Uptime: 6216 hours. Total Downtime: 0 hours (no downtime). Calculation: (Uptime/Total Time) X 100% = (6216/6216+0)X100% = 100%

As a user, I want to have secure authentication so that I can ensure the confidentiality and privacy of my account and prevent unauthorized access to sensitive data.	**Security**: How to ensure that the access privileges are implemented correctly	Compute the level of system security.	Business Gate's security is assessed by its stringent access controls, which limit unauthorized access to information. Before retrieving data, our system verifies user authorization, ensuring access is granted only to permitted users.
As a user, I want to be provided with up-to-date information on projects so that I can accurately track progress and effectively work on tasks related to the projects.	**Reliability**: The system will likely work as expected and produce accurate results for a given time period.	Assess System Performance under Load Conditions.	While Business Gate depends on PostgreSQL, Load testing was conducted to assess the performance of PostgreSQL under moderate to heavy load conditions. Load: Simulated 30 concurrent users accessing the database. Transactions: Executed a mix of read and write operations. Duration: Test ran for 1 hour. Results: Average Response Time: 30 milliseconds Transactions per Second: 300.
As a user, I want to have intuitive and user-friendly interfaces so that I can easily navigate through the system and perform tasks efficiently.	**Usability**: How fast a user may become familiar with a system through interaction with an system to complete a task.	Calculate the average time of completing the tasks .	20 users were tasked with common actions, and we recorded the time each user took to complete these tasks. - Average time taken by users: Logging In: 10 seconds Logging Out: 5 seconds Creating a Chat: 11 seconds Creating a Meeting: 13 seconds Joining a Meeting: 16 seconds - Average time taken to complete tasks across all users and tasks: (10 + 5 + 11 + 13 + 16) / 5 = 11 seconds.

As a user, I want to get a response time of less than 5 seconds so that I can efficiently access and work on tasks without experiencing significant delays.	**Responsiveness**: How quickly does the system respond to user interaction?	Calculate the average system response time.	20 users were assigned common actions, and we recorded the time it took for the system to respond to each action. -Average response time: Navigating to Different Pages: 3 seconds Viewing Notifications: 4 seconds Filtering or Sorting Data: 3 seconds Viewing Chats: 5 seconds -Average response time across all users and tasks is 3.6 seconds.

Table 24 Quality attributes NFR testing

5.4 Discussion

The system evaluation results indicate a successful implementation, with user acceptance testing (UAT) revealing high levels of satisfaction among a diverse group of stakeholders, including business unit heads, faculty members, KAI head and staff, dean, and trainees. The testing process was thorough, involving a well-structured setup that simulated real-world usage. Test cases covered essential tasks for both the application and website and the results showed that the design focused on user-friendly interfaces and intuitive functionalities, allowing users to perform tasks effectively without significant issues.

The evaluation of non-functional requirements (NFR) demonstrated exceptional system performance. The system maintained 100% availability over 8.5 months, indicating robust reliability. Security measures were stringent, ensuring that access controls were correctly implemented to protect user data. Load testing showed the system performed well under moderate to heavy conditions, with an average response time of 30 milliseconds and 300 transactions per second. Usability metrics indicated that users could quickly familiarize themselves with the system, completing tasks efficiently with an average task completion time of 11 seconds. Responsiveness was also within an acceptable range, with an average response time of 3.6 seconds.

Overall, the system evaluation was overwhelmingly positive, confirming that the system met its goals and user needs effectively. To maintain and enhance this success, it is essential to regularly update test cases to cover new functionalities, continuously incorporate user feedback to refine the interface and features, and maintain rigorous monitoring and security audits. These steps will ensure the system remains reliable, secure, and user-friendly, adapting to evolving user needs and technological advancements.

5.4.1 Summary

The system evaluation showed high user satisfaction and robust performance, with effective user-friendly design and strong reliability, security, and usability metrics. Continuous updates and refinements based on user feedback and rigorous monitoring will ensure ongoing success and adaptation to future needs.

6 Conclusions and Future Work

The Business Gate project stands as a transformative initiative addressing critical challenges faced by King Saud University's Business Units (BUs). At its core, Business Gate is designed to transcend far beyond the confines of KSU. Locally, the project aligns seamlessly with the Kingdom's Vision 2030's [1] aspirations, contributing to the diversification of the economy. By streamlining BU operations and promoting sustainable development, Business Gate becomes a catalyst for change within the university, and by extension the broader community.

The project's performance places KSU in a leadership position for efficient workflow management among institutions globally, providing a model for superiority in operations. The software development journey of Business Gate was not without its hurdles. The identified challenges in our problem, such as communication gaps, resource management complexities, and operational inefficiencies within BUs, underscored the critical need for a dedicated workflow management system.

We navigated these challenges strategically, leading to the development of a robust platform tailored to the unique needs of KSU. In this collaborative endeavor, it is essential to extend our sincere acknowledgment to the Business Units (BUs) and the King Abdullah Institute for Research and Consultancy Studies (KAI) for their invaluable collaboration and their time and effort towards our project. Their active participation and insights played a pivotal role in shaping the project, ensuring that the final product not only meets but exceeds the expectations of the stakeholders involved.

While Business Gate stands as a transformative solution, it is essential to acknowledge its limitations. Limitations, such as potential scalability challenges or specific contextual constraints, will be addressed through iterative improvements, ensuring the sustained relevance and effectiveness of Business Gate.

The primary contribution of the Business Gate project is its role in revolutionizing how KSU's BUs operate. By providing a centralized platform for task tracking, project assignments, and team communication. Business Gate becomes the cornerstone of efficient administration. Its impact on financial sustainability, innovation, and knowledge transfer stands out as a testament to its significance in the university's journey towards excellence.

Looking ahead, the Business Gate project not only marks a significant achievement in addressing current challenges but also sets the stage for future developments and enhancements. In the broader context of future work, our vision includes expanding the functionalities of Business Gate to ensure its sustained relevance in the dynamic landscape of higher education and technological advancements. This entails a commitment to adding features that enhance user experience, streamline operations, and foster effective communication among different stakeholders.

7 Acknowledgments

First and foremost, we would like to thank almighty Allah for giving us the opportunity to gain this valuable experience, the strength throughout this journey, and the patience to keep going through hard times.

Secondly, we would like to express our gratitude and appreciation to our supervisor Dr.Nourah Alrossais for her support, patience, and continuous encouragement and guidance throughout this project.

Also, we would like to thank the College of Computer and Information Sciences, especially the Department of Information Technology, for giving us the opportunity and support.

Special thanks and love go to our parents, families, and friends this project would not be possible without their love and support.

Finally, we are grateful to our instructors and colleagues for making this journey easier, sweeter, and enjoyable

7.1 Achievements

We were accepted to showcase our project at the 15th Annual Undergraduate Research Conference in Applied Computing at Zayed University.

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9 Appendix

9.1 Appendix A : Interviews

Interview 1 Outline	
Interviewee: Head of Business Unit at college of computer and information sciences dr. Nourah Alrossais	**Interviewer:** Business Gate developer team
Location/Medium: College of computer and information sciences	**Appointment:** Start Time: 12:00 pm End Time 12:40
Objectives:	**Reminders:**
Agenda: Topic 1 Question Topic 2 Question Topic 3 Question Topic 4 Question Topic 5 Question Topic 6 Question	**Approximate Time:** 10 minutes 10 minutes 2 minutes 5 minutes 2 minutes 10 minutes
General Observations: The interview went well, the interviewee was able to answer all the questions.	
Unresolved Issues, Topics Not Covered: There were none.	
Interviewee: Dr. Nourah	**Date:** 1/9/2023
Questions:	**Notes:**
Question 1: Can you explain what any business unit in KSU aims and what they provide?	**Answer :** The university business units serves as a channel connecting different stakeholders public and private sector with college academic expertise. Providing many serves that generates extra income to the university and the services' providers from faculty members. Some of these services are: • Applying and then working in tenders or projects • Organize training programs such as courses, workshops, and summer camp. • Provide consultation services. **Observation:** the interviewee noted that Business Units is a new sector of the university it is still developing, and probably new serves will be added and noted that she is not aware of all the services other business units provides.
Question 2: What is KAI role?	**Answer:**

	We do not communicate with the stakeholders directly they are our communication interface to them. Additionally, they supervise the work we do, they review it and give notes on it. They inform us about the projects and provide us with documentation and instructions. **Observation:** None
Question 3: How do you communicate with KAI?	**Answer:** We communicate through emails. **Observation:** The interviewee has noted that emails are not practical.
Question 4: How do you construct work teams?	**Answer:** If King Abdullah Institute assigns us a task, I will send an email to a faculty member that I think would be a good team leader. If they accept the role, I will then send emails to other faculty members that the team leader and I believe would be good fits for the team. **Observation:** The interviewee has noted that the lack of a faculty database makes this process hard and time consuming when the solution is extremely easy.
Question 5: How do teams communicate?	**Answer:** Team communicates through WhatsApp group. **Observation:** The interviewee has noted that commination method is neither professional nor practical
Question 6: What other difficulties does the business unit face?	**Answer:** In addition to inefficient communication methods and the lack of a faculty database, we do not have a centralized system to store task details. This leads to data fragmentation - important data and documents end up scattered across different systems like emails and file folders. The lack of a workflow management system negatively impacts project visibility. **Observation:** The interviewee has noted that the lack of workflow management system affects business units' productivity.

Interview 2 Outline	
Interviewee: Business Unit associate head at the College of Humanities and Social Sciences Dr. Mai Al Wathlan	**Interviewer:** Business Gate developer team

Location/Medium: Online, Zoom	**Appointment:** Start time: 6:00pm End time: 6:40 pm
Objectives: collect data.	**Reminders:**
Agenda: Introduction Background on the project Overview of the interview Topics to Be Covered Permission to Record Topic 1 Question Topic 2 Question Topic 3 Question Topic 4 Question Topic 5 Question Topic 6 Question Topic 7 Question Topic 8 Question Topic 9 Question Topic 10 Question Topic 11 Question Summary of Major Points Questions from Interviewee Closing	**Approximate Time:** 3 minutes 3 minutes 1minute 2 minutes 1 minute 4 minutes 2 minutes 1minute 4 minutes 1 minute 2 minutes 1 minute 2 minutes 2 minutes 4 minutes 1 minute 1 minute
General Observations: The interview went well, the interviewee was able to answer all the questions.	
Unresolved Issues, Topics Not Covered: There were none.	
Interviewee: Dr. Mai	**Date:** 5/9/2023
Questions: Business Unit head at the College of Humanities and Social Sciences	**Notes:**
Question 1: What services does the business unit at your college provide, and what is the process of implementing each service?	**Answer:** Our Business Unit's main role is to source and oversee projects that align with the expertise of our college's faculty. While some of these projects have been identified through our own research, others come directly from the King Abdullah Institute. Once we have a project, we pair it with the appropriate department in our college and then proceed to manage its implementation according to the plans approved by the Institute. **Observation:** None
Question 2: What is the method of communication with King Abdullah Institute? Do you face any problems communicating with them?	**Answer:** Our primary method of communication with the King Abdullah Institute is via email. We haven't encountered significant issues with this approach as the responses are usually prompt.

	Observation: None
Question 3: When forming a team to work on projects, how do you form the team and communicate among yourselves? Do you face any communication problems?	**Answer:** Teams for projects are formed based on the specific expertise required. Communication within these teams is typically done via WhatsApp or Telegram. While there may be room for improvement in this communication method, we have not encountered significant issues thus far. **Observation:** the interviewee has noted that they encountered some issues in creating the teams by not knowing the faculty interests and some other information related to their major, so they have fixed that problem by creating faculty database specified for their college
Question 4: What do you usually share in work groups? Do you just use groups or also hold virtual meetings?	**Answer:** In our groups, we share files and hold meetings on Zoom when needed. **Observation:** None
Question 5: Does the business unit provide paid master's programs affiliated with King Abdullah Institute?	**Answer:** No, we don't offer any paid master’s programs with the King Abdullah Institute. **Observation:** None
Question 6: When did work in the business unit start? Are services currently limited? Will they be increased in the future?	**Answer:** We started in January 2022 and are still setting up. Right now, we only manage projects, but we might expand our services later. **Observation:** The interviewee has noted that due to that the Business unit in their college is new thing there is not a lot of tasks they do but they suspect to expand their work in the upcoming years
Question 7: Do you need to communicate with business units in other colleges?	**Answer:** Yes, we sometimes work with business units in other colleges. We usually communicate with them by email. **Observation:** The interviewee has noted that they face a major issue in this part because they do not have contact with every Business Unit in KSU, and they have a hard time reaching them.
Question 8: Since establishing the business unit, how many projects have been accomplished so far? How would you describe the work intensity?	**Answer:** We've completed about 13 to 15 out of 93 projects since we started. The workload varies depending on the projects we have. **Observation:** None

Question 9: We asked about financial offer details and employee wages, what was the answer?	**Answer:** Details about financial offers and employee wages on projects are handled on a case-by-case basis and are typically included in the technical and financial proposals for each project. **Observation:** None
Question 10: Are there any daily tasks you wish were automated instead of done manually as routine procedures?	**Answer:** Currently, we don't have any tasks that we wish were automated. **Observation:** None
Question 11: Do you have any suggestions to add for developing the business unit's electronic system?	**Answer:** The interviewee did not give any suggestions. **Observation:** None

Interview 3 Outline	
Interviewee: Head of Business Unit at Nursing college Dr. Abdulrahman Al Shahir.	**Interviewer:** Business Gate developer team
Location/Medium: Online, Zoom	**Appointment:** Start time: 11:30am End time: 12:05pm
Objectives:	**Reminders:**
Agenda: Introduction Background on the project Overview of the interview Topics to Be Covered Permission to Record Topic 1 Question Topic 2 Question Topic 3 Question Topic 4 Question Topic 5 Question Topic 6 Question Topic 7 Question Topic 8 Question Topic 9 Question Topic 10 Question Topic 11 Question Summary of Major Points Questions from Interviewee Closing	**Approximate Time:** 3 minutes 3 minutes 1minute 3 minutes 1 minute 3 minutes 2 minutes 1minute 3 minutes 1 minute 2 minutes 1 minute 2 minutes 2 minutes 3 minutes 1 minute 1 minute
General Observations: The interview went well, the interviewee was able to answer all the questions.	

Unresolved Issues, Topics Not Covered: There were none.	
Interviewee: dr. Abdulrahman	**Date:** 11/9/2023
Questions:	**Notes:**
Question 1: What services does the business unit at your college provide, and what is the process of implementing each service?	**Answer-:** The business unit provides supervision for academic programs required by the job market, conferences and workshops that generate revenue, diploma programs after bachelor's degree, qualification programs to complete a bachelor's degree, and contracts with external entities. The unit coordinates with the relevant university agency and King Abdullah Institute administratively and financially. **Observation:** None
Question 2: What is the method of communication with King Abdullah Institute? Do you face any problems communicating with them?	**Answer-:** Communication with King Abdullah Institute is through email and official correspondence. There can be delays in responses sometimes due to workload. An electronic system connecting the unit and institute would facilitate communication and workflow. **Observation:** None
Question 3: When forming a team to work on projects, how do you form the team and communicate among yourselves? Do you face any communication problems?	**Answer-:** So far, there have been no joint programs with other colleges requiring cross-college teams. Teams within the college communicate through WhatsApp groups, email, and virtual meetings. No major communication issues have been faced. **Observation:** None
Question 4: What do you usually share in work groups? Do you just use groups or also hold virtual meetings?	**Answer-:** Work groups share project details, progress updates, meeting notes and any information relevant to completing tasks. Both WhatsApp groups and virtual meetings are utilized. **Observation:** None
Question 5: Does the business unit provide paid master's programs affiliated with King Abdullah Institute?	**Answer-:** Paid master’s programs are under the jurisdiction of the Deanship of Graduate Studies and Scientific Research, not the business unit. **Observation:** even though they don’t provide master programs the college of nursing Business unite do give other forms of academic and non-academic programs, they provide diploma programs but not for individuals but for

Question 6: When did work in the business unit start? Are services currently limited? Will they be increased in the future?	**Answer-:** The business unit was established around a year and a half ago. Currently offered services are diplomas, conferences, workshops, and qualification programs. More consulting services may be added in the future. **Observation:** None
Question 7: Do you need to communicate with business units in other colleges?	**Answer-:** We have not asked this question because it was answered in question 3. **Observation:** The interviewee acknowledged that currently there is no established system for communicating across business units in different colleges. He noted that while they haven't needed to collaborate yet, the lack of a smooth communication channel could become an obstacle in the future.
Question 8: Since establishing the business unit, how many projects have been accomplished so far? How would you describe the work intensity?	**Answer-:** The number of accomplished projects so far is unclear. The unit has several ongoing projects pending final approval. The workload is manageable so far without major issues. **Observation:** None
Question 9: We asked about financial offer details and employee wages, what was the answer?	**Answer-:** No definite financial figures were provided regarding revenue and wages. This will be clearer once ongoing projects are formally contracted and launched. **Observation:** None
Question 10: Are there any daily tasks you wish were automated instead of done manually as routine procedures?	**Answer-:** Having an electronic system would automate much of the paperwork, tracking requests and communication currently done manually. This would significantly ease workflows. **Observation:** None
Question 11: Do you have any suggestions to add for developing the business unit's electronic system?	**Answer-:** having a portal to view external requests coming to the Institute that are relevant to our college. This would help us track and follow up on these requests. Also, to track progress of requests initiated by the college to the Institute, to see where it is in the approval process. **Observation:** None

Interview 4 Outline	
Interviewee: Business Unit head at the College of Applied Medical Sciences Dr. Dara Al Dossary	**Interviewer:** Business Gate developer team
Location/Medium: Online, Zoom	**Appointment:** Start time: 1:00 pm End time: 1:35 pm
Objectives:	**Reminders:**
Agenda: Introduction Background on the project Overview of the interview Topics to Be Covered Permission to Record Topic 1 Question Topic 2 Question Topic 3 Question Topic 4 Question Topic 5 Question Topic 6 Question Topic 7 Question Topic 8 Question Topic 9 Question Topic 10 Question Topic 11 Question Summary of Major Points Questions from Interviewee Closing	**Approximate Time:** 3 minutes 3 minutes 2minute 1 minutes 1 minute 4 minutes 2 minutes 1minute 3 minutes 1 minute 2 minutes 1 minute 3 minutes 2 minutes 4 minutes 1 minute 1 minute
General Observations: The interview went well, the interviewee was able to answer all the questions.	
Unresolved Issues, Topics Not Covered: There were none.	
Interviewee: Dr. Dara	**Date:** 11/9/2023
Questions:	**Notes:**
Question 1: What services does the business unit at your college provide, and what is the process of implementing each service?	**Answer-:** The business unit at the college aims to benefit from the college's resources and capabilities. It provides research, consulting, training, conferences, workshops, and events. It coordinates with government and private entities and attracts projects to generate revenue for the college. **Observation:** None
Question 2: What is the method of communication with King Abdullah Institute? Do you face any problems communicating with them?	**Answer-:** Communication with King Abdullah Institute happens through official letters, emails, and meetings. No major problems have been reported. They provide legal and marketing consultation on proposals before signing agreements with external entities.

	Observation: None
Question 3: When forming a team to work on projects, how do you form the team and communicate among yourselves? Do you face any communication problems?	**Answer-:** For project teams, the department chair nominates a project manager based on certain criteria. The manager then selects the team members based on competencies needed for that project. Communication is usually by email and there are no reported problems. **Observation:** None
Question 4: What do you usually share in work groups? Do you just use groups or also hold virtual meetings?	**Answer-:** Work groups share project details, proposals, timelines, responsibilities etc. Mainly email is used, with some virtual meetings when needed. **Observation:** None
Question 5: Does the business unit provide paid master's programs affiliated with King Abdullah Institute?	**Answer-:** Yes, the business unit provides paid master's programs in coordination with King Abdullah Institute after getting department and committee approvals. **Observation:**
Question 6: When did work in the business unit start? Are services currently limited? Will they be increased in the future?	**Answer-:** The business unit was recently formed so services are still limited. More services are planned for the future as part of the college's strategic goals. **Observation:** None
Question 7: Do you need to communicate with business units in other colleges?	**Answer-:** Communicating with other college business units is beneficial for collaborations, training workshops, and sharing best practices. Email and a shared portal can enable this. **Observation:** None
Question 8: Since establishing the business unit, how many projects have been accomplished so far? How would you describe the work intensity?	**Answer-:** The unit is still new so only a few projects have been completed so far. More major projects are expected once the processes mature. **Observation:** None
Question 9: We asked about financial offer details and employee wages, what was the answer?	**Answer-:** The interviewee indicated that financial and wage details are confidential matters handled through King Abdullah Institute. **Observation:** None

Question 10: Are there any daily tasks you wish were automated instead of done manually as routine procedures?	**Answer-:** No specific manual tasks were mentioned but automating processes could help as the unit's work increases. **Observation:** None
Question 11: Do you have any suggestions to add for developing the business unit's electronic system?	**Answer-:** A shared portal for business units, announcement forums, documentation of procedures, and databases of available personnel were suggested to improve the electronic system. **Observation:** None

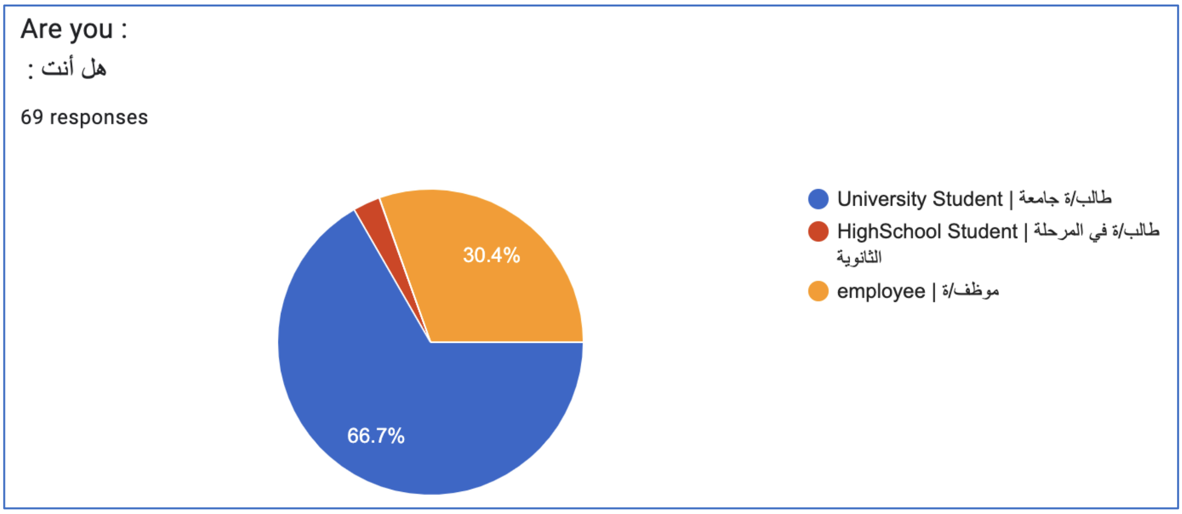
Interview 5 Outline	
Interviewee: A staff member at KAI business units' department Boshra Aljamaan	**Interviewer:** Business Gate developer team
Location/Medium: King Abdullah Institute for Research & Consulting Studies office	**Appointment:** Start time: 12:00 pm End time: 12:30 pm
Objectives: Collect data	**Reminders:**
Agenda: Introduction Background on the project Overview of the interview Topics to Be Covered Permission to Record Topic 1 Question Topic 2 Question Topic 3 Question Topic 4 Question Topic 5 Question Topic 6 Question Topic 7 Question Topic 7 Question Topic 8 Question Summary of Major Points Questions from Interviewee Closing	**Approximate Time:** 3 minutes 2 minutes less than a minute 1 minute 1 minute 3 minute 1minute 3minute 1minute 2minute 2minute 2minute 2minute 2minute
General Observations: The interview went well, the interviewee was able to answer all the questions.	
Unresolved Issues: There were none.	
Interviewee: Boshra	**Date:** 11/9/2023
Questions:	**Notes:**
Question 1:	**Answer-:**

How many business units are there in King Saud University?	22 units, one for each college. **Observation:** None
Question 2: What services do the business units in King Saud University provide and which service is for each one?	**Answer-:** All the services provided by the business units such as projects, courses, are presented to the appropriate business unit in the form of a project. Some of them are direct and submitted as a letter from KSU and executed, but the majority are presented as a project that the unit either approves or rejects. Then we prepare the financial and technical proposal and review it before submitting it to the tendering body within the specified deadline. **Observation:** The interviewee noted that even if business unites provide many services the process of execution is almost identical .
Question 3: Do you notify the business units whether their tender proposal was rejected or accepted?	**Answer-:** If accepted, yes, we inform them to start working on the project. If rejected, we do not inform them, but if the unit contacts us to know the status of the proposal, we inform them of the rejection and the reason if we are aware of it. **Observation:** None
Question 4: Do you have an interest in knowing the progress of each project in the business unit?	**Answer-:** Yes definitely, we are also interested in knowing the financial reports of each project and the financial reports of the units. **Observation:** None
Question 5: How are workshops or courses arranged?	**Answer-:** We are requested by external entities to hold workshops or courses in a certain field. This is presented to the business unit to prepare the financial and technical proposal and give it to the entity for approval or rejection. If approved, work starts on holding the workshop or course. **Observation:** None
Question 6: Who are the users of the system at KSU?	**Answer-:** There are 2 – KAI head for final approval and the business units' department staff to carry out communication, editing and other tasks. **Observation:** None
Question 7:	**Answer-:**

Do you need to communicate with business units in other colleges?	Yes definitely, we are also interested in knowing the financial reports of each project and the financial reports of the units. **Observation:** None
Question 8: What do you need a system for managing business units to have?	**Answer-:** We need a communication system. And we need archiving all project files in a place designated for each project. We also need to know the team leader for each project and the project team. We need a way to upload files for the project. I want the system to state the deadline for rejection or acceptance and the final deadline for submitting proposals after acceptance. **Observation:** None

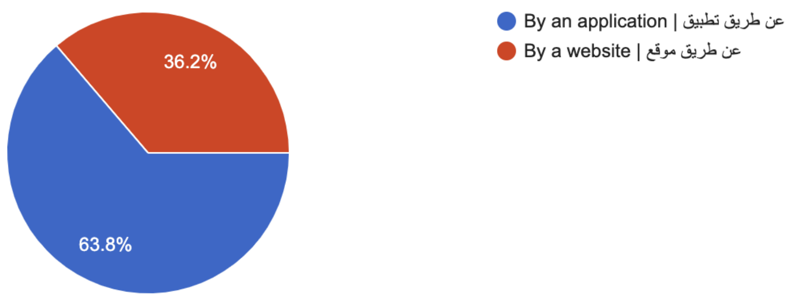
9.2 Appendix B : Questionnaires

Q1:



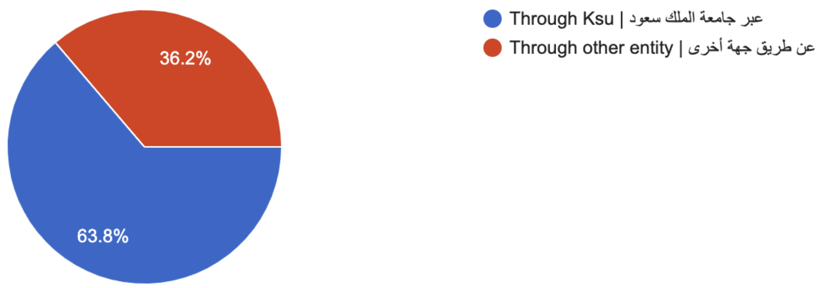
Q2:

Would you prefer to register for courses by an application or a website?
هل تفضل التسجيل في الدورات التدريبية عن طريق تطبيق أم عن طريق موقع ؟
69 responses



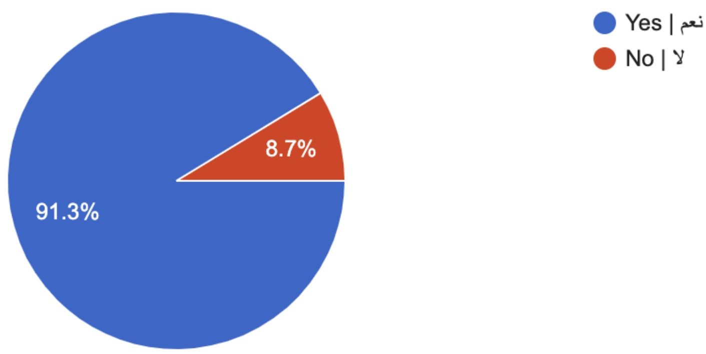
Q3:

Would you rather register for courses that belong to KSU or other entities?
هل تفضل التسجيل في دورة تدريبية تابعة لجامعة الملك سعود أم جهة أخرى ؟
69 responses



Q4:

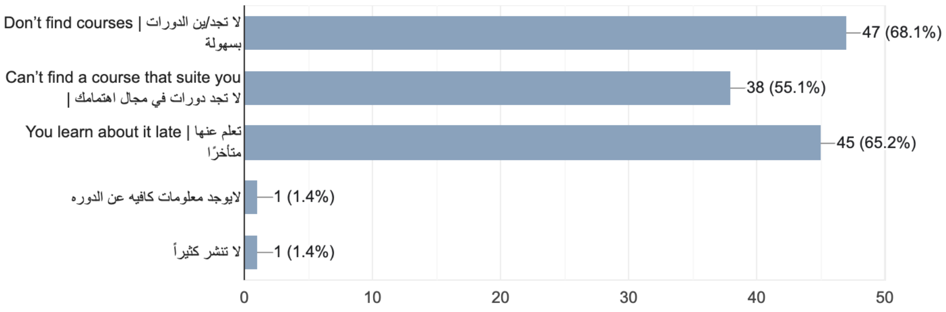
Do you usually face problems finding courses or workshops ?
هل تواجه/ين صعوبة في ايجاد الدورات او ورش العمل؟
69 responses



Q5:

If yes, What the is the problems you usually face when searching for courses or workshops?
ما هي الصعوبات التي تواجهك عند البحث عن دورات او ورش عمل ؟

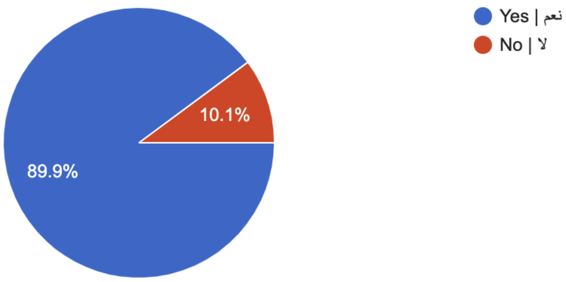
69 responses



Q6:

Do you want the option to automatically fill out the course registration form from your personal information?
هل تفضل/ين تواجد خيار لتعبئة معلومات التسجيل بدورة تلقائيا؟

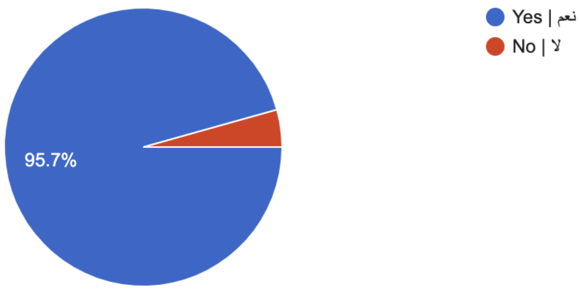
69 responses



Q7:

Would you like to receive your certificates for courses through the application, and it will be stored in it?
هل ترغب/ين في استلام الشهادات للدورات التدريبية عن طريق التطبيق، ويكون تخزينها فيه؟

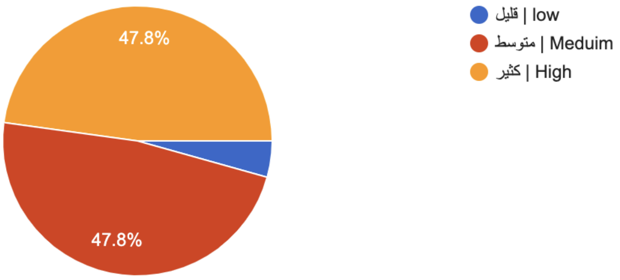
69 responses



Q8:

How much would you like to receive notifications in case a new course is added?
ما مدى رغبتك في الحصول على تنبيهات في حال إضافة دورة جديدة؟

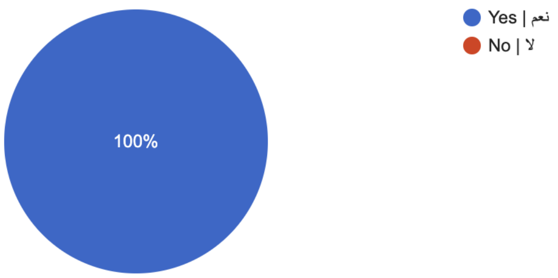
69 responses



Q9:

Would you like to be able to see the evaluation of the courses you entered and the course presenter?
هل تفضل/ين الاطلاع على تقييم السابق لمقدم الدورة أو الدورة التدريبية التي التحقت بها ؟

69 responses



Q10:

Are there any features you would like our application to have?
هل هناك أي مميزات تفضل/ين تواجدها في التطبيق ؟

11 responses

لا

اضع مجال اهتمامي عند التسجيل، وتكون التنبيهات خاصة بالمجال اللي وضعته.

يوضح مدة الدورة ووقتها واذا تتعارض مع حدث انا حطيته من قبل او اذا سجلت بالدورة اقدر أضيف تنبيه لهت قي كالندر الجوال حقي Calender

A discussion space for participants.

يكون فيها اراء سابقة اذا احد كان ماخذها من قبل

لا

وجود تعليقات تقييم عن الدورة ، ووجود وصف لها

ان يكون هناك وصف واضح للدوره تاريخ بدايتها وتاريخ نهايتها ، كم مدتها وكم ساعه باليوم واذا هي اونلاين او حضوري واذا حضوري وين موقعها واذا اونلاين هل هي مباشره او مسجله

سهوله الاستخدام في متناول الجميع

9.3 Appendix C : Testing Questions

Question Number	Question
Application Testing Questions	
1	The Sign Up proccess on the application was straightforward ?
2	Was Editing your profile and saving changes within the application was easy ?
3	Was Navigating through the available programs and filtering them intuitive and easy ?
4	Was filling the evaluation questionnaire within the application convenient and easy?
Website Testing Questions	
1	Signing In on the website was easy ?
2	Was the visibility and accessability of faculty members details on the website were satisfactory?
3	Are you satisfied with the system's program processing functionality ?
4	Are you satisfied with the system's project processing functionality ?
5	Were the collibration features (creating chats, meetings) on the website effective?
6	Were the calendar feature on the website helpful in tracking the programs, projects, and tasks effectively?
7	Were the process of viewing and deleting the notifications on the system straightforward nad user-friendly ?
General system feedback	
1	Were you satisfied with the performance and functionality of the system ?
2	Did you found the system interfaces clear and easy to use ?
3	Did you find it easy and smooth to navigate through the system pages ?
4	Did the error messages in the system were clear and informative ?
5	What improvments or additional features would you suggest to enhance the user experiment of the system ?